

Test report

246416-2R2TRFWL

Date of issue: February 12, 2014

Applicant:

Bombardier Recreational Products

Product:

RFID Ignition Module

Model:

246416

FCC ID:

2ABBF-246416

IC Registration number:

11538A-246416

Specifications:

◆ **FCC 47 CFR Part 15.209**


Radiated emission limits; general requirements

◆ **RSS-210, Issue 8, December 2010**

Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

Test location

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Website:	www.nemko.com
Site number:	FCC: 176392; IC: 2040A-4 (3 m semi anechoic chamber)

Tested by:	Andrey Adelberg, Senior Wireless/EMC Specialist
Reviewed by:	Kevin Rose, Wireless/EMC Specialist
Date:	February 12, 2014
Signature:	

Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contain in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

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Section 1. Report summary

1.1 Applicant

Company name	Bombardier Recreational Products
Address	565 Rue de la Montagne
City	Valcourt
Province/State	QC
Postal/Zip code	JOE 2L0
Country	Canada

1.2 Manufacturer

Company name	Minda Corporation Ltd.
Address	D-6-11, Sec-59
City	Noida
Province/State	Uttar Pradesh
Postal/Zip code	201301
Country	India

1.3 Test specifications

FCC 47 CFR Part 15.209	Radiated emission limits; general requirements
RSS-210, Issue 8, December 2010	Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

1.4 Test methods

ANSI C64.3 v 2003	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
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1.5 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was completed against all relevant requirements of the test standard. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

See "Summary of test results" for full details.

1.6 Exclusions

None

1.7 Test report revision history

Revision #	Details of changes made to test report
TRF	Original report issued
R1TRF	Model name updated
R2TRF	Class I permissive change as per quote Q10257460

Section 2. Summary of test results

2.1 FCC Part 15 Subpart C, general requirements test results

Part	Test description	Verdict
§15.31(e)	Variation of power source	Not applicable ¹
§15.203	Antenna requirement	Pass ²
§15.209	Radiated emission limits; general requirements.	Pass
§15.207	Conducted limits	Not applicable ³
§15.215	Emission bandwidth	Pass

Notes: ¹ The testing was performed with fully charged battery

² The Antennas are located within the enclosure of EUT and not user accessible

³ The EUT is powered from motorcycle battery

2.2 RSS-210, Issue 8, Clause 2 test results

In addition to RSS-210, the requirements in RSS-Gen, General Requirements and Information for the Certification of Radio Apparatus, must be met.

RSS-Gen, part	Test description	Verdict
§4.6.1	Occupied bandwidth	Pass
§7.2.4	AC power lines conducted emission limits	Not applicable ¹
§7.2.5	Transmitter spurious emission limits	Pass

Notes: ¹ The EUT is powered from motorcycle battery

Section 3. Equipment under test (EUT) details

3.1 Sample information

Receipt date	February 12, 2014
Nemko sample ID number	1, 2

3.2 EUT information

Product name	DESS RFID Ignition Module for Spyder
Model	246416
Part number	710004142
Serial number	Not applicable

3.3 Technical information

Operating frequency	125 kHz (fixed)
Modulation type	Continuous wave
Occupied bandwidth (99 %)	663 Hz
Emission designator	NON
Power requirements	12 V _{DC} from motorcycle battery
Antenna information	The EUT uses a non-detachable coil antenna to the intentional radiator

3.4 Product description and theory of operation

The Digitally Encoded Security System (DESS) is powered by a 12 V_{DC} battery.

It is connected to a key switch barrel (antenna) and communicates with an Engine Control Module (ECM).

The base station communicates with a key having a transponder at 125 kHz.

Depending if the key inserted in the barrel is authenticated or not, it gives a digital signal (via a Dallas protocol) to the ECM. The ECM will then permit the ignition of the engine. The RFID communication is occurring only at key on and shuts down after authentication.

3.5 EUT exercise details

The EUT's software was modified to transmit continuously once powered.

3.6 EUT setup diagram

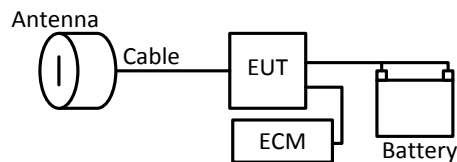


Figure 3.6-1: Setup diagram

Section 4. Engineering considerations

4.1 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

4.2 Technical judgment

Class I permissive change was made to the EUT by introducing internal RC circuit at the antenna output and removing external ferrite ring and removing extension of the antenna cable.

4.3 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 5. Test conditions

5.1 Atmospheric conditions

Temperature	15–30 °C
Relative humidity	20–75 %
Air pressure	860–1060 mbar

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

5.2 Power supply range

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages $\pm 5\%$, for which the equipment was designed.

Section 6. Measurement uncertainty

6.1 Uncertainty of measurement

Nemko Canada Inc. has calculated measurement uncertainty and is documented in EMC/MUC/001 "Uncertainty in EMC measurements." Measurement uncertainty was calculated using the methods described in CISPR 16-4 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC measurements; as well as described in UKAS LAB34: The expression of Uncertainty in EMC Testing. Measurement uncertainty calculations assume a coverage factor of $K=2$ with 95% certainty.



Section 7. Test equipment

7.1 Test equipment list

Table 7.1-1: Equipment list

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
3 m EMI test chamber	TDK	SAC-3	FA002047	1 year	Mar. 09/14
Flush mount turntable	Sunol	FM2022	FA002082	—	NCR
Controller	Sunol	SC104V	FA002060	—	NCR
Antenna mast	Sunol	TLT2	FA002061	—	NCR
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 26	FA002043	1 year	Oct. 24/14
Bilog antenna (20–3000 MHz)	Sunol	JB3	FA002108	1 year	Feb. 21/14
Active loop antenna (0.01–30 MHz)	EMCO	6502	FA001686	1 year	Sept. 27/14

Note: NCR - no calibration required

Section 8. Testing data

8.1 FCC 15.215(c) Emission bandwidth and RSS Gen 4.6.1 Occupied bandwidth

8.1.1 Definitions and limits

Part 15.215(c)

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80 % of the permitted band in order to minimize the possibility of out-of-band operation.

RSS-Gen Clause 4.6.1 Occupied bandwidth

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99 percent emission bandwidth, as calculated or measured.

The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1 percent of the selected span as is possible without being below 1 percent. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual.

The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 percent of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded.

The span between the two recorded frequencies is the occupied bandwidth.

8.1.2 Test summary

Test date:	February 12, 2014	Temperature:	25.2 °C
Test engineer:	Andrey Adelberg	Air pressure:	1020 mbar
Verdict:	Pass	Relative humidity:	31.6 %

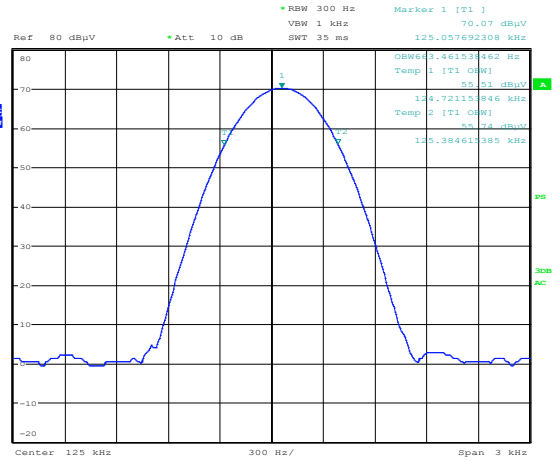
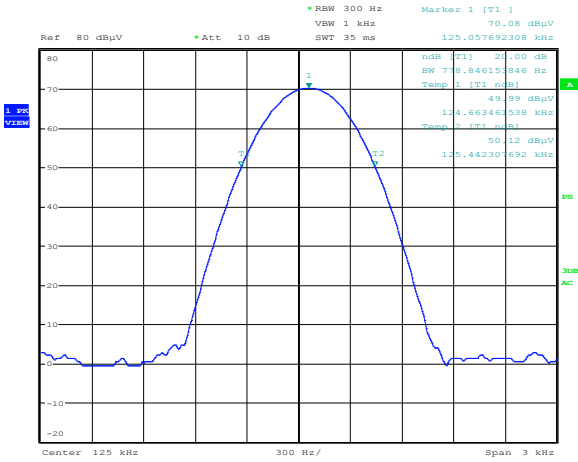
8.1.3 Observations/special notes

Spectrum analyzer settings:

Resolution bandwidth:	300 Hz
Video bandwidth:	≥3 × RBW
Detector mode:	Peak
Trace mode:	Max Hold



8.1.4 Test data



Date: 12.FEB.2014 10:27:10

Date: 12.FEB.2014 10:27:54

Plot 8.1-1: 20 dB bandwidth

Plot 8.1-2: 99 % bandwidth

Table 8.1-1: 20 dB bandwidth results

Frequency, kHz	20 dB bandwidth, Hz
125	779

Table 8.1-2: 99 % bandwidth results

Frequency, kHz	99 % bandwidth, Hz
125	663

8.2 FCC Part 15.209 and RSS-Gen Clause 7.2.5 Radiated emission limits; general requirements

8.2.1 Definitions and limits

FCC:

(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table.

IC:

Spurious emissions from licence-exempt transmitters shall comply with the field strength limits shown below. Additionally, the level of any transmitter spurious emission shall not exceed the level of the transmitter's fundamental emission.

Table 8.2-1: FCC §15.209 and RSS-Gen – Radiated emission limits

Frequency, MHz	Field strength of emissions		Measurement distance, m
	µV/m	dBµV/m	
0.009–0.490*	2400/F	$67.6 - 20 \times \log_{10}(F)$	300
0.490–1.705*	24000/F	$87.6 - 20 \times \log_{10}(F)$	30
1.705–30.0*	30	29.5	30
30–88	100	40.0	3
88–216	150	43.5	3
216–960	200	46.0	3
above 960	500	54.0	3

Note: F is in kHz

8.2.2 Test summary

Test date:	February 12, 2014	Temperature:	25.2 °C
Test engineer:	Andrey Adelberg	Air pressure:	1020 mbar
Verdict:	Pass	Relative humidity:	31.6 %

8.2.3 Observations, settings and special notes

The spectrum was searched from 20 kHz to 1 GHz.

Radiated measurements were performed at a distance of 3 m.

Fundamental limit calculation: $67.6 - 20 \times \log_{10}(F) = 67.6 - 20 \times \log_{10}(125) = 67.6 - 41.9 = 25.7$ dBµV/m at 300 m.

300 m to 3 m distance correction factor for frequencies below 30 MHz is $40 \times \log_{10}(300 / 3) = 80$ dB.

Fundamental limit at 3 m = Fundamental limit at 300 m + distance correction factor = $25.7 + 80 = 105.7$ dBµV/m at 3 m

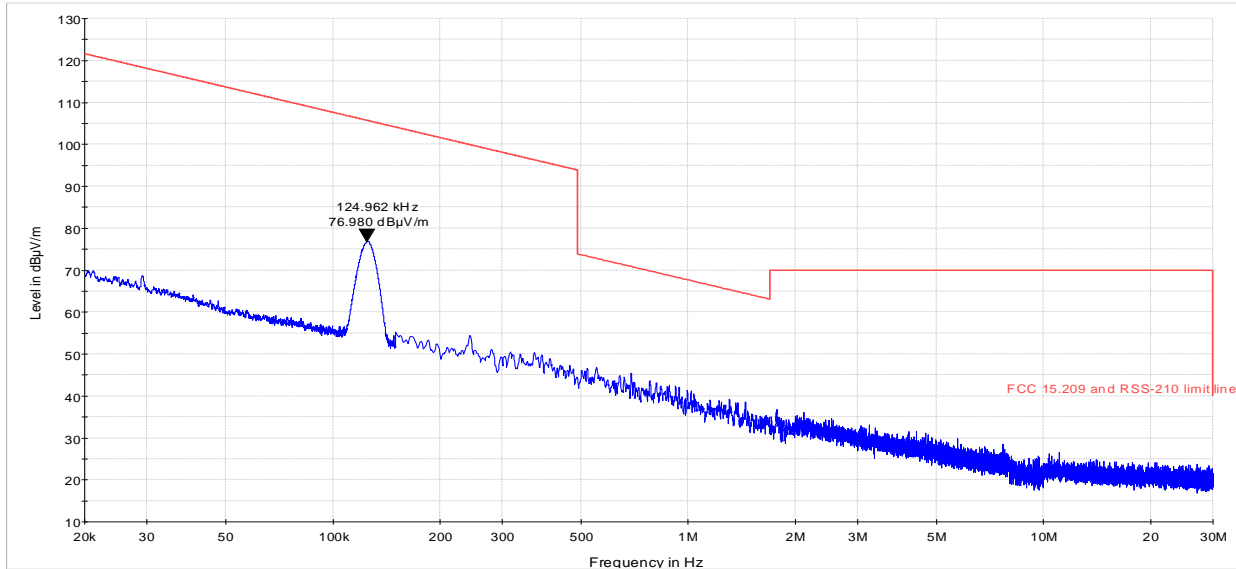
Spectrum analyser settings for radiated measurements below 30 MHz:

Resolution bandwidth:	10 kHz
Video bandwidth:	30 kHz
Detector mode:	Peak
Trace mode:	Max Hold

Spectrum analyser settings for radiated measurements within 30 MHz to 1 GHz:

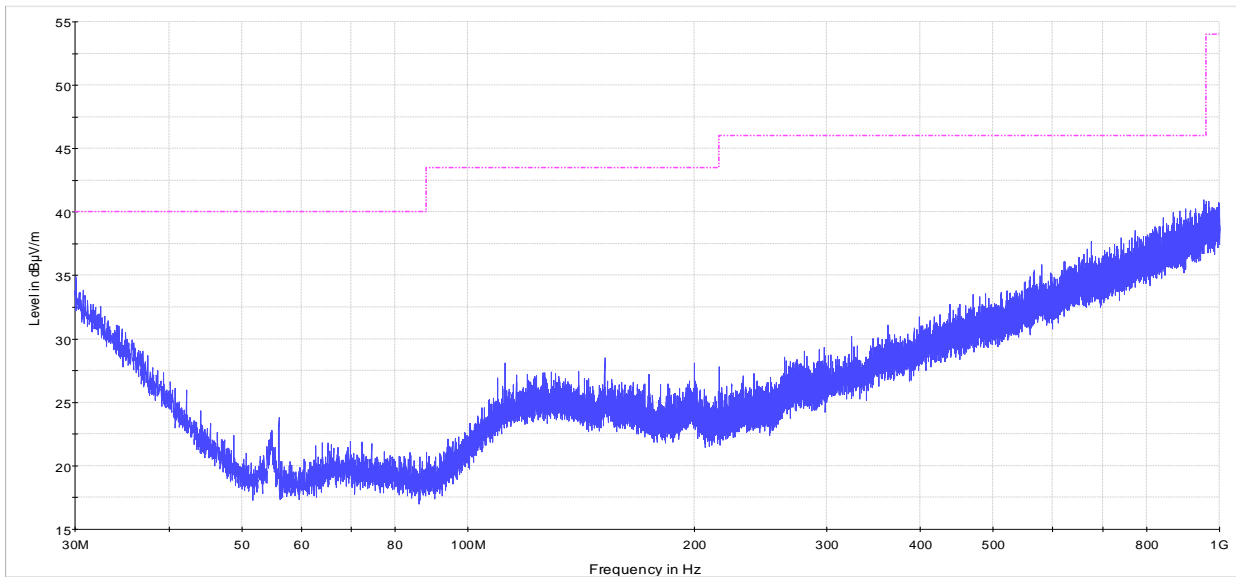
Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Detector mode:	Peak
Trace mode:	Max Hold

8.2.4 Test data



— Radiated emissions
— Peak scan
— FCC 15.209 and RSS-210 limit line

Plot 8.2-1: Emission below 30 MHz



— Radiated emissions above 30 MHz
— Preview Peak Detector
— FCC Part 15.209 and ICES-GEN Limit

Plot 8.2-2: Emission above 30 MHz

8.2.4 Test data, continued

Table 8.2-2: Radiated field strength measurement results

Frequency, kHz	Peak Field strength, dB μ V/m @ 3 m	Limit, dB μ V/m @ 3 m	Margin, dB
125	76.98	105.70	28.72

Notes: Field strength includes correction factor of antenna and cable loss.

Section 9. Block diagrams of test set-ups

9.1 Radiated emissions set-up

