

# Wireless Test Report – 368533-13TRFWL

Applicant:

**Ring LLC**

Product name:

**Ring**

Model:

**Base Station US**

FCC ID:

**2AEUPBHABU002**

ISED Registration number:

**20271-BHABU002**

Specifications:

**Co-location**

Date of issue: April 4, 2019

Test engineer(s): Mark Libbrecht, EMC/Wireless Specialist

Signature:



Reviewed by: David Duchesne, Senior EMC/Wireless Specialist

Signature:



Lab and Test location(s)

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|                        |  |                           |
|------------------------|--|---------------------------|
| Company name           | Nemko Canada Inc. (Cambridge)  |                           |
| Facility               | 130 Saltsman Drive, Unit #1<br>Cambridge, ON<br>Canada, N3E 0B2<br><br>Tel: +1 519 680 4811<br><br>Test Firm Registration Number: 332406 |                           |
| Test site registration | <b>Organization</b>  | <b>Designation Number</b> |
|                        | FCC  | CA0101                    |
|                        | ISED   | CA0101                    |
| Website                | <a href="http://www.nemko.com">www.nemko.com</a>   |                           |

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 Test specifications

|  |  |
|--|--|
| FCC 47 CFR Part 15, Subpart C, Clause 15.247 | Operation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–585 MHz  |
| FCC 47 CFR Part 15, Subpart E, Clause 15.407 | Unlicensed National Information Infrastructure Devices   |
| FCC 47 CFR Part 15, Subpart C, Clause 15.249 | Operation within the bands 902–928 MHz, 2400–2483.5 MHz, 5725–5875 MHz, and 24.0–24.25 GHz.  |
| FCC 47 CFR Part 22, Subpart C, Clause 22.359 | Emission limitations.  |
| RSS-247, Issue 2, Feb 2017, Section 5        | Standard specifications for frequency hopping systems and digital transmission systems operating in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz |
| RSS-247, Issue 2, Feb 2017, Section 6        | Technical requirements for licence-exempt local area network devices and digital transmission systems operating in the 5 GHz band                            |
| RSS-210 Issue 9, August 2016, Annex B.10     | Devices operating in 902–928, 2400–2483.5 and 5725–5875 MHz  |
| RSS-139 Issue 3, July 2015, Section 6        | Advanced Wireless Services (AWS) Equipment Operating in the Bands 1710-1780 MHz and 2110-2180 MHz  |

### 1.2 Test methods

|  |  |
|--|--|
| 789033 D02 General UNII Test Procedures New Rules v02r01 (December 14, 2017) | Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E |
| 662911 D01 Multiple Transmitter Output v02r01 (October 31, 2013)             | Emissions Testing of Transmitters with Multiple Outputs in the Same Band   |
| 558074 D01 DTS Meas Guidance v05r01 (February 11, 2019)                      | Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247          |
| ANSI C63.10 v2013  | American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices                         |

### 1.3 Exclusions

The EUT was assessed for radiated emissions as a verification with multiple transmitters enabled at the same time to ensure compliance was maintained. Unable to filter GSM1900 @ 1880 MHz. GSM1900 (1810 – 1910 MHz) omitted from radiated measurements

### 1.4 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was completed against all relevant requirements of the test standard or as per detailed in the section 1.3 Exclusions above. 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 Test report revision history

*Table 1.5-1: Test report revision history*

| Revision # | Date of issue | Details of changes made to test report |
|------------|---------------|--|
| TRF        | April 4, 2019 | Original report issued                 |

## Section 2. Summary of test results

### 2.1 Testing period

|                 |                   |
|-----------------|-------------------|
| Test start date | February 13, 2019 |
| Test end date   | April 4, 2019     |

### 2.2 FCC test results

*Table 2.2-1: Result summary*

| Part    | Section | Test description  | Verdict |
|---------|---------|---|---------|
| §15.247 | d       | Unwanted emissions (Radiated)                                     | Pass    |
| §15.249 | d       | Spurious emissions (except harmonics)                             | Pass    |
| §15.407 | (b)(1)  | Undesirable emission limits (Operating in the band 5.15-5.25 GHz) | Pass    |
| §22.359 | (a)     | Out of band emissions   | Pass    |

- Notes:
- The EUT was only assessed for the radiated emissions. No conducted measurements were performed.
  - Only emissions that were a product of multiple transmitters enabled were verified for continued compliance.

### 2.3 RSS test results

*Table 2.3-1: Result summary RSS*

| Part    | Section  | Test description   | Verdict |
|---------|----------|--|---------|
| RSS-247 | 5.5      | Unwanted emissions <sup>1</sup>                                | Pass    |
| RSS-210 | B.10 (b) | Spurious emissions (except for harmonics)                      | Pass    |
| RSS-247 | 6.2.1.2  | Unwanted emission limits (Operating in the band 5.15-5.25 GHz) | Pass    |
| RSS-139 | 6.6      | Transmitter Unwanted Emissions                                 | Pass    |

- Notes:
- The EUT was only assessed for the radiated emissions. No conducted measurements were performed.
  - Only emissions that were a product of multiple transmitters enabled were verified for continued compliance.

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

### 3.1 Applicant and manufacturer

|              |  |
|--------------|--|
| Company name | Ring LLC   |
| Address      | 1523 26 <sup>th</sup> Street, Santa Monica, CA, United States, 90404 |

### 3.2 Sample information

|                        |               |
|------------------------|---------------|
| Receipt date           | April 3, 2019 |
| Nemko sample ID number | Item # 4      |

### 3.3 EUT information

|               |                   |
|---------------|-------------------|
| Product name  | Ring              |
| Model         | Base Station US   |
| Serial number | BHBU21851PG000028 |

### 3.4 Technical information

|                                      |                |
|--------------------------------------|----------------|
| Applicant IC company number          | 20271          |
| IC UPN number                        | 20271-BHABU002 |
| All used IC test site(s) Reg. number | 332406         |

*Table 3.4-1: Antenna information*

| GSM Antenna       | Antenna type | Band 2 Peak gain, dBi       |                             |
|-------------------|--------------|-----------------------------|-----------------------------|
| Main              | Monopole     | 3.6                         |                             |
| Tri band antenna  | Antenna type | 900 MHz Band peak gain, dBi |                             |
| Halo              | Inverted F   | 3.1                         |                             |
| Dual band antenna | Antenna type | 900 MHz Band peak gain, dBi | 2.4 GHz Band peak gain, dBi |
| Z-Wave            | Inverted F   | 0.8                         | NA                          |
| Zigbee            | Inverted F   | NA                          | 4.8                         |

Notes: None

### 3.5 Co-location test plan

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*Table 3.5-1: Co-Location configuration*

| Radio module device   | Radio parameters         |
|---|--------------------------|
| <b>Configuration 1: GSM + ZigBee + Z-Wave + SimpleLink (TI1310)</b> |                          |
| GSM   | Channel 661: 1880 MHz    |
| Zigbee  | Low Channel 11: 2405 MHz |
| Z-Wave  | High Channel 916 MHz     |
| SimpleLink (TI1310)   | High Channel 927.8 MHz   |
| Notes:  | None                     |

### 3.6 Product description and theory of operation

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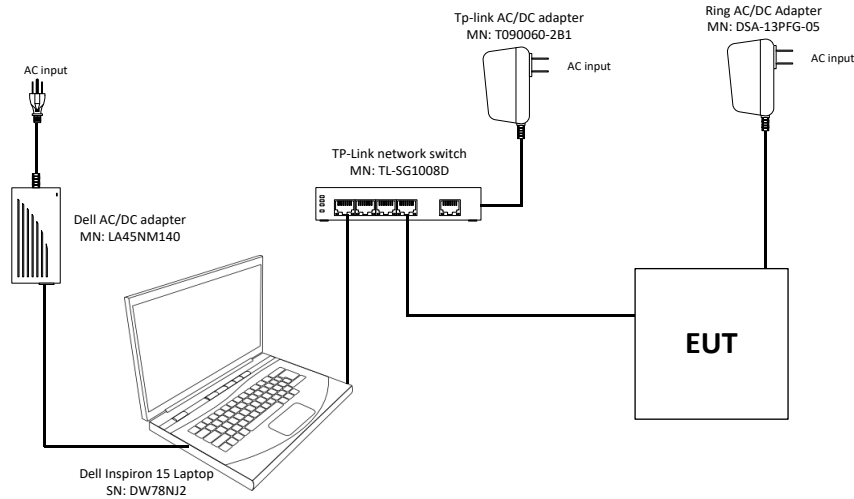
Communications Hub for Home Security Products

### 3.7 EUT exercise details

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The EUT was setup in continuous transmit state.

### 3.8 EUT setup diagram



**Figure 3.8-1:** Setup diagram

### 3.9 EUT sub assemblies

**Table 3.9-1:** EUT sub assemblies

| Description    | Brand name | Model/Part number | Serial number     |
|----------------|------------|-------------------|-------------------|
| AC/DC Adapter  | Ring       | DSA-13PFG-05      | BHAB11851DV000116 |
| Laptop         | Dell       | Inspiron 15       | DW78NJ2           |
| Network switch | TP-Link    | TL-SG1008D        | 2171682000263     |



## Section 4. Engineering considerations

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### 4.1 Modifications incorporated in the EUT for compliance

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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      | 86–106 kPa |

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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UKAS Lab 34 and TIA-603-B have been used as guidance for measurement uncertainty reasonable estimations with regards to previous experience and validation of data. Nemko Canada, Inc. follows these test methods in order to satisfy ISO/IEC 17025 requirements for estimation of uncertainty of measurement for wireless products.

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 |
|-----------------------------|-----------------------------|
| Radiated spurious emissions | 3.78                        |

## Section 7. Test equipment

### 7.1 Test equipment list

**Table 7.1-1: Equipment list**

| Equipment                   | Manufacturer       | Model no. | Serial no. | Asset no. | Cal./Ver. cycle | Next cal./ver. |
|-----------------------------|--------------------|-----------|------------|-----------|-----------------|----------------|
| 3 m EMI test chamber        | TDK                | SAC-3     |            | FA003012  | 1 year          | Aug. 22/19     |
| Flush mount turntable       | SUNAR              | FM2022    |            | FA003006  | —               | NCR            |
| Controller                  | SUNAR              | SC110V    | 050118-1   | FA002976  | —               | NCR            |
| Antenna mast                | SUNAR              | TLT2      | 042418-5   | FA003007  | —               | NCR            |
| Receiver/spectrum analyzer  | Rohde & Schwarz    | ESR26     | 101367     | FA002969  | 1 year          | June 1/19      |
| Spectrum analyzer           | Rohde & Schwarz    | FSW43     | 104437     | FA002971  | 1 year          | June 1/19      |
| Horn antenna (1–18 GHz)     | ETS-Lindgren       | 3117      | 00052793   | FA002911  | 1 year          | Aug. 16/19     |
| Preamplifier (1–18 GHz)     | ETS-Lindgren       | 124334    | 00224880   | FA002956  | 1 year          | Sept 18/19     |
| Bilog antenna (30–2000 MHz) | SUNAR              | JB1       | A053018-2  | FA003010  | 1 year          | Sept. 6/19     |
| 50 Ω coax cable             | Huber + Suhner     | None      | 457630     | FA003047  | 1 year          | Nov 12/19      |
| 50 Ω coax cable             | Huber + Suhner     | None      | 457624     | FA003044  | 1 year          | Nov 12/19      |
| Filter 2.4 – 2.4835 GHz     | Microwave Circuits | N0324413  | 499781     | FA003027  | 1 year          | Oct. 1/19      |
| High Pass Filter 3 – 18 GHz | Microwave Circuits | H3G020G8  | 499786     | FA003026  | 1 year          | Oct. 1/19      |
| Filter 902 – 928 MHz        | Microwave Circuits | N03916M1  | 499787     | FA003032  | 1 year          | Oct. 1/19      |
| Horn antenna (18-25 GHz)    | ETS-Lindgren       | 3116B     | 00122305   | FA002948  | 1 year          | Apr. 18/19     |

Notes: NCR - no calibration required, VOU - verify on use

## Section 8. Testing data

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### 8.1 Spurious emissions caused by co-located transmitters

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#### 8.1.1 Definitions and limits

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##### FCC §15.247 (d):

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

##### FCC §15.249 (d):

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

##### FCC §15.407 (b):

- (1) For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz.
- (5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.
- (6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in § 15.209.
- (7) The provisions of § 15.205 apply to intentional radiators operating under this section.
- (8) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency block edges as the design of the equipment permits.

##### FCC §22.359 (a)

*Out of band emissions.* The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

##### RSS-210 Section B.10 (b):

Emissions radiated outside of the specified frequency bands, except for harmonic emissions, shall be attenuated by at least 50 dB below the level of the fundamental emissions or to the general field strength limits listed in RSS-Gen, whichever is less stringent.

##### RSS-247 Section 5.5:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

##### RSS-247 Section 6.2.1.2:

For transmitters operating in the band 5150–5250 MHz, all emissions outside the band 5150–5350 MHz shall not exceed –27 dBm/MHz e.i.r.p. However, any unwanted emissions that fall into the band 5250–5350 MHz must be 26 dBc, when measured using a resolution bandwidth between 1 and 5% of the occupied bandwidth, above 5.25 GHz. Otherwise, the transmission is considered as intentional and the devices shall implement dynamic frequency selection (DFS) and transmitter power control (TPC) as per the requirements for the band 5250–5350 MHz.

##### RSS-139 Section 6.6:

- i. In the first 1.0 MHz bands immediately outside and adjacent to the equipment's smallest operating frequency block, Footnote 2 which can contain the equipment's occupied bandwidth, the emission power per any 1% of the emission bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least  $43 + 10 \log_{10} p$  (watts) dB.
- ii. After the first 1.0 MHz outside the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power in any 1 MHz bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least  $43 + 10 \log_{10} p$  (watts) dB.

##### IC RSS-Gen Section 8.10:

Restricted bands, identified in table 6 of RSS-Gen Section 8.10, are designated primarily for safety-of-life services (distress calling and certain aeronautical bands), certain satellite downlinks, radio astronomy and some government uses. Except where otherwise indicated, the following restrictions apply:

- a. fundamental components of modulation of licence-exempt radio apparatus shall not fall within the restricted bands of below;
- b. unwanted emissions falling into restricted bands of below shall comply with the limits specified in RSS-Gen;
- c. unwanted emissions not falling within restricted frequency bands shall either comply with the limits specified in the applicable RSS, or with those specified in RSS-Gen.

## 8.1.2 Definitions and limits, continued

**Table 8.1-1: FCC §15.209 and RSS-Gen – Radiated emission limits**

| Frequency,<br>MHz | Field strength of emissions |                                 | Measurement distance, 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                       |

Notes: 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 8.1-2: ISED restricted frequency bands**

| MHz               | MHz                 | MHz           | GHz         |
|-------------------|---------------------|---------------|-------------|
| 0.090–0.110       | 12.57675–12.57725   | 399.9–410     | 7.25–7.75   |
| 0.495–0.505       | 13.36–13.41         | 608–614       | 8.025–8.5   |
| 2.1735–2.1905     | 16.42–16.423        | 960–1427      | 9.0–9.2     |
| 3.020–3.026       | 16.69475–16.69525   | 1435–1626.5   | 9.3–9.5     |
| 4.125–4.128       | 16.80425–16.80475   | 1645.5–1646.5 | 10.6–12.7   |
| 4.17725–4.17775   | 25.5–25.67          | 1660–1710     | 13.25–13.4  |
| 4.20725–4.20775   | 37.5–38.25          | 1718.8–1722.2 | 14.47–14.5  |
| 5.677–5.683       | 73–74.6             | 2200–2300     | 15.35–16.2  |
| 6.215–6.218       | 74.8–75.2           | 2310–2390     | 17.7–21.4   |
| 6.26775–6.26825   | 108–138             | 2483.5–2500   | 22.01–23.12 |
| 6.31175–6.31225   | 149.9–150.05        | 2655–2900     | 23.6–24.0   |
| 8.291–8.294       | 156.52475–156.52525 | 3260–3267     | 31.2–31.8   |
| 8.362–8.366       | 156.7–156.9         | 3332–3339     | 36.43–36.5  |
| 8.37625–8.38675   | 162.0125–167.17     | 3345.8–3358   |             |
| 8.41425–8.41475   | 167.72–173.2        | 3500–4400     |             |
| 12.29–12.293      | 240–285             | 4500–5150     | Above 38.6  |
| 12.51975–12.52025 | 322–335.4           | 5350–5460     |             |

Notes: Certain frequency bands listed in and above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.



8.1.1 Definitions and limits, continued

**Table 8.1-3: 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

8.1.2 Test summary

|               |                |                   |          |
|---------------|----------------|-------------------|----------|
| Verdict       | Pass           |                   |          |
| Test date     | April 4, 2019  | Temperature       | 22 °C    |
| Test engineer | Mark Libbrecht | Air pressure      | 985 mbar |
| Test location | Cambridge      | Relative humidity | 29 %     |

8.1.3 Observations, settings and special notes

- The spectrum was searched from 30 MHz to 25 GHz.
- The spectral plots have been corrected with the associated transducer factors (i.e. antenna factors, cable loss, amplifier gains, and attenuators).
- Radiated measurements were performed at a distance of 3 m from 30 MHz – 1GHz, and 3 GHz – 18 GHz
- Unable to filter GSM1900 @ 1880 MHz. GSM1900 (1810 – 1910 MHz) omitted from radiated measurements
- Measurements 1 GHz – 3 GHz measured at 30 cm.
- Measurements 18 – 25 GHz measured at 3 cm.



8.1.3 Observations, settings and special notes

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Spectrum analyzer settings for radiated measurements below 1 GHz:

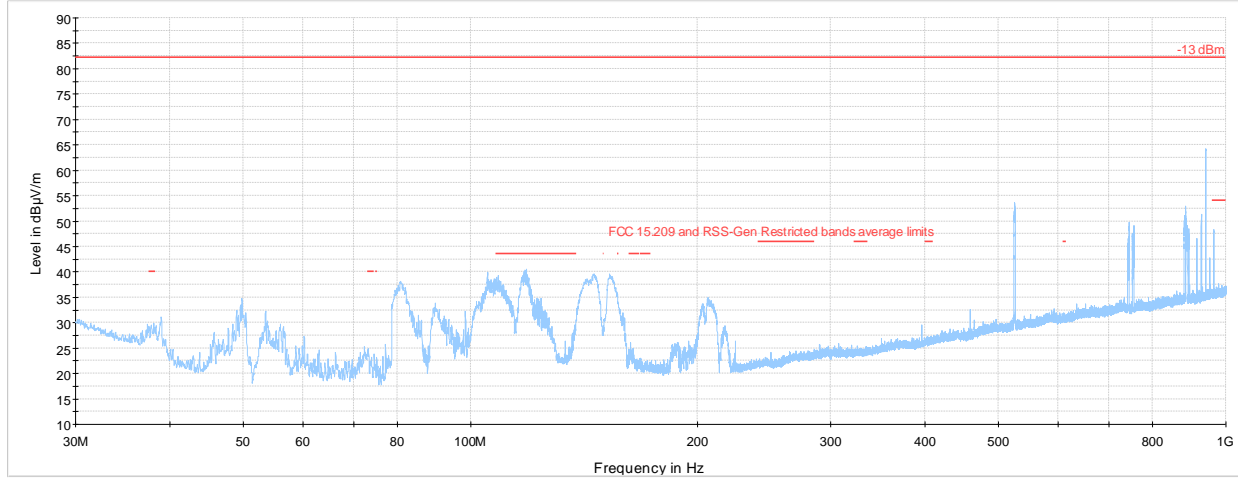
|                      |                    |
|----------------------|--------------------|
| Detector mode        | Peak or Quasi-Peak |
| Resolution bandwidth | 100 kHz or 120 kHz |
| Video bandwidth      | 300 kHz            |
| Trace mode           | Max Hold           |

Spectrum analyser settings for radiated measurements above 1 GHz:

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



8.1.4 Test data



368533 30 MHz - 1 GHz US colocation, filter 902-928 MHz  
— Preview Result 1-PK+  
— -13 dBm  
— FCC 15.209 and RSS-Gen Restricted bands average limits

**Figure 8.1-1:** Radiated spurious emissions products from co-located transmitters, 30 MHz – 1 GHz

8.1.4 Test data, continued

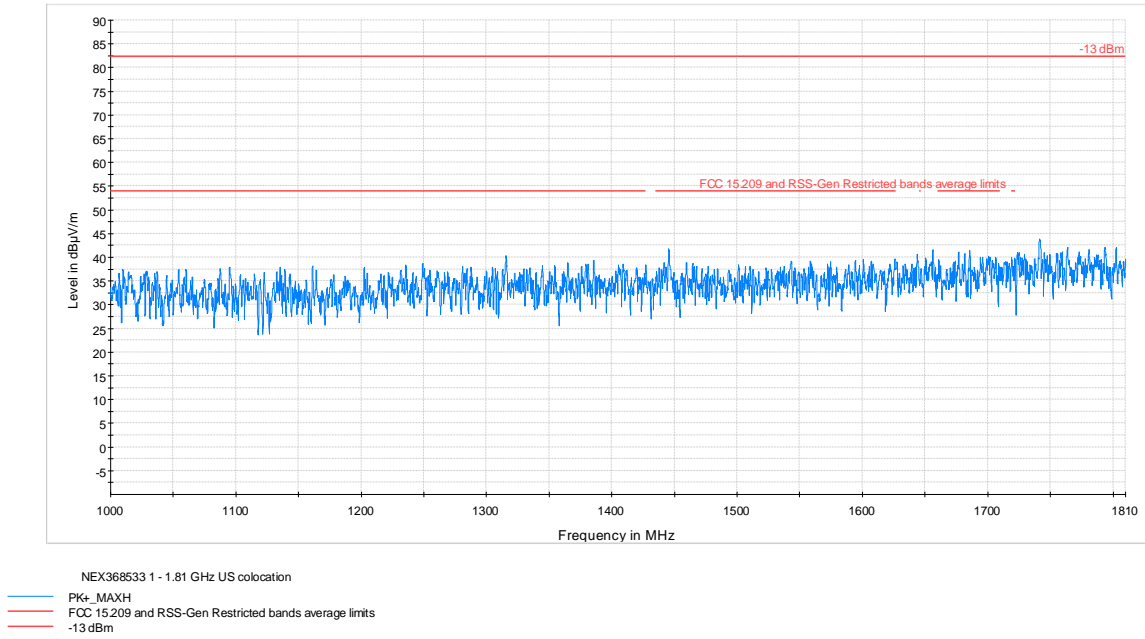
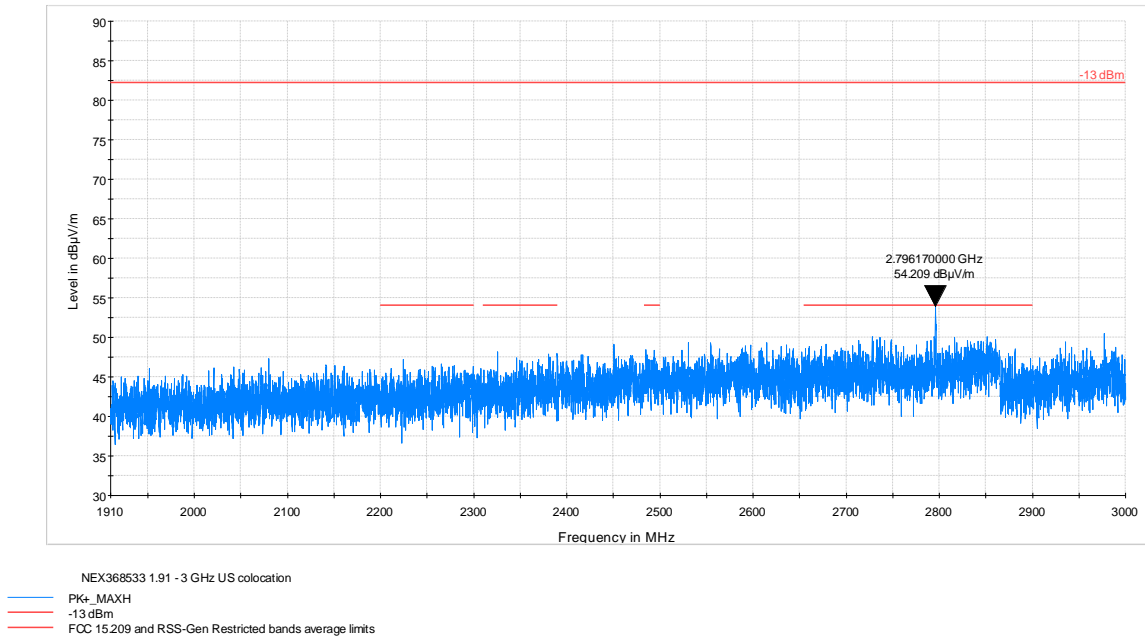


Figure 8.1-2: Radiated spurious emissions products from co-located transmitters within 1–1.810 GHz

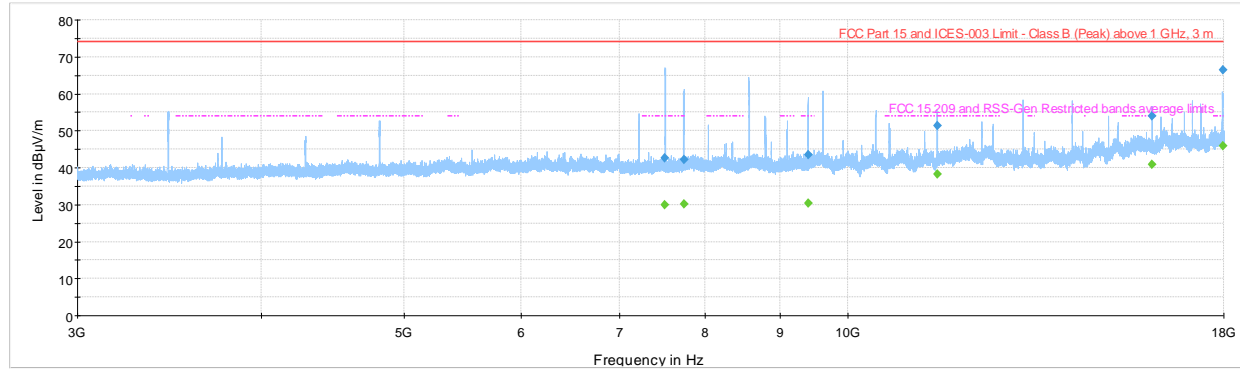


Note: Emissions above the limit were from intentional emissions or their harmonic, no intermodulation emissions were detected

Figure 8.1-3: Radiated spurious emissions products from co-located transmitters within 1.810–3 GHz



8.1.4 Test data, continued



NEX368533 3-18 GHz US Colocation, 3-18 GHz High pass filter  
 Preview Result 1-PK+  
 FCC Part 15 and ICES-003 Limit - Class B (Peak) above 1 GHz, 3 m  
 FCC 15.209 and RSS-Gen Restricted bands average limits  
 Final\_Result PK+  
 Final\_Result CAV

Figure 8.1-4: Radiated spurious emissions products from co-located transmitters within 3–18 GHz

Table 8.1-4: Radiated disturbance (Peak) results for (Colocation)

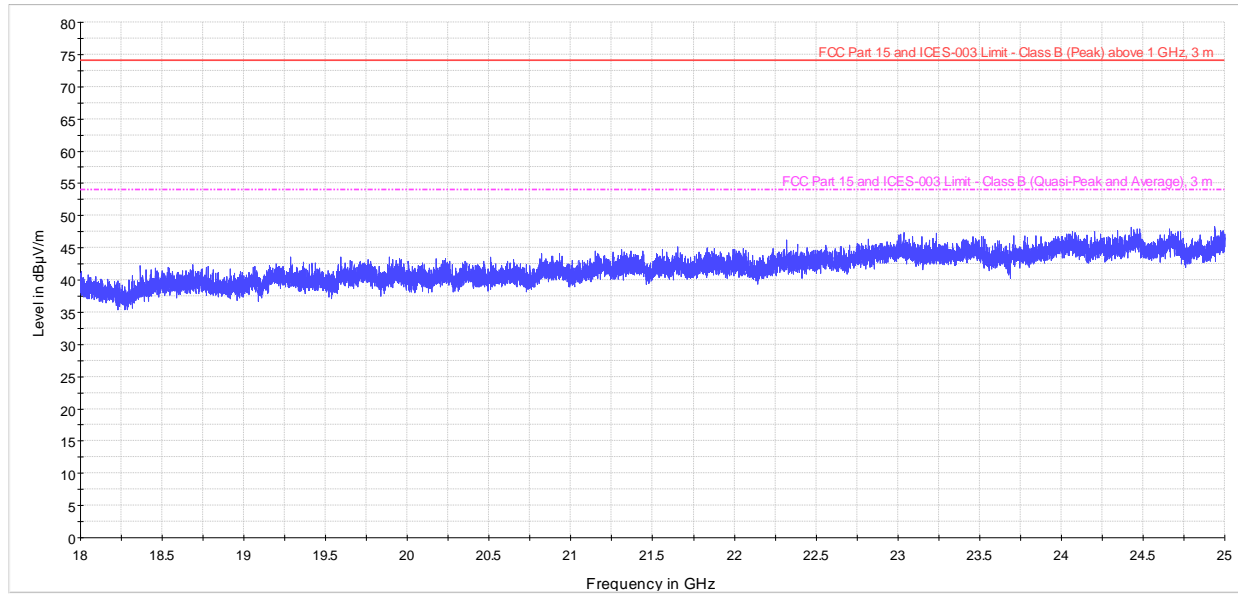
| Frequency (MHz) | Peak field strength <sup>1 and 3</sup> (dBµV/m) | 3 m Peak limit (dBµV/m) | Margin (dB) | Measurement time (ms) | Bandwidth (kHz) | Antenna height (cm) | Pol. (V/H) | Turn table position (°) | Correction factor <sup>2</sup> (dB) |
|-----------------|---|-------------------------|-------------|-----------------------|-----------------|---------------------|------------|-------------------------|-------------------------------------|
| 7514.500        | 42.70   | 74.0                    | 31.30       | 100                   | 1000            | 310.0               | H          | 45                      | -2.2                                |
| 7745.300        | 42.29   | 74.0                    | 31.71       | 100                   | 1000            | 260.0               | V          | 121                     | -2.1                                |
| 9399.700        | 43.53   | 74.0                    | 30.47       | 100                   | 1000            | 310.0               | H          | 18                      | 0.1                                 |
| 11499.700       | 51.44   | 74.0                    | 22.56       | 100                   | 1000            | 254.0               | V          | 8                       | 1.2                                 |
| 16088.500       | 53.93   | 74.0                    | 20.07       | 100                   | 1000            | 300.0               | H          | 29                      | 7.3                                 |
| 17967.700       | 66.48   | 74.0                    | 7.52        | 100                   | 1000            | 305.0               | H          | 10                      | 14.4                                |

Notes: <sup>1</sup> Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)  
<sup>2</sup> Correction factor = antenna factor ACF (dB) + cable loss (dB) – amplifier gain (dB)  
<sup>3</sup> Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions have been recorded.

Sample calculation: 42.7 dBµV/m (field strength) = 44.9 dBµV (receiver reading) -2.2 dB (Correction factor)



8.1.4 Test data, continued



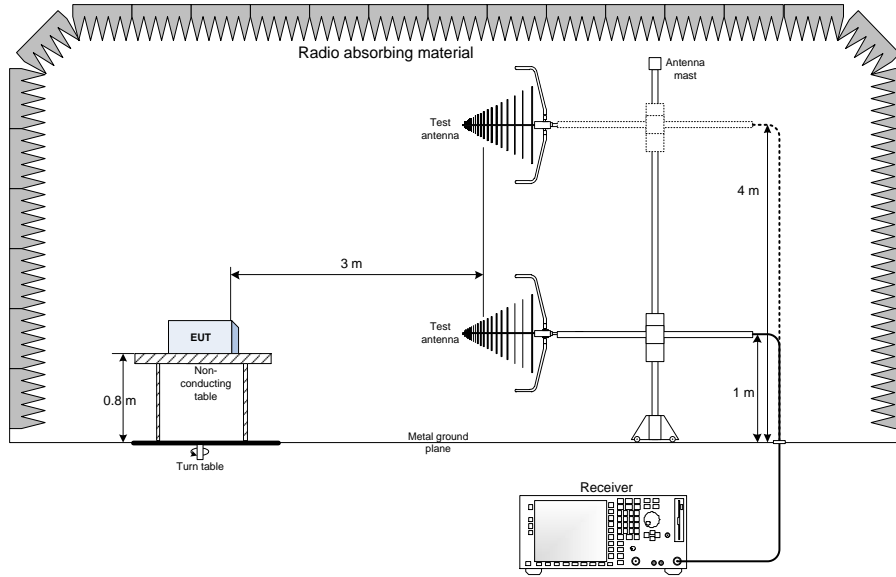
NEX368533 18 - 25 GHz US colocation

- AVG\_MAXH
- PK+\_MAXH
- FCC Part 15 and ICES-003 Limit - Class B (Peak) above 1 GHz, 3 m
- FCC Part 15 and ICES-003 Limit - Class B (Quasi-Peak and Average), 3 m

Figure 8.1-5: Radiated spurious emissions products from co-located transmitters within 18 - 25 GHz

## Section 9. Block diagrams of test set-ups

### 9.1 Radiated emissions set-up for frequencies below 1 GHz



### 9.2 Radiated emissions set-up for frequencies above 1 GHz

