

# 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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|               |                                                      |
|---------------|------------------------------------------------------|
| Company name: | Nemko Canada Inc.                                    |
| Address:      | 303 River Road                                       |
| City:         | Ottawa                                               |
| Province:     | Ontario                                              |
| Postal code:  | K1V 1H2                                              |
| Country:      | Canada                                               |
| Telephone:    | +1 613 737 9680                                      |
| Facsimile:    | +1 613 737 9691                                      |
| Toll free:    | +1 800 563 6336                                      |
| 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

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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

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### 1.1 Applicant

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|                 |                                  |
|-----------------|----------------------------------|
| 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

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|                 |                        |
|-----------------|------------------------|
| 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

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|                                 |                                                                            |
|---------------------------------|----------------------------------------------------------------------------|
| 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

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|                   |                                                                                                                                                                      |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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 |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### 1.5 Statement of compliance

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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

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None

### 1.7 Test report revision history

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| 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 <sup>1</sup> |
| §15.203   | Antenna requirement                             | Pass <sup>2</sup>           |
| §15.209   | Radiated emission limits; general requirements. | Pass                        |
| §15.207   | Conducted limits                                | Not applicable <sup>3</sup> |
| §15.215   | Emission bandwidth                              | Pass                        |

Notes: <sup>1</sup> The testing was performed with fully charged battery

<sup>2</sup> The Antennas are located within the enclosure of EUT and not user accessible

<sup>3</sup> 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 <sup>1</sup> |
| §7.2.5        | Transmitter spurious emission limits     | Pass                        |

Notes: <sup>1</sup> The EUT is powered from motorcycle battery

## Section 3. Equipment under test (EUT) details

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### 3.1 Sample information

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

### 3.2 EUT information

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

### 3.3 Technical information

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|                           |                                                                        |
|---------------------------|------------------------------------------------------------------------|
| Operating frequency       | 125 kHz (fixed)                                                        |
| Modulation type           | Continuous wave                                                        |
| Occupied bandwidth (99 %) | 663 Hz                                                                 |
| Emission designator       | N0N                                                                    |
| Power requirements        | 12 V <sub>DC</sub> 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

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The Digitally Encoded Security System (DESS) is powered by a 12 V<sub>DC</sub> 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

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

### 3.6 EUT setup diagram

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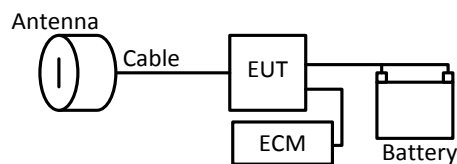


Figure 3.6-1: Setup diagram

## Section 4. Engineering considerations

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### 4.1 Modifications incorporated in the EUT

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

### 4.2 Technical judgment

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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

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No deviations were made from laboratory procedures.

# Section 5. Test conditions

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## 5.1 Atmospheric conditions

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|                   |               |
|-------------------|---------------|
| 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

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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

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### 6.1 Uncertainty of measurement

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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

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### 7.1 Test equipment list

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**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 %    |

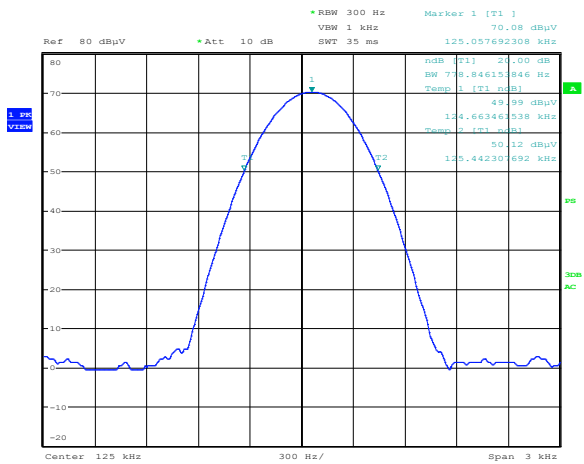
#### 8.1.3 Observations/special notes

##### Spectrum analyzer settings:

|                       |                            |
|-----------------------|----------------------------|
| Resolution bandwidth: | 300 Hz                     |
| Video bandwidth:      | $\geq 3 \times \text{RBW}$ |
| Detector mode:        | Peak                       |
| Trace mode:           | Max Hold                   |

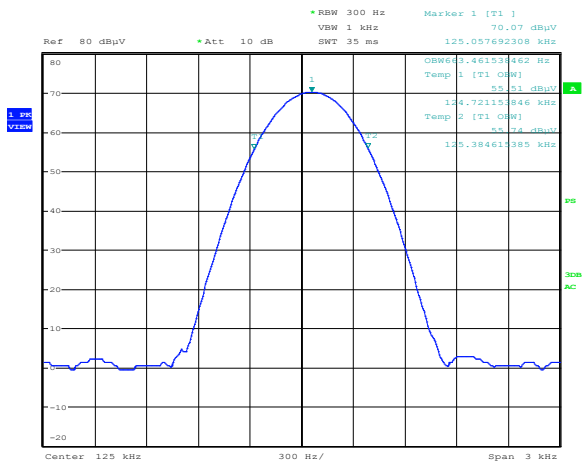


8.1.4 Test data



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

Plot 8.1-1: 20 dB bandwidth



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

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,<br>MHz | Field strength of emissions |                                 | Measurement distance,<br>m |
|-------------------|-----------------------------|---------------------------------|----------------------------|
|                   | $\mu\text{V/m}$             | $\text{dB}\mu\text{V/m}$        |                            |
| 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:  $67.6 - 20 \times \log_{10}(F) = 67.6 - 20 \times \log_{10}(125) = 67.6 - 41.9 = 25.7 \text{ dB}\mu\text{V/m}$  at 300 m.

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

Fundamental limit at 3 m = Fundamental limit at 300 m + distance correction factor =  $25.7 + 80 = 105.7 \text{ dB}\mu\text{V/m}$  at 3 m

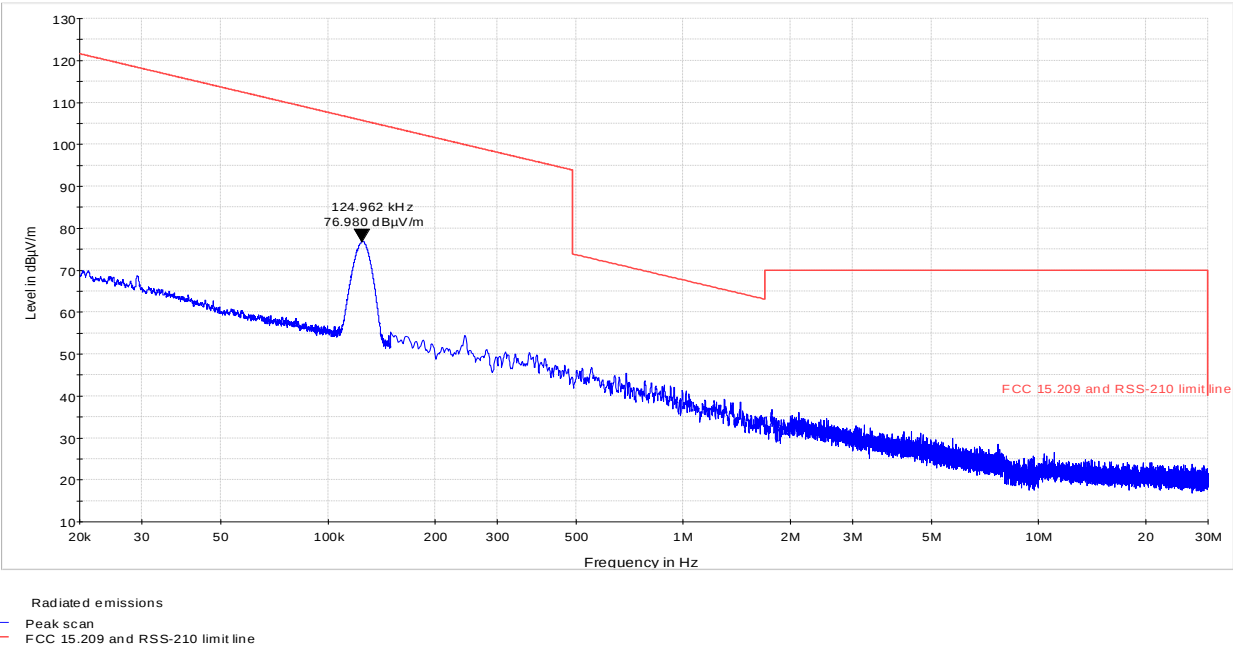
Spectrum analyser settings for radiated measurements below 30 MHz:

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

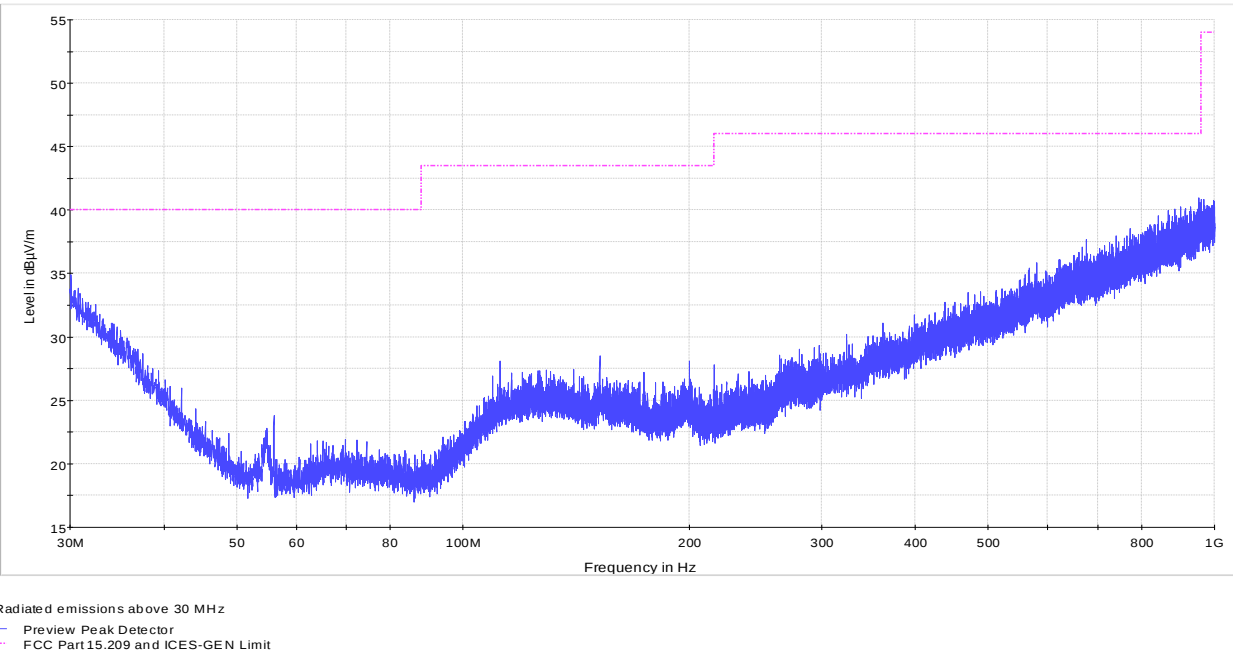
Spectrum analyser settings for radiated measurements within 30 MHz to 1 GHz:

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

8.2.4 Test data



Plot 8.2-1: Emission below 30 MHz



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, dBµV/m @ 3 m | Limit, dBµV/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

