

# Test report

**281122-3TRFWL**

Date of issue: March 23, 2015

Applicant:

**Paradox Security Systems Ltd.**

Product:

**Outdoor/Indoor Window and Sliding Door Dual Detector with Anti Masking and Pet immunity**

Model:

**NVR35M**

FCC ID:

**KDYNVR35M**

IC Registration number:

**2438A-NVR35M**

Specifications:

◆ **FCC 47 CFR Part 15 Subpart C, §15.231**

Periodic operation in the band 40.66-40.70 MHz and above 70 MHz.

◆ **RSS-210, Issue 8, December 2010, Annex 1.1**

Momentarily operated devices

#### Test location

|              |                                                      |
|--------------|------------------------------------------------------|
| 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             | David Duchesne, Senior EMC/Wireless Specialist                                      |
| Reviewed by           | Andrey Adelberg, Senior Wireless/EMC Specialist                                     |
| Date                  | March 23, 2015                                                                      |
| Signature of reviewer |  |

#### 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

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### 1.1 Applicant and manufacturer

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|              |                                                           |
|--------------|-----------------------------------------------------------|
| Company name | Paradox Security Systems Ltd.                             |
| Address      | 780 Industrial Blvd, St-Eustache, Quebec, Canada, J7R 5V3 |

### 1.2 Test specifications

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|                                              |                                                                 |
|----------------------------------------------|-----------------------------------------------------------------|
| FCC 47 CFR Part 15, Subpart C, Clause 15.231 | Periodic operation in the band 40.66–40.70 MHz and above 70 MHz |
| RSS-210, Issue 8, December 2010, Annex 1.1   | Momentarily operated devices                                    |

### 1.3 Test methods

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

### 1.4 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.

### 1.5 Exclusions

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None

### 1.6 Test report revision history

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| Revision # | Details of changes made to test report |
|------------|----------------------------------------|
| TRF        | Original report issued                 |

## Section 2. Summary of test results

### 2.1 FCC Part 15 Subpart C test results

**Table 2.1-1: FCC Part 15 – Radio frequency devices results**

| Part       | Test description                                                       | Verdict                     |
|------------|------------------------------------------------------------------------|-----------------------------|
| §15.31(e)  | Variation of power source                                              | See Notes <sup>1</sup>      |
| §15.203    | Antenna requirement                                                    | See Notes <sup>2</sup>      |
| §15.207(a) | Conducted limits                                                       | Not applicable <sup>3</sup> |
| §15.231(a) | Conditions for intentional radiators to comply with periodic operation | Pass                        |
| §15.231(b) | Field strength of emissions                                            | Pass                        |
| §15.231(c) | Emission bandwidth                                                     | Pass                        |
| §15.231(d) | Requirements for devices operating within 40.66–40.70 MHz band         | Not applicable <sup>4</sup> |
| §15.231(e) | Conditions for intentional radiators to comply with periodic operation | Not applicable <sup>5</sup> |

Notes:

- <sup>1</sup> Fundamental field strength was measured with a fresh battery.
- <sup>2</sup> The EUT is equipped with an integral antenna.
- <sup>3</sup> The EUT is battery powered.
- <sup>4</sup> The EUT does not operate in the frequency range of 40.66–40.70 MHz.
- <sup>5</sup> The EUT complies with requirement 15.231 (a).

### 2.2 IC RSS-GEN, Issue 4 test results

**Table 2.2-1: IC RSS-GEN Issue 4 results**

| Part  | Test description                                                         | Verdict                     |
|-------|--------------------------------------------------------------------------|-----------------------------|
| 7.1.2 | Receiver radiated emission limits                                        | Not applicable <sup>1</sup> |
| 7.1.3 | Receiver conducted emission limits                                       | Not applicable <sup>1</sup> |
| 8.8   | Power Line Conducted Emissions Limits for Licence-Exempt Radio Apparatus | Not applicable <sup>2</sup> |

Notes:

- <sup>1</sup> The EUT does not contain a receiver.
- <sup>2</sup> The EUT is battery powered.

### 2.3 IC RSS-210, Issue 8 test results

**Table 2.3-1: IC RSS-210 Issue 8 Annex 1 results**

| Part   | Test description                                | Verdict                     |
|--------|-------------------------------------------------|-----------------------------|
| A1.1.1 | Types of momentary signals                      | Pass                        |
| A1.1.2 | Field strength and frequency bands              | Pass                        |
| A1.1.3 | Bandwidth for momentary signals                 | Pass                        |
| A1.1.4 | Frequency stability within 40.66–40.70 MHz band | Not applicable <sup>1</sup> |
| A1.1.5 | Reduced field strengths                         | Not applicable <sup>2</sup> |

Notes:

- <sup>1</sup> The EUT does not operate in the frequency range of 40.66–40.70 MHz.
- <sup>2</sup> The EUT complies with requirement RSS-210 A1.1.2.

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

### 3.1 Sample information

|                        |               |
|------------------------|---------------|
| Receipt date           | March 6, 2015 |
| Nemko sample ID number | 133000962     |

### 3.2 EUT information

|                   |                                                                                         |
|-------------------|-----------------------------------------------------------------------------------------|
| Product name      | Outdoor/Indoor Window and Sliding Door Dual Detector with Anti Masking and Pet immunity |
| Model             | NRV35M (433 MHz)                                                                        |
| Hardware revision | 480-5005-000                                                                            |
| FW version        | V1.0.50                                                                                 |
| Serial number     | None                                                                                    |

### 3.3 Technical information

|                                         |                                                                                             |
|-----------------------------------------|---------------------------------------------------------------------------------------------|
| Applicant IC company number             | 2438A                                                                                       |
| IC UPN number                           | NVR35M                                                                                      |
| All used IC test site(s) Reg. number    | 2040A-4                                                                                     |
| RSS number and Issue number             | RSS-210 Annex A1.1, Issue 8, December 2010                                                  |
| Frequency Min (MHz)                     | 433.92                                                                                      |
| Frequency Max (MHz)                     | 433.92                                                                                      |
| RF power Min (W)                        | N/A                                                                                         |
| RF power Max (W)                        | N/A                                                                                         |
| Field strength, Units @ distance        | 73.69 dBμV/m, Peak field strength @ 3m, 62.45 dBμV/m, Average field strength @ 3m           |
| Measured BW (kHz) (99 %)                | 55 kHz                                                                                      |
| Calculated BW (kHz), as per TRC-43      | N/A                                                                                         |
| Type of modulation                      | OOK                                                                                         |
| Emission classification (F1D, G1D, D1D) | A1A                                                                                         |
| Transmitter spurious, Units @ distance  | 51.96 dBμV/m Average Detector @ 3037.44 MHz, @ 3m                                           |
| Power requirements                      | 3 V <sub>DC</sub> (Two "AA" Alkaline batteries)                                             |
| Antenna information                     | The EUT uses a unique antenna coupling/ non-detachable antenna to the intentional radiator. |

### 3.4 Product description and theory of operation

EUT is a motion detector for alarm systems

### 3.5 EUT exercise details

The EUT was in continuous transmit state.

3.6 EUT setup diagram

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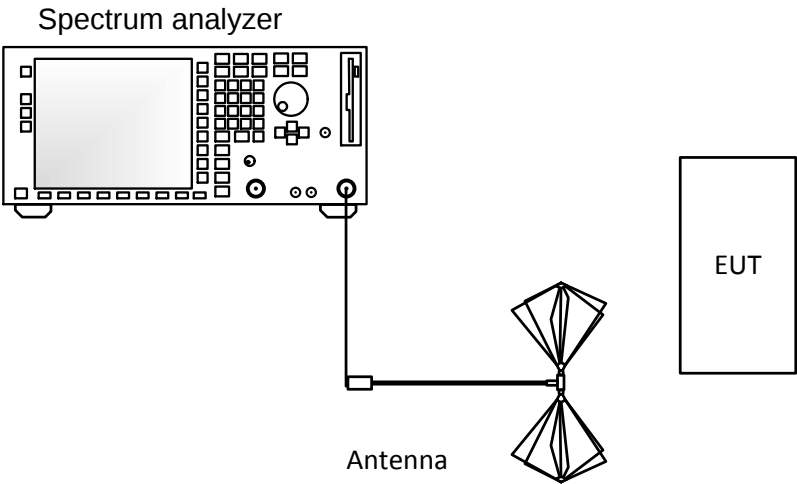


Figure 3.6-1: Setup diagram

## 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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None

### 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

## 6.1 Uncertainty of measurement

Measurement uncertainty budgets for the tests are detailed below. Measurement uncertainty calculations assume a coverage factor of  $K = 2$  with 95% certainty.

| Test name                         | Measurement uncertainty, dB |
|-----------------------------------|-----------------------------|
| All antenna port measurements     | 0.55                        |
| Conducted spurious emissions      | 1.13                        |
| Radiated spurious emissions       | 3.78                        |
| AC power line conducted emissions | 3.55                        |

## 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. 18/15 |
| Receiver/spectrum analyzer  | Rohde & Schwarz | ESU 26    | FA002043  | 1 year    | Jan. 07/16 |
| Bilog antenna (20–3000 MHz) | Sunol           | JB3       | FA002108  | 1 year    | Mar. 12/15 |
| Horn antenna (1–18 GHz)     | EMCO            | 3115      | FA000649  | 1 year    | Mar. 25/15 |
| 50 $\Omega$ coax cable      | C.C.A.          | None      | FA002555  | 1 year    | June 23/15 |
| 50 $\Omega$ coax cable      | Huber + Suhner  | None      | FA002074  | 1 year    | June 23/15 |

Notes: NCR - no calibration required

**Table 7.1-2: Test software details**

| Test description   | Manufacturer of Software | Details                                              |
|--------------------|--------------------------|------------------------------------------------------|
| Radiated emissions | Rhode & Schwarz          | EMC32, Software for EMC Measurements, Version 8.53.0 |

Notes: None

## Section 8. Testing data

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### 8.1 FCC 15.231(a) and RSS-210 A1.1.1 Conditions for intentional radiators to comply with periodic operation

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#### 8.1.1 Definitions and limits

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**FCC:**

- (a) The provisions of this section are restricted to periodic operation within the band 40.66–40.70 MHz and above 70 MHz. Except as shown in paragraph (e) of this section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Continuous transmissions, voice, video and the radio control of toys are not permitted. Data is permitted to be sent with a control signal. The following conditions shall be met to comply with the provisions for this periodic operation:
  - (1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
  - (2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.
  - (3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.
  - (4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.
  - (5) Transmission of set-up information for security systems may exceed the transmission duration limits in paragraphs (a)(1) and (a)(2) of this section, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.

**IC:**

The following conditions shall be met to comply with the provisions for momentary operation:

- (a) A manually operated transmitter shall be equipped with a push-to-operate switch and be under manual control at all transmission times. When released, the transmitter shall cease transmission (holdover time of up to 5 seconds is permitted).
- (b) A transmitter activated automatically shall cease transmission within 5 seconds after activation (i.e. maximum 5 seconds of operation).
- (c) Periodic transmissions at regular predetermined intervals are not permitted, except as provided in Section A.1.1.5. However, polling or supervision transmissions to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmission does not exceed 2 seconds per hour for each transmitter.
- (d) Intentional radiators employed for radio control purposes during emergencies involving fire, security of goods (e.g. burglar alarms), and safety-of-life, when activated to signal an alarm, may operate during the interval of the alarm condition.

#### 8.1.2 Test summary

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|               |                |
|---------------|----------------|
| Test date     | March 10, 2015 |
| Test engineer | David Duchesne |
| Verdict       | Pass           |

#### 8.1.3 Observations, settings and special notes

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None

|                      |                                                                                                         |
|----------------------|---------------------------------------------------------------------------------------------------------|
| <b>Section 8</b>     | Testing data                                                                                            |
| <b>Test name</b>     | FCC 15.231(a) and RSS-210 A1.1.1 Conditions for intentional radiators to comply with periodic operation |
| <b>Specification</b> | FCC Part 15 Subpart C and RSS-210, Issue 8                                                              |



#### 8.1.4 Test data

- 1) The EUT is not manual triggered.
- 2) The EUT generates automatic transmission when it is signaling an alarm. Transmission ceases within 5 seconds. (See Figure 8.1-1)
- 3) The EUT transmits periodic integrity polling messages, not exceeding 2 seconds of transmission per hour.
- 4) The EUT usage is for radio control purposes during emergencies. See client provided details below.
- 5) The EUT does not transmit set-up information

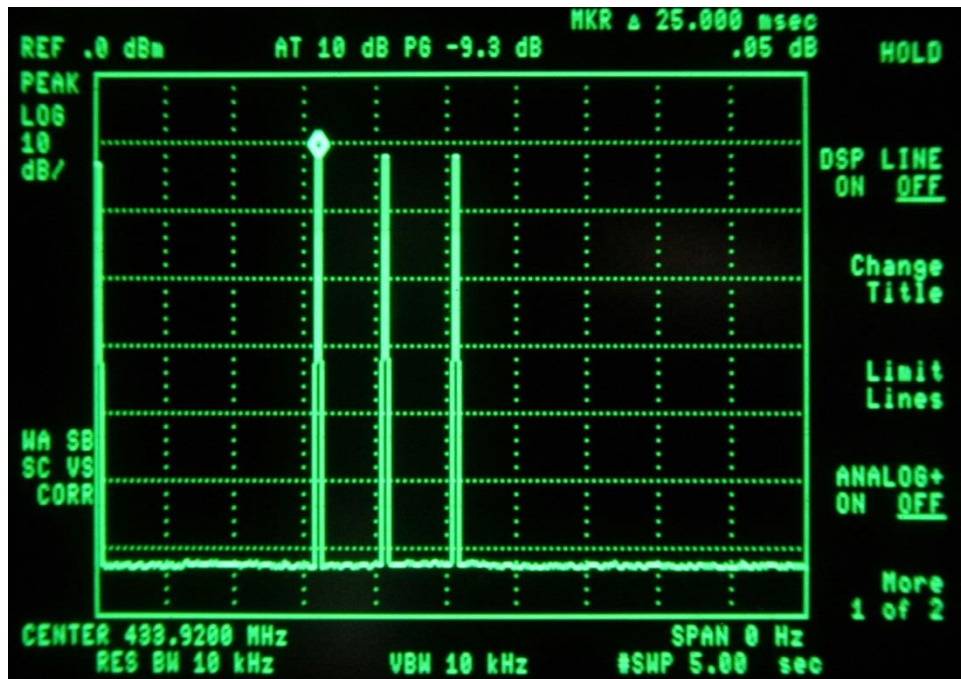


Figure 8.1-1: Transmission time

Details as provided by applicant.

The NVR35 M undifferentiated of its frequency transmits one type of message called the Standard Message (SM). The SM is 8 transmissions spaced apart between 200 and 500 ms (random) with duration of 27.4 ms for each transmission. The SM is sent out every 16–19 minutes for supervision purpose and whenever a detection, tamper, or low battery event occurs. Within a typical hour we can assume 3 supervision events and 2 detection events:

$$(3 + 2) \times 8 \times 27.4 \text{ ms} = 1.1 \text{ seconds per 3600 seconds} = 0.03\% \text{ duty cycle}$$

## 8.2 FCC 15.231(b) and RSS-210 A1.1.2 Field strength of emissions

### 8.2.1 Definitions and limits

#### FCC:

- (b) In addition to the provisions of §15.205 the field strength of emissions from intentional radiators operated under this section shall not exceed the following table.
- 1) The field strength limits in the table are specified at a distance of 3 meters. The tighter limits apply at the band edges.
  - 2) Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in §15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.
  - 3) The limits on the field strength of the spurious emissions in the table below are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

#### IC:

- 1) The field strength of emissions from momentarily operated intentional radiators shall not exceed the limits in Table A.
- 2) Intentional radiators shall demonstrate compliance with the field strength limits shown in Table A, based on the average value of the measured emissions.  
Alternatively, compliance with the limit in Table A may be demonstrated using a CISPR quasi-peak detector. If average measurements are employed, the requirements of Pulsed Operation of RSS-Gen apply regarding pulsed operation for averaging pulsed emissions and for limiting peak emissions.
- 3) The field strength limits shown in Table A are based on the fundamental frequency of the intentional radiator. Unwanted emissions shall be attenuated to the limits listed in RSS-Gen or to the limits shown in table below, whichever are less stringent.

**Table 8.2-1: Field strength limits**

| Fundamental frequency<br>(MHz) | Field strength of fundamental |               | Field strength of spurious emissions |               |
|--------------------------------|-------------------------------|---------------|--------------------------------------|---------------|
|                                | (µV/m)                        | (dBµV/m)      | (µV/m)                               | (dBµV/m)      |
| 40.66–40.70 <sup>1</sup>       | 2,250                         | 67            | 225                                  | 47            |
| 70–130                         | 1,250                         | 61.9          | 125                                  | 41.9          |
| 130–174                        | 1,250 to 3,750*               | 61.9 to 71.5* | 125 to 375*                          | 41.9 to 51.5* |
| 174–260                        | 3,750                         | 71.5          | 375                                  | 51.5          |
| 260–470                        | 3,750 to 12,500*              | 71.5 to 81.9* | 375 to 1,250*                        | 51.5 to 61.9* |
| Above 470                      | 12,500                        | 81.9          | 1,250                                | 61.9          |

Notes: <sup>1</sup>The levels applicable to FCC only. For IC field strength shall not exceed 10 µV/m (80 dBµV/m) measured at 3 m with an average meter. Alternatively, it shall not exceed 233 mV/m measured with a quasi-peak meter. (Note: Do not use the above to convert average meter readings to quasi-peak values.)  
Outside the 40.65–40.71 MHz band, the general field strength limits listed in RSS-Gen shall apply, except for harmonics, which shall not exceed 225 µV/m at 3 m.

\* Linear interpolation with frequency F in MHz:

For 130–174 MHz: FS (microvolts/m) =  $(56.82 \times F) - 6136$

For 260–470 MHz: FS (microvolts/m) =  $(41.67 \times F) - 7083$

The frequency band 225–399.9 MHz is allocated for Government of Canada usage. There are different types of operations in different parts of this band of frequencies, including communications with aircraft and operations using high-power transmitters. Besides avoiding the restricted frequency bands listed in RSS-Gen, it is recommended that the entire 225–399.9 MHz band be avoided.

## 8.2.1 Definitions and limits, continued

**Table 8.2-2: FCC §15.209 and RSS-Gen – Radiated emission limits**

| Frequency,<br>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                       |

- Notes:
- F = fundamental frequency in kHz
  - In the emission table above, the tighter limit applies at the band edges.
  - For frequencies above 1 GHz the limit on peak RF emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test.

**Table 8.2-3: IC restricted frequency bands**

| MHz             | MHz                 | MHz           | GHz         |
|-----------------|---------------------|---------------|-------------|
| 0.090–0.110     | 12.51975–12.52025   | 399.9–410     | 5.35–5.46   |
| 2.1735–2.1905   | 12.57675–12.57725   | 608–614       | 7.25–7.75   |
| 3.020–3.026     | 13.36–13.41         | 960–1427      | 8.025–8.5   |
| 4.125–4.128     | 16.42–16.423        | 1435–1626.5   | 9.0–9.2     |
| 4.17725–4.17775 | 16.69475–16.69525   | 1645.5–1646.5 | 9.3–9.5     |
| 4.20725–4.20775 | 16.80425–16.80475   | 1660–1710     | 10.6–12.7   |
| 5.677–5.683     | 25.5–25.67          | 1718.8–1722.2 | 13.25–13.4  |
| 6.215–6.218     | 37.5–38.25          | 2200–2300     | 14.47–14.5  |
| 6.26775–6.26825 | 73–74.6             | 2310–2390     | 15.35–16.2  |
| 6.31175–6.31225 | 74.8–75.2           | 2655–2900     | 17.7–21.4   |
| 8.291–8.294     | 108–138             | 3260–3267     | 22.01–23.12 |
| 8.362–8.366     | 156.52475–156.52525 | 3332–3339     | 23.6–24.0   |
| 8.37625–8.38675 | 156.7–156.9         | 3345.8–3358   | 31.2–31.8   |
| 8.41425–8.41475 | 240–285             | 3500–4400     | 36.43–36.5  |
| 12.29–12.293    | 322–335.4           | 4500–5150     | Above 38.6  |

- Notes:
- Certain frequency bands listed in Table 8.2-3 and above 38.6 GHz are designated for low-power licence-exempt applications. These frequency bands and the requirements that apply to the devices are set out in this Standard

**Table 8.2-4: FCC restricted frequency bands**

| MHz               | MHz                 | MHz           | GHz         |
|-------------------|---------------------|---------------|-------------|
| 0.090–0.110       | 16.42–16.423        | 399.9–410     | 4.5–5.15    |
| 0.495–0.505       | 16.69475–16.69525   | 608–614       | 5.35–5.46   |
| 2.1735–2.1905     | 16.80425–16.80475   | 960–1240      | 7.25–7.75   |
| 4.125–4.128       | 25.5–25.67          | 1300–1427     | 8.025–8.5   |
| 4.17725–4.17775   | 37.5–38.25          | 1435–1626.5   | 9.0–9.2     |
| 4.20725–4.20775   | 73–74.6             | 1645.5–1646.5 | 9.3–9.5     |
| 6.215–6.218       | 74.8–75.2           | 1660–1710     | 10.6–12.7   |
| 6.26775–6.26825   | 108–121.94          | 1718.8–1722.2 | 13.25–13.4  |
| 6.31175–6.31225   | 123–138             | 2200–2300     | 14.47–14.5  |
| 8.291–8.294       | 149.9–150.05        | 2310–2390     | 15.35–16.2  |
| 8.362–8.366       | 156.52475–156.52525 | 2483.5–2500   | 17.7–21.4   |
| 8.37625–8.38675   | 156.7–156.9         | 2690–2900     | 22.01–23.12 |
| 8.41425–8.41475   | 162.0125–167.17     | 3260–3267     | 23.6–24.0   |
| 12.29–12.293      | 167.72–173.2        | 3332–3339     | 31.2–31.8   |
| 12.51975–12.52025 | 240–285             | 3345.8–3358   | 36.43–36.5  |
| 12.57675–12.57725 | 322–335.4           | 3600–4400     | Above 38.6  |
| 13.36–13.41       |                     |               |             |

- Notes:
- None

### 8.2.2 Test summary

|               |                |                   |            |
|---------------|----------------|-------------------|------------|
| Verdict       | Pass           |                   |            |
| Test date     | March 10, 2015 | Temperature       | 23.5 °C    |
| Test engineer | David Duchesne | Air pressure      | 1000. mbar |
| Test location | Ottawa         | Relative humidity | 32.3 %     |

### 8.2.3 Observations, settings and special notes

- The spectrum was searched from 30 MHz to the 10<sup>th</sup> harmonic.
- Average radiated emissions were obtained by subtracting duty cycle / correction factor from the peak measurement results.

Spectrum analyser settings for radiated measurements within restricted bands below 1 GHz:

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

Spectrum analyser settings for peak radiated measurements within restricted bands above 1 GHz:

|                      |          |
|----------------------|----------|
| Resolution bandwidth | 1 MHz    |
| Video bandwidth      | 3 MHz    |
| Detector mode        | Peak     |
| Trace mode           | Max Hold |

Setup details

|                          |                           |
|--------------------------|---------------------------|
| EUT setup configuration  | Table top                 |
| Test facility            | 3 m Semi anechoic chamber |
| Measuring distance       | 3 m                       |
| Antenna height variation | 1–4 m                     |
| Turn table position      | 0–360°                    |

## 8.2.4 Test data

§15.35(c) When the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed; the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds.

$$\text{Duty cycle or average factor} = 20 \times \log_{10} \left( \frac{T_{x100ms}}{100ms} \right)$$

Duty cycle/average factor calculations

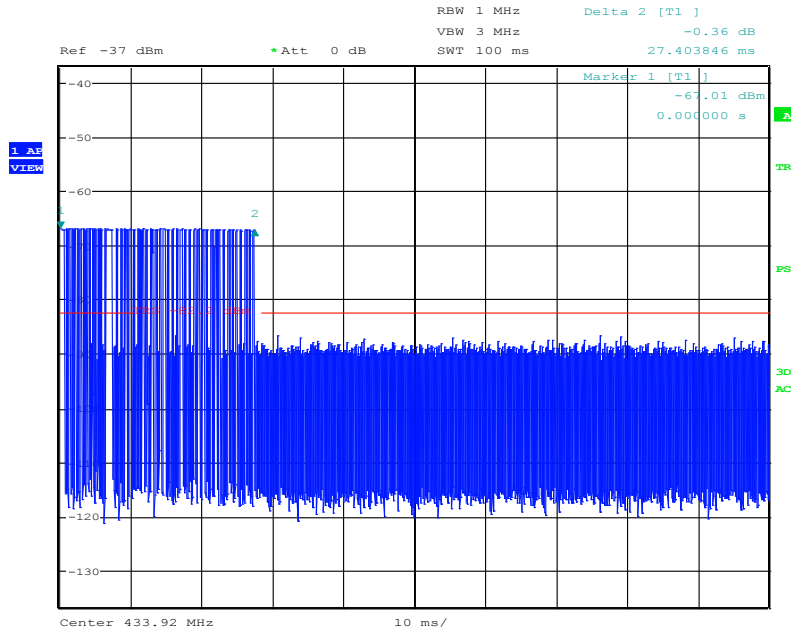


Figure 8.2-1: Burst length

$T_{x100ms} = 27.4 \text{ ms}$

$$\text{Duty cycle/average factor} = 20 \times \log_{10} \left( \frac{T_{x100ms}}{100ms} \right) = 20 \times \log_{10} \left( \frac{27.4ms}{100ms} \right) = -11.24 \text{ dB}$$

## 8.2.4 Test data, continued

**Table 8.2-5: Field Strength of Fundamental results**

| Freq. (MHz) | Ant. Pol. (V/H) | Meas. peak field strength <sup>1</sup> (dBμV/m) | Peak field strength limit (dBμV/m) | Peak field strength margin <sup>3</sup> (dB) | Duty cycle correction factor (dB) | Calculated average field strength <sup>2</sup> (dBμV/m) | Average field strength limit (dBμV/m) | Average field strength margin <sup>3</sup> (dB) |
|-------------|-----------------|-------------------------------------------------|------------------------------------|----------------------------------------------|-----------------------------------|---------------------------------------------------------|---------------------------------------|-------------------------------------------------|
| 433.92      | V               | 73.69                                           | 100.83                             | 27.14                                        | -11.2                             | 62.45                                                   | 80.83                                 | 18.38                                           |
|             | H               | 66.41                                           | 100.83                             | 34.42                                        | -11.2                             | 55.17                                                   | 80.83                                 | 25.66                                           |

Notes: <sup>1</sup> Field strength (dBμV/m) = spectrum analyzer value (dBμV) + correction factor (dB)  
Correction factor = antenna factor ACF (dB) + cable loss (dB) – amplifier gain (dB)  
Sample calculation: 66.68 dBμV/m (field strength) = 77.58 dBμV (receiver reading) + (-10.9 dB) (Correction factor)  
<sup>2</sup> Calculated average field strength (dBμV/m) = measured Peak field strength (dBμV/m) + Duty cycle correction factor (dB). Duty cycle correction factor as calculated from §15.35 (c)  
<sup>3</sup> Margin (dB) = field strength limit – field strength measurement

**Table 8.2-6: Field Strength of Spurious emissions (Harmonic) results**

| Freq. (MHz) | Ant. Pol. (V/H) | Meas. peak field strength <sup>1</sup> (dBμV/m) | Peak field strength limit (dBμV/m) | Peak field strength margin <sup>3</sup> (dB) | Duty cycle correction factor (dB) | Calculated average field strength <sup>2</sup> (dBμV/m) | Average field strength limit (dBμV/m) | Average field strength margin <sup>3</sup> (dB) |
|-------------|-----------------|-------------------------------------------------|------------------------------------|----------------------------------------------|-----------------------------------|---------------------------------------------------------|---------------------------------------|-------------------------------------------------|
| 867.84      | H               | 58.10                                           | 80.83                              | 22.73                                        | -11.24                            | 46.86                                                   | 60.83                                 | 13.97                                           |
| 1735.68     | H               | 58.07                                           | 80.83                              | 22.76                                        | -11.24                            | 46.83                                                   | 60.83                                 | 14.00                                           |
| 2169.6      | V               | 66.15                                           | 80.83                              | 14.68                                        | -11.24                            | 54.91                                                   | 60.83                                 | 5.92                                            |
| 2603.52     | V               | 67.28                                           | 80.83                              | 13.55                                        | -11.24                            | 56.04                                                   | 60.83                                 | 4.79                                            |
| 3471.36     | H               | 64.40                                           | 80.83                              | 16.43                                        | -11.24                            | 53.16                                                   | 60.83                                 | 7.67                                            |

Notes: <sup>1</sup> Field strength (dBμV/m) = spectrum analyzer value (dBμV) + correction factor (dB)  
Correction factor = antenna factor ACF (dB) + cable loss (dB) – amplifier gain (dB)  
Sample calculation: 66.68 dBμV/m (field strength) = 77.58 dBμV (receiver reading) + (-10.9 dB) (Correction factor)  
<sup>2</sup> Calculated average field strength (dBμV/m) = measured Peak field strength (dBμV/m) + Duty cycle correction factor (dB). Duty cycle correction factor as calculated from §15.35 (c)  
<sup>3</sup> Margin (dB) = field strength limit – field strength measurement

**Table 8.2-7: Field Strength of Spurious emissions falling within restricted bands FCC and IC results**

| Freq. (MHz) | Ant. Pol. (V/H) | Meas. peak field strength <sup>1</sup> (dBμV/m) | Peak field strength limit (dBμV/m) | Peak field strength margin <sup>3</sup> (dB) | Duty cycle correction factor (dB) | Calculated average field strength <sup>2</sup> (dBμV/m) | Average field strength limit (dBμV/m) | Average field strength margin <sup>3</sup> (dB) |
|-------------|-----------------|-------------------------------------------------|------------------------------------|----------------------------------------------|-----------------------------------|---------------------------------------------------------|---------------------------------------|-------------------------------------------------|
| 1301.76     | H               | 59.67                                           | 74                                 | 14                                           | -11.24                            | 48.43                                                   | 54                                    | 5.57                                            |
| 3037.44     | V               | 63.20                                           | 74                                 | 11                                           | -11.24                            | 51.96                                                   | 54                                    | 2.04                                            |
| 3905.28     | H               | 62.03                                           | 74                                 | 12                                           | -11.24                            | 50.79                                                   | 54                                    | 3.21                                            |
| 4339.2      | V               | 60.13                                           | 74                                 | 14                                           | -11.24                            | 48.89                                                   | 54                                    | 5.11                                            |

Notes: <sup>1</sup> Field strength (dBμV/m) = spectrum analyzer value (dBμV) + correction factor (dB)  
Correction factor = antenna factor ACF (dB) + cable loss (dB) – amplifier gain (dB)  
Sample calculation: 66.68 dBμV/m (field strength) = 77.58 dBμV (receiver reading) + (-10.9 dB) (Correction factor)  
<sup>2</sup> Calculated average field strength (dBμV/m) = measured Peak field strength (dBμV/m) + Duty cycle correction factor (dB). Duty cycle correction factor as calculated from §15.35 (c)  
<sup>3</sup> Margin (dB) = field strength limit – field strength measurement

8.2.5 Setup photos

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*Figure 8.2-2: Emissions setup photo*



*Figure 8.2-3: Emissions setup photo*

## 8.3 FCC 15.231(c) and RSS-210 A1.1.3 Emission bandwidth of momentary signals

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### 8.3.1 Definitions and limits

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**FCC:**

The bandwidth of the emission shall be no wider than 0.25 % of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5 % of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

**IC:**

For the purpose of Section A1.1, the 99 % bandwidth shall be no wider than 0.25 % of the centre frequency for devices operating between 70 MHz and 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5 % of the centre frequency.

### 8.3.2 Test summary

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|               |                |                   |            |
|---------------|----------------|-------------------|------------|
| Verdict       | Pass           |                   |            |
| Test date     | March 10, 2015 | Temperature       | 23.5 °C    |
| Test engineer | David Duchesne | Air pressure      | 1000. mbar |
| Test location | Ottawa         | Relative humidity | 32.3 %     |

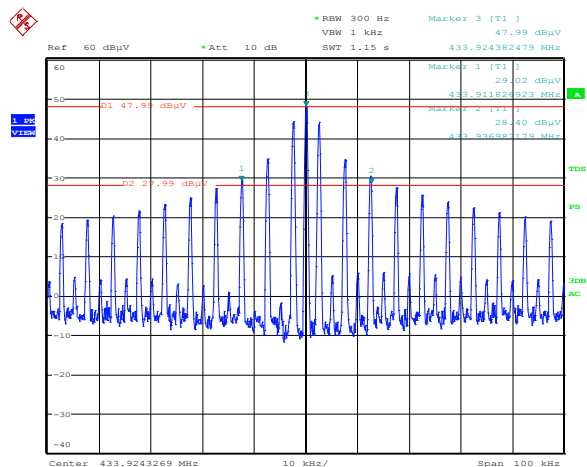
### 8.3.3 Observations, settings and special notes

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Spectrum analyser settings:

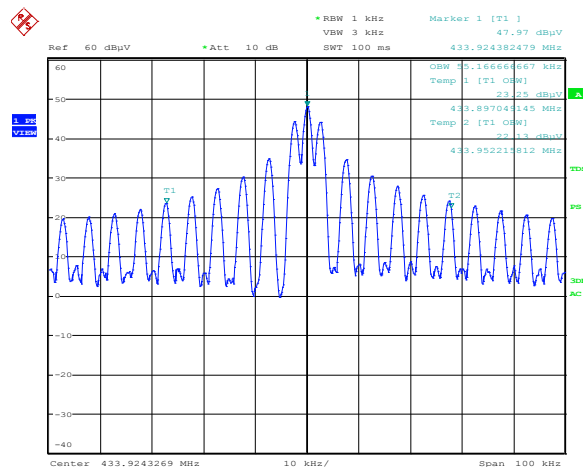
|                      |                                  |
|----------------------|----------------------------------|
| Resolution bandwidth | $\geq 1\%$ of emission bandwidth |
| Video bandwidth      | $\geq 3 \times \text{RBW}$       |
| Frequency span       | Wider than emission bandwidth    |
| Detector mode        | Peak                             |

### 8.3.4 Test data



Date: 11.MAR.2015 13:24:53

**Figure 8.3-1: 20 dB bandwidth**



Date: 11-MAR-2015 13:39:42

**Figure 8.3-2: 99 % bandwidth**

**Table 8.3-1: 20 dB bandwidth results**

| 20 dB bandwidth (kHz) | Limit (kHz) | Margin, kHz |
|-----------------------|-------------|-------------|
| 25                    | 1084.8      | 1059.8      |

Notes: Limit: 0.25 % of 433.92 MHz is 1083.5 kHz

**Table 8.3-2: 99 % bandwidth results**

| 99 % bandwidth (kHz) | Limit (kHz) | Margin, kHz |
|----------------------|-------------|-------------|
| 55                   | 1084.8      | 1029.8      |

Notes: Limit: 0.25 % of 433.92 MHz is 1083.5 kHz

# Section 9. Block diagrams of test set-ups

## 9.1 Radiated emissions set-up

