

# FCC and IC Test report for Part 15B, 15.109 and Parts 15.209, 15.225, RSS-210, RSS-Gen

Product name : AXA IN ERL BLE 2  
Applicant : AXA Stenman Nederland B.V  
FCC ID : 2AIQH-AXA-IN-ERL-2  
ISED ID : 21586-AXAINERL2

Test report No. : 190100025 004 v2.00

## Laboratory information

### Accreditation

Telefication complies with the accreditation criteria for test laboratories as laid down in ISO/IEC 17025:2005. The accreditation covers the quality system of the laboratory as well as the specific activities as described in the authorized annex bearing the accreditation number L021 and is granted on 30 November 1990 by the Dutch Council For Accreditation (RvA: Raad voor Accreditatie).

Telefication is designated by the FCC as an Accredited Test Firm for compliance testing of equipment subject to Certification under Parts 15 & 18. The Designation number is: NL0001.

Telefication is a Wireless Device Testing laboratory recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements.  
The Industry Canada registration number for the 3 meter test chamber of Telefication is: 4173A-1.

### Documentation

The test report must always be reproduced in full; reproduction of an excerpt only is subject to written approval of the testing laboratory. The documentation of the testing performed on the tested devices is archived for 10 years at Telefication Netherlands.

### Testing Location

|                    |                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------|
| Test Site          | Telefication BV                                                                                       |
| Test Site location | Edisonstraat 12a<br>6902 PK Zevenaar<br>The Netherlands<br><br>Tel. +31889983600<br>Fax. +31316583189 |
| Test Site FCC      | NL0001                                                                                                |

## Revision History

| Version | Date       | Remarks                                         | By  |
|---------|------------|-------------------------------------------------|-----|
| v0.50   | 05-02-2019 | First draft                                     | RvB |
| v1.00   | 14-02-2019 | Initial release                                 | RvB |
| v2.00   | 09-04-2019 | Updated FCC and ISED id and emission designator | RvB |
|         |            |                                                 |     |

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## Summary of Test results

| FCC                               | ISED         | Description                                | Section in report | Verdict |
|-----------------------------------|--------------|--------------------------------------------|-------------------|---------|
| 15.225(a),(b),(c)                 | RSS-210 B.6  | Field strength of emissions                | 3.1               | Pass    |
| 15.225(d)<br>15.209 (a)<br>15.109 | RSS-Gen 8.9  | Radiated spurious emissions                | 3.2               | Pass    |
| 15.205 (a)                        | RSS Gen 8.10 | Spurious emissions in the restricted bands | 3.2               | Pass    |
| 15.225(e)                         | RSS-210 B.6  | Frequency Stability                        | 3.3               | Pass    |
| 15.215 (c)                        | RSS Gen 6.6  | Occupied Bandwidth/<br>20 dB bandwidth     | 3.4               | Pass    |

## 1 General Description

### 1.1 Applicant

|               |                                                                                |
|---------------|--------------------------------------------------------------------------------|
| Client name:  | AXA Stenman Nederland B.V                                                      |
| Address       | Energiestraat 2, Veenendaal, Utrecht, The Netherlands                          |
| Zip code:     | 3903 AV                                                                        |
| Telephone:    | +31 318 536 111                                                                |
| E-mail:       | <a href="mailto:Gerbrand.hutten@allegion.com">Gerbrand.hutten@allegion.com</a> |
| Contact name: | Mr. G. Hutten                                                                  |

### 1.2 Manufacturer

|                    |                                                                                |
|--------------------|--------------------------------------------------------------------------------|
| Manufacturer name: | AXA Stenman Nederland B.V                                                      |
| Address:           | Energiestraat 2, Veenendaal, Utrecht, The Netherlands                          |
| Zip code:          | 3903 AV                                                                        |
| Telephone:         | +31 318 536 111                                                                |
| E-mail:            | <a href="mailto:Gerbrand.hutten@allegion.com">Gerbrand.hutten@allegion.com</a> |
| Contact name:      | Mr. G. Hutten                                                                  |

### 1.3 Tested Equipment Under Test (EUT)

|                      |                                  |
|----------------------|----------------------------------|
| Product name:        | AXA IN ERL BLE2                  |
| Brand name:          | AXA                              |
| Product Description: | Electronic bicycle lock with BLE |
| FCC ID:              | 2AIQH-AXA-IN-ERL-2               |
| ISED ID:             | 21586-AXAINERL2                  |
| Software version:    | --                               |
| Hardware version:    | --                               |
| Date of receipt      | 22-01-2019                       |
| Tests started:       | 22-01-2019                       |
| Testing ended:       | 30-01-2019                       |

## 1.4 Product specifications of Equipment under test

|                      |                                                                 |
|----------------------|-----------------------------------------------------------------|
| TX Frequency range : | BLE:2400 – 2483.5 MHz<br>RFID: 125 kHz                          |
| RX frequency range : | BLE:2400 – 2483.5<br>RFID: 125 kHz<br>NFC: 13.56 MHz            |
| Antenna type:        | BLE: PCB Antenna<br>RFID: loop antenna<br>NFC: PCB loop antenna |
| Antenna gain :       | BLE: - 2 dBi                                                    |
| Emission designators | BLE: 831KF1D<br>125kHz: 21K5K1D                                 |

## 1.5 Environmental conditions

|                     |            |            |
|---------------------|------------|------------|
| Test date           | 28-01-2019 | 31-01-2019 |
| Ambient temperature | 20.5 °C    | 20.2 °C    |
| Humidity            | 35.1 %     | 32.7 %     |

## 1.6 Measurement standards

- ANSI C63.4:2014
- ANSI C63.10:2013

## 1.7 Applicable standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.209
- FCC Part 15 Subpart B §15.109
- FCC Part 15 Subpart C §15.225
- RSS-Gen Issue 5
- RSS-210 Issue 9

## 1.8 Observation and remarks

The EUT is an Electronic bicycle lock with BLE, RFID and NFC.

With the BLE function the lock can be locked and unlocked. RFID is used to detect a RFID tag embedded inside a chain and the NFC function is used during programming in the factory.

The manufacturer provided both a radiated sample and conducted sample for radio testing.

The NFC radio is in listening mode only. It doesn't transmit a 13.56 MHz carrier. So it was tested with a host device. (Samsung Galaxy A3 (2016)).

## 1.9 Conclusions

The sample of the product showed NO NON-COMPLIANCES to the specifications stated in paragraph 1.7 of this report.

The results of the test as stated in this report, are exclusively applicable to the product items as identified in this report. Telefication accepts no responsibility for any properties of product items in this test report, which are not supported by the tests as specified in paragraph 1.7 *"Applicable standards"*.

All conducted tests are performed by:

Name : ing. R. van Barneveld

Review of test methods and report by:

Name : ing. P.A. Suringa

The above conclusions have been verified by the following signatory:

Date : 09-04-2019

Name : ing K.A. Roes

Function : Coordinator Radio Laboratory

Signature :

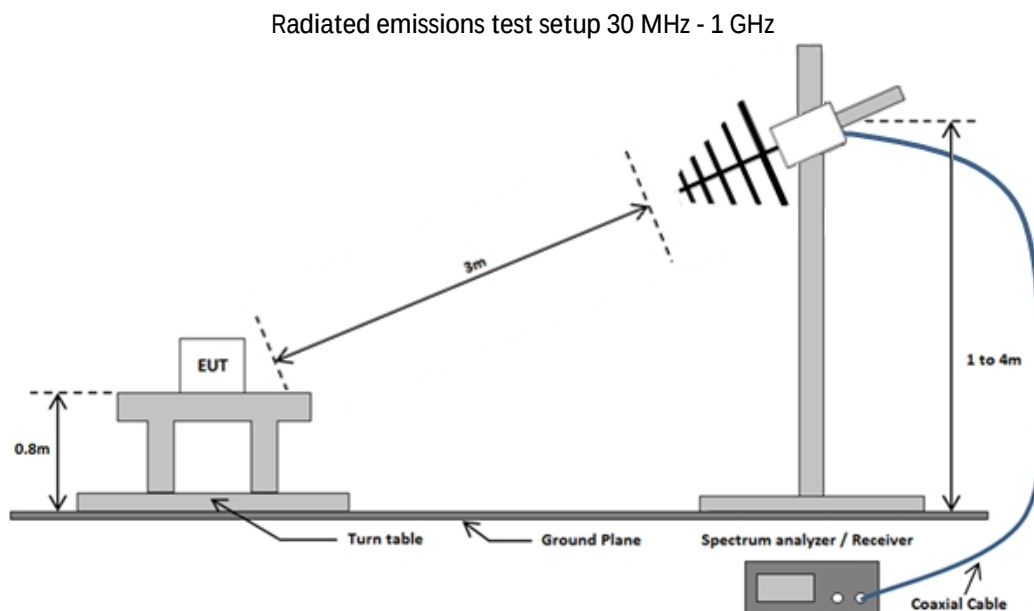
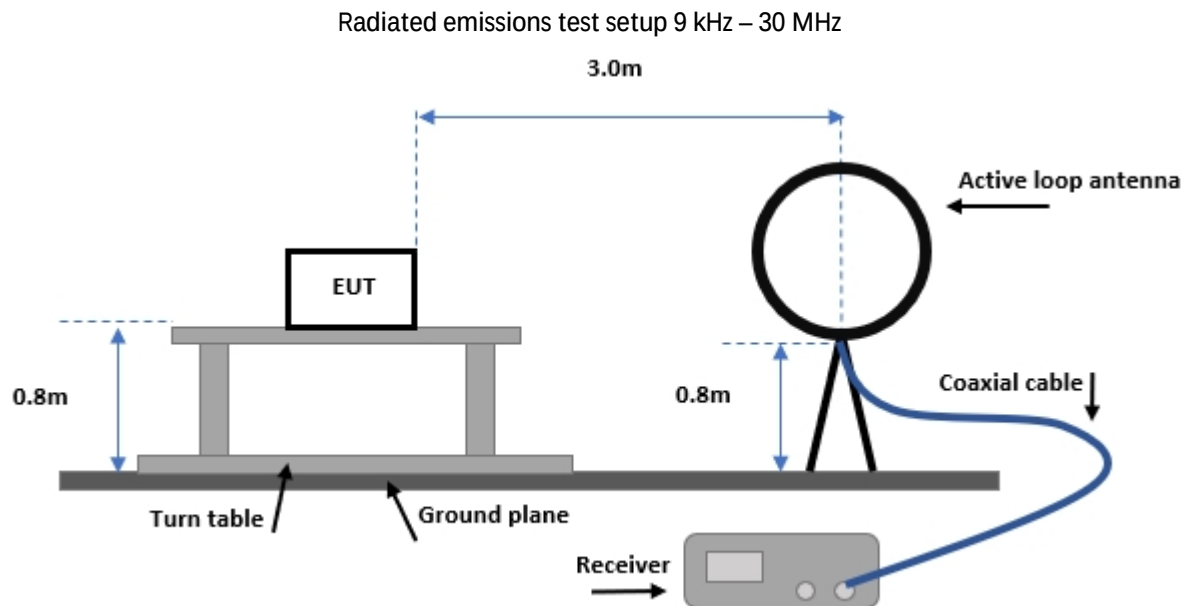


## 2 Test configuration of the Equipment Under Test

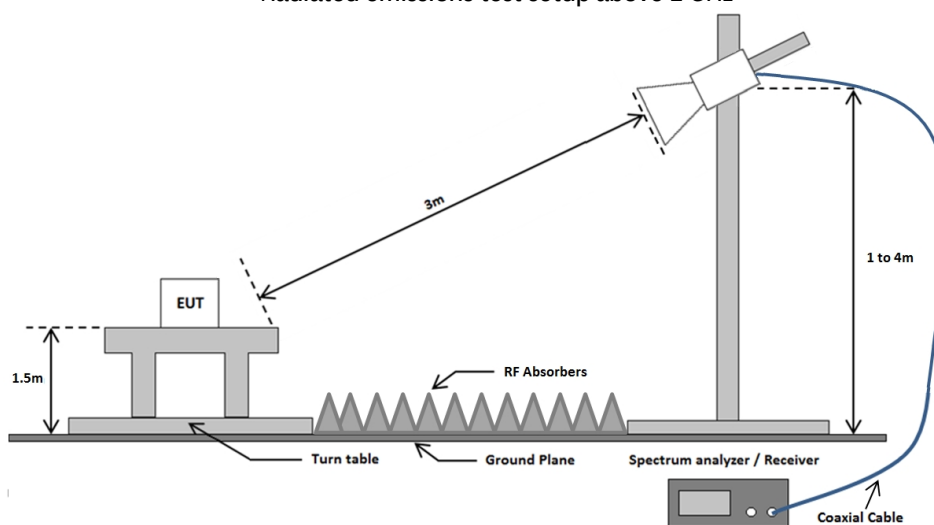
### 2.1 Test mode

The applicant provided test mode firmware for the EUT, in which it was possible to configure the EUT to transmit/receive continuously.

### 2.2 Test setups



### Radiated emissions test setup above 1 GHz



## 2.3 Equipment used in the test configuration

| Description         | Manufacturer           | Model               | ID      | Used at Par. |
|---------------------|------------------------|---------------------|---------|--------------|
| Spectrum Analyzer   | Rohde & Schwarz        | ESCI                | TE11128 | 3.1 – 3.2    |
| Spectrum Analyzer   | Rohde & Schwarz        | FSP40               | TE11125 | 3.3          |
| Spectrum Analyzer   | Rohde & Schwarz        | FSV40               | TE01269 | 3.1 – 3.2    |
| Climate Chamber     | TE 00741               | CTS                 | -40/350 | 3.3          |
| Biconilog Antenna   | Chase                  | CBL6112a            | TE00967 | 3.1 – 3.2    |
| SAC Chamber         | Comtest Engineering BV | -                   | TE00861 | 3.1 – 3.2    |
| Active loop antenna | Rohde & Schwarz        | HFH 2-Z2            | TE00746 | 3.1 – 3.2    |
| Software            | D.A.R.E Instruments    | Radimation 2018.1.3 | --      | 3.2          |

## 2.4 Sample calculations

Field Strength Measurement example(see chapter 3.3):

| Frequency (MHz) | Polarization | Height(m) | Quasi-Peak (dBμV/m) |
|-----------------|--------------|-----------|---------------------|
| 135,6           | Horizontal   | 1         | 40,4                |

The following relation applies:

$$E \text{ (dB}\mu\text{V/m)} = U \text{ (dB}\mu\text{V)} + AF \text{ (dB/m)} + CL \text{ (dB)}$$

Where:

E = Electric field strength

U = Measuring reveiver voltage

AF = Antenna factor

CL = Cable loss

$$(40.4 = 27.23 + 11.8 + 1.37)$$

### 3 Test results

#### 3.1 Field strength of emissions

##### 3.1.1 Limit

15.225(a),(b),(c)

| Frequency (MHz)                     | $\mu\text{V/m}$ at 30 meter | $\text{dB}\mu\text{V/m}$ at 30 meter |
|-------------------------------------|-----------------------------|--------------------------------------|
| 13.553 – 13.567                     | 15,848                      | 84                                   |
| 13.410 – 13.553 and 13.567 – 13.710 | 334                         | 50.5                                 |
| 13.110 – 13.410 and 13.710 - 14.010 | 106                         | 40.5                                 |

##### 3.1.2 Measurement instruments

The measurement instruments are listed in chapter 2.3 of this report.

##### 3.1.3 Test setup

The test setup is as shown in chapter 2.2 of this report.

##### 3.1.4 Test procedure

According to ANSI C63.10-2013, section 6.4.4.2.

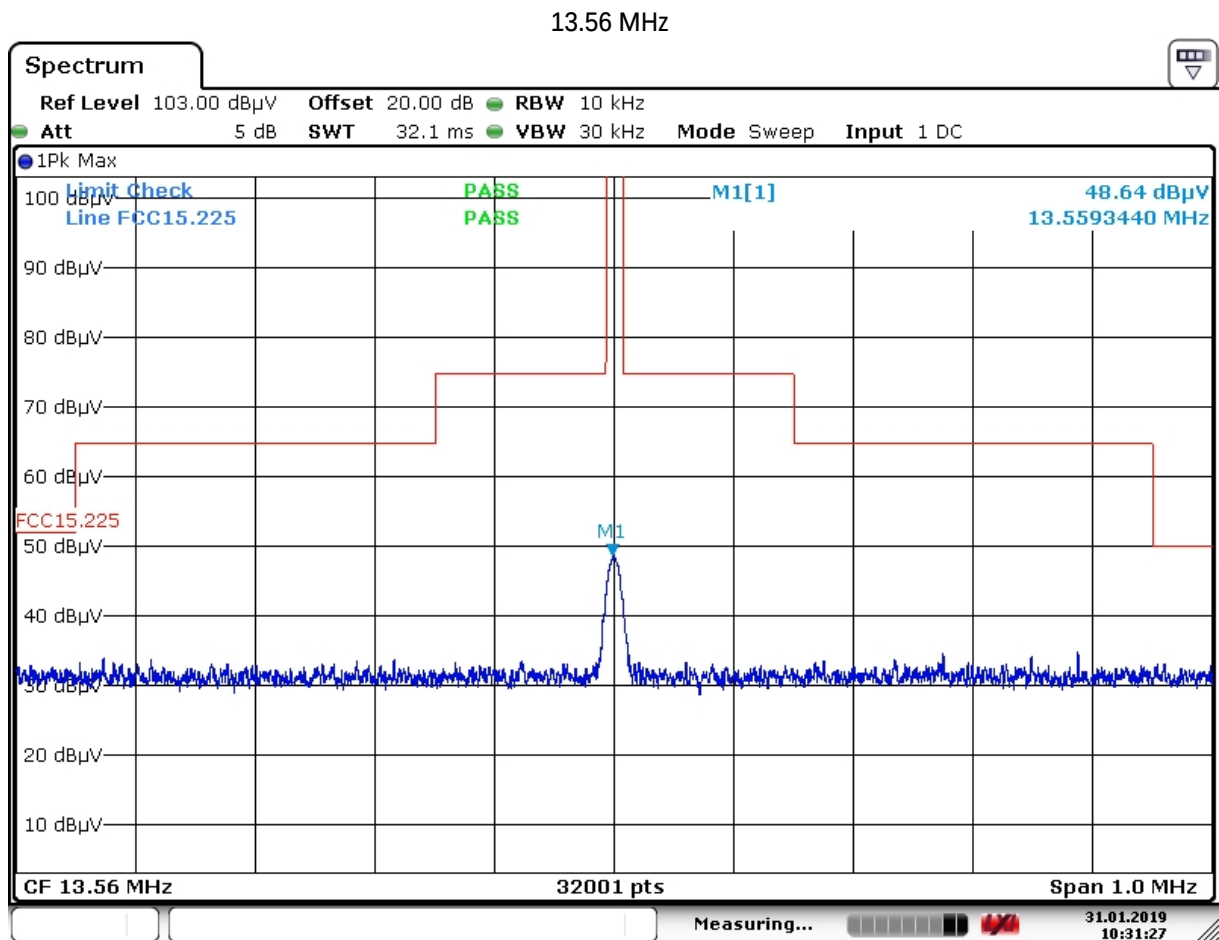
IRN 026 – Method 10.

##### 3.1.5 Test results of Field strength of emissions

| Frequency (MHz) | Max Field strength at 30m ( $\text{dB}\mu\text{V/m}$ ) |
|-----------------|--------------------------------------------------------|
| 13.56           | 21.36                                                  |
| Uncertainty     | +3.0 / -2.5 dB                                         |

Note: the measured value is corrected according to ANSI 63.10, Par. 6.4.4.2.

### 3.1.6 Plots of Field strength of emissions Measurement



Note 1: in the plots above a distance factor of - 40 dB/decade to convert to 3 m distance has been used (ref. 47 CFR part 15B, §15.31 f (2)).

Note 2: dBμV reads as dBμV/m

## 3.2 Radiated spurious emissions

### 3.2.1 Limit

15.225(d)/15.109

The field strength of any emissions appearing outside of the 13.110 -14.010 MHz band shall not exceed the general radiated emission limits in part 15.209/15.109.

| Frequency (MHz)               | Field strength (μV/m) | Field strength (dBμV/m)                          | Measurement distance(m) |
|-------------------------------|-----------------------|--------------------------------------------------|-------------------------|
| 0.009 – 0.490                 | 2400/F(kHz)           | $20 \cdot \{\log[2400] - \log[F(\text{kHz})]\}$  | 300*                    |
| 0.490 – 1.705                 | 24000/F(kHz)          | $20 \cdot \{\log[24000] - \log[F(\text{kHz})]\}$ | 30*                     |
| 1.705 – 13.11<br>14.01 – 30.0 | 30                    | 29.5                                             | 30*                     |
| 30 -88                        | 100                   | 40                                               | 3                       |
| 88 - 216                      | 150                   | 43,5                                             | 3                       |
| 216-960                       | 200                   | 46                                               | 3                       |
| Above 960                     | 500                   | 54                                               | 3                       |

\*Note: Limit lines in the plots are corrected to 3m measurement distance according to the method described in ANSI C63.10-2013, clause 6.4

### 3.2.2 Measurement instruments

The measurement instruments are listed in chapter 2.3 of this report.

### 3.2.3 Test setup

The test setup is as shown in chapter 2.2 of this report.

### 3.2.4 Test procedure

9 kHz – 30 MHz: According to ANSI C63.4-2014, section 5.4.2 and 8.2.3.

30 MHz to 26.5 GHz: According to ANSI C63.4-2014, section 8.3.

9 kHz to 30 MHz: IRN 026 – Method 10.

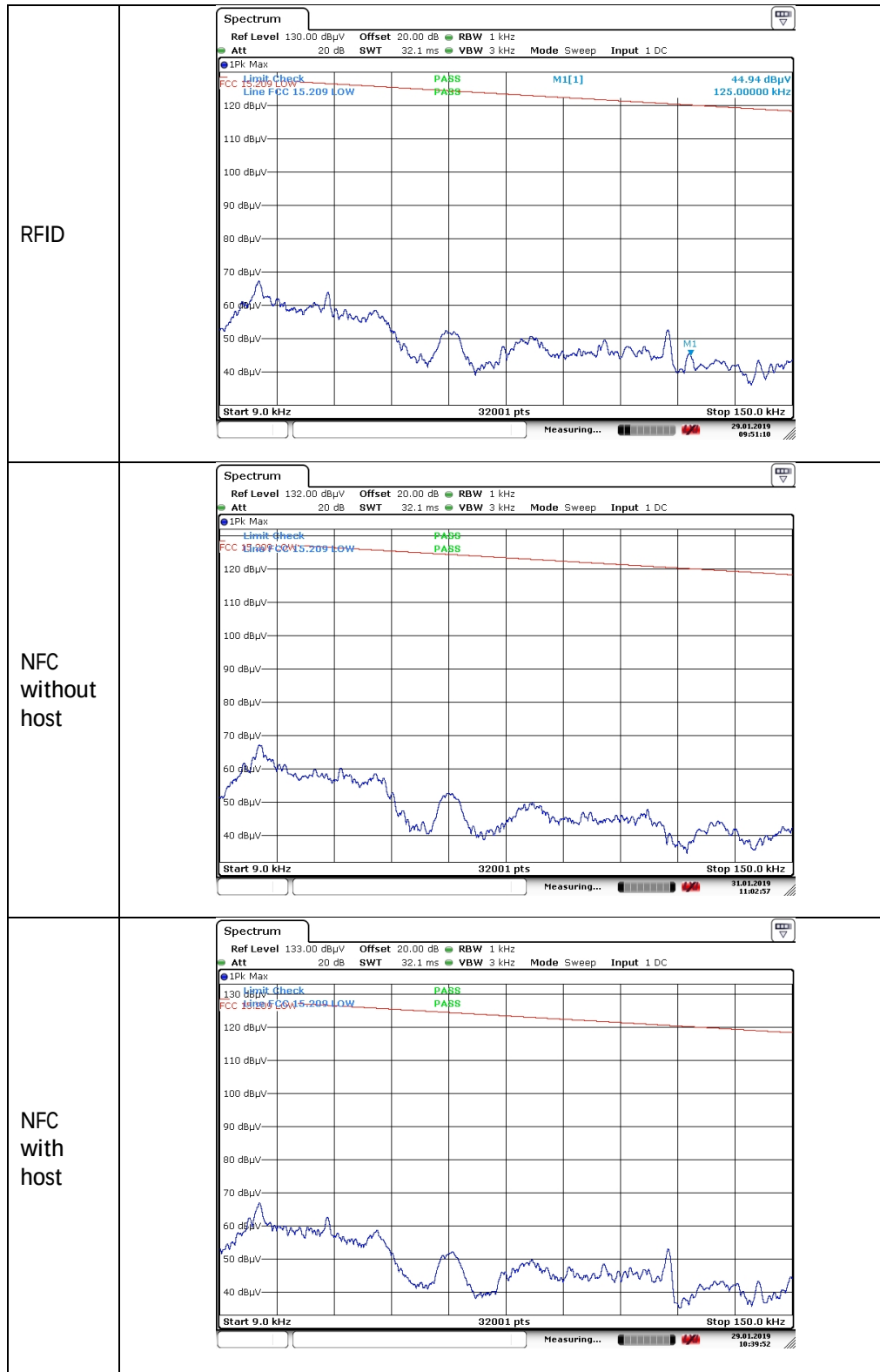
30 MHz to 1 GHz: IRN 026 – Method 1.

### 3.2.5 Measurement Uncertainty

| Frequency range | Polarization | Uncertainty |
|-----------------|--------------|-------------|
| 9 kHz – 30 MHz  | --           | ±1.6 dB     |
| 30 – 200 MHz    | Horizontal   | ±4.5 dB     |
|                 | Vertical     | ±5.4 dB     |
| 200 -1000 MHz   | Horizontal   | ±3.6 dB     |
|                 | Vertical     | ±4.6 dB     |

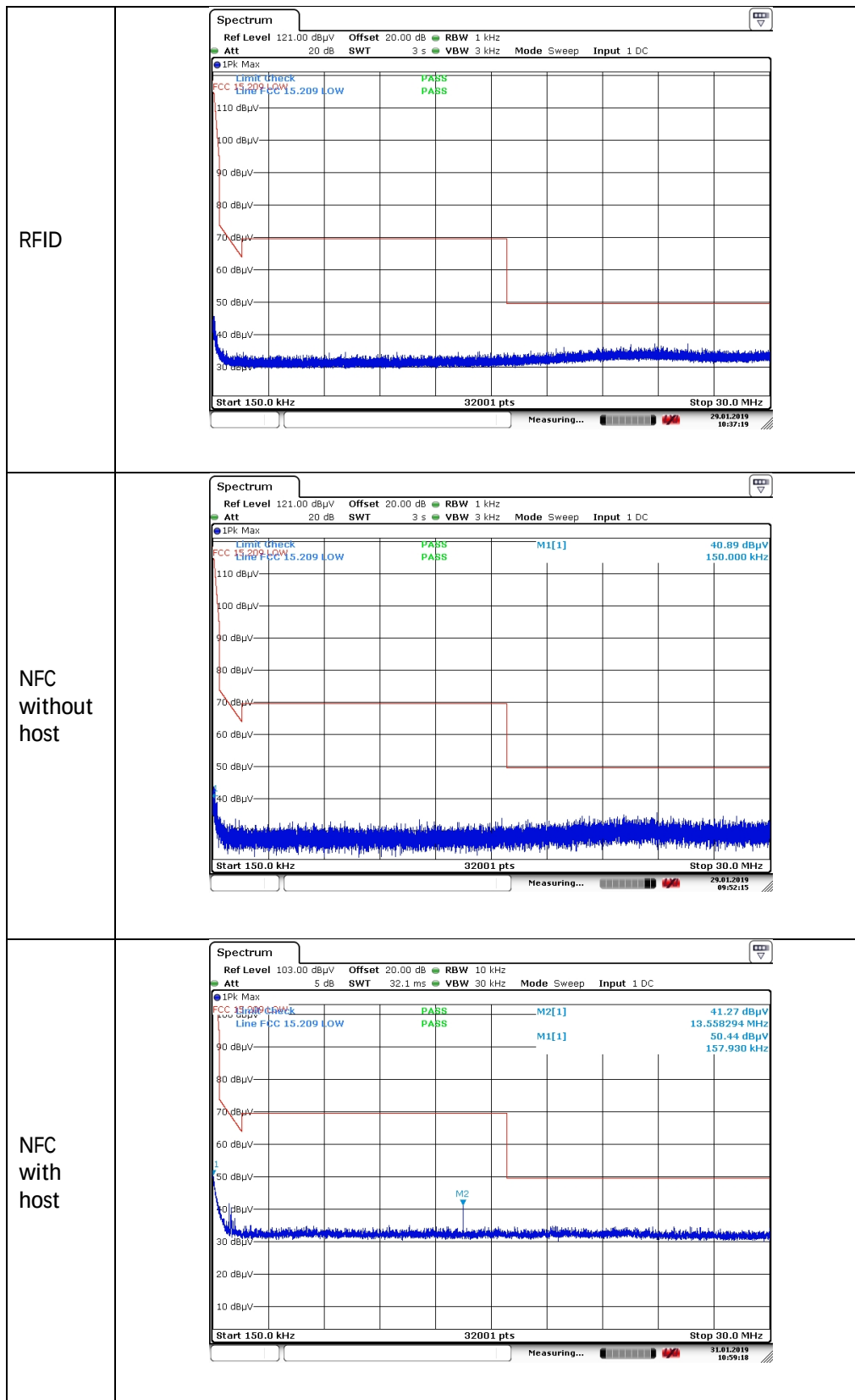
### 3.2.6 Plots of the Radiated Spurious Emissions Measurement

9 – 150 kHz



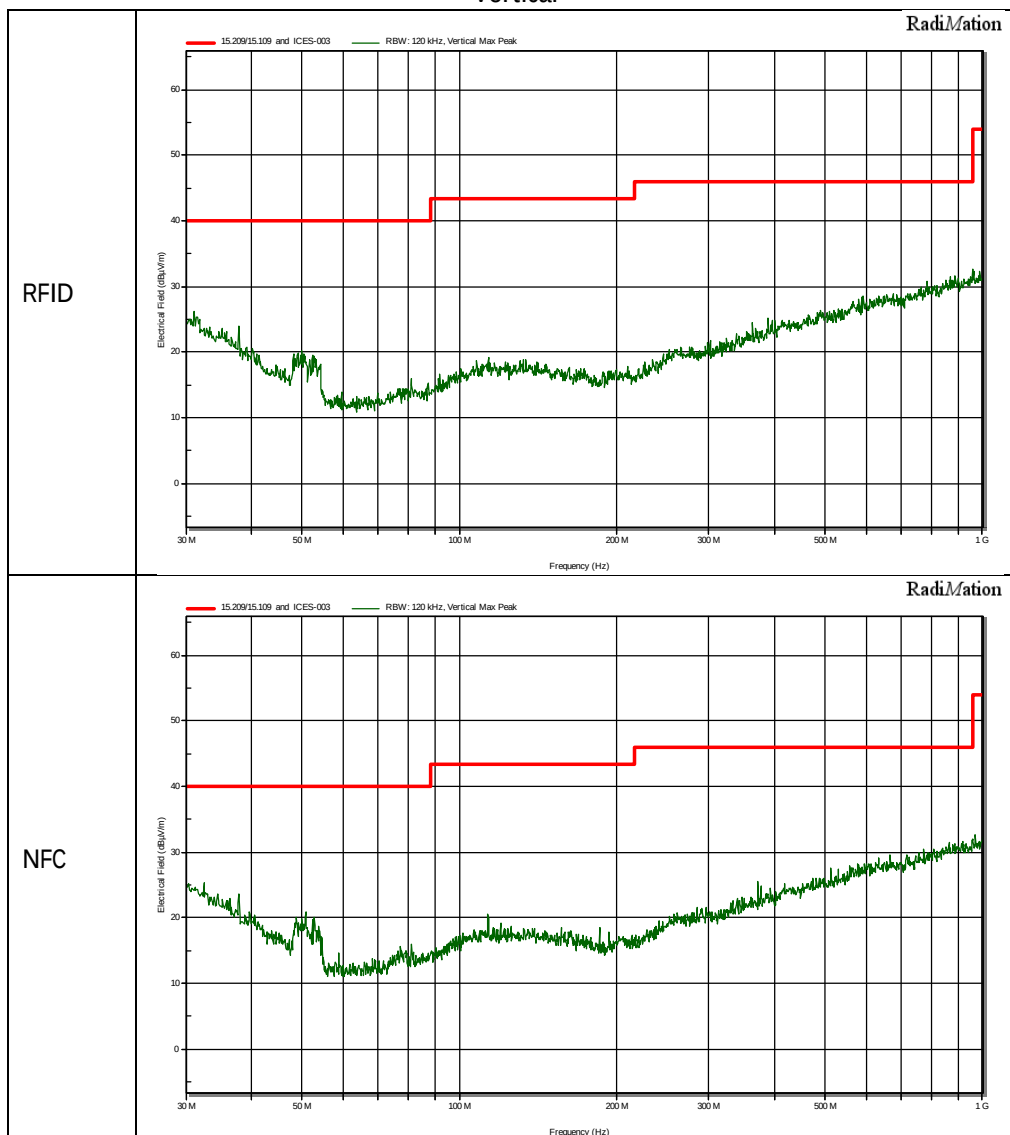
Note: the output power of the 125 kHz transmitter is below the noise floor of the plots above.

150 kHz – 30 MHz



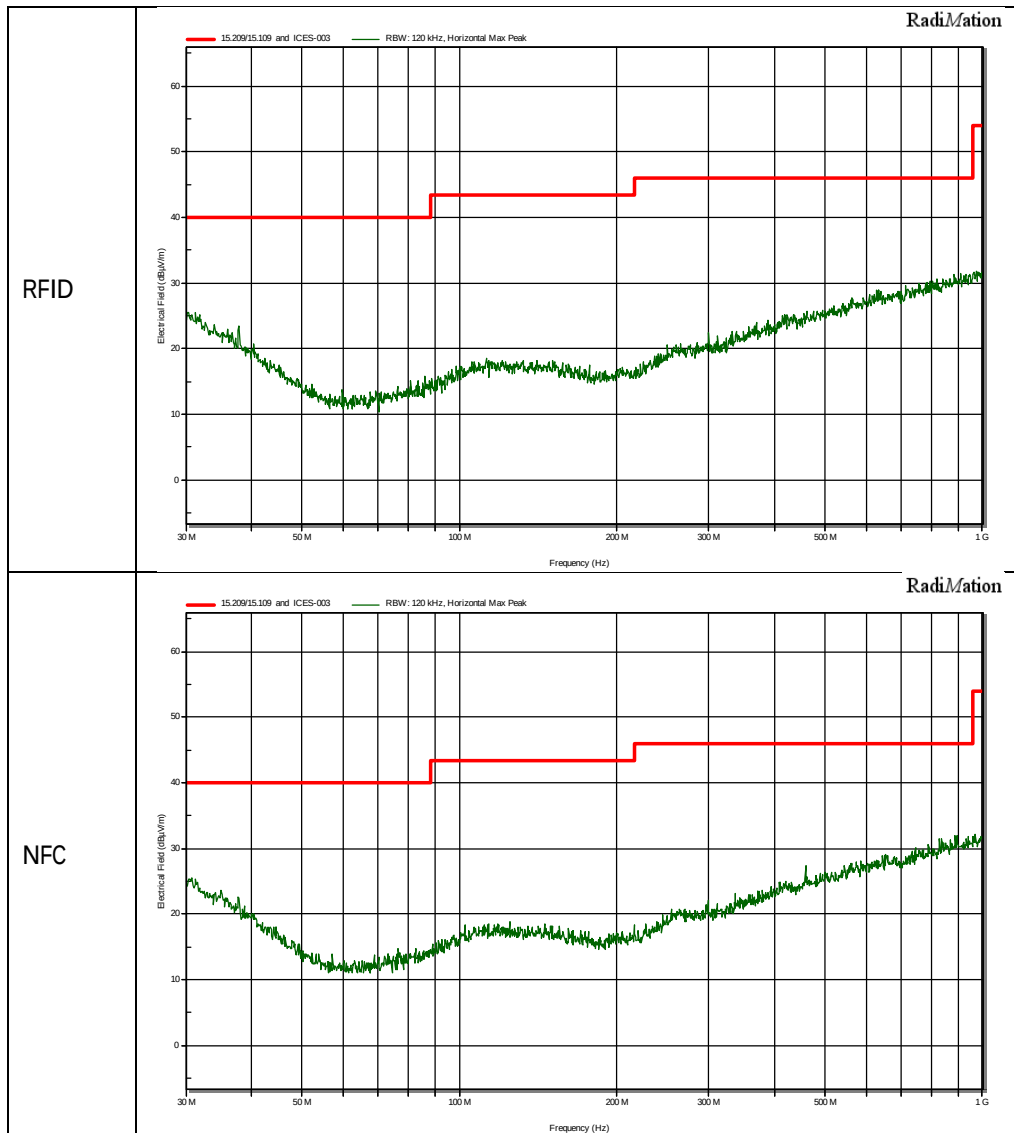
30-1000 MHz

Vertical



Note: NFC is tested with a host device

## Horizontal



### 3.3 Frequency Stability

#### 3.3.1 Limit

The frequency stability of the carrier signal shall be maintained within  $\pm 0.01\%$  of the operating frequency over a temperature variation of  $-20$  degrees to  $50$  degrees C at normal supply voltage, and for a variation in the primary supply voltage from  $85\%$  to  $115\%$  of the rated supply voltage at a temperature of  $20$  degrees C.

The measured frequency for the  $13.56$  MHz radio should fall within the limits  $13558.644 \text{ kHz} \leq f \leq 13561.356 \text{ kHz}$ .

#### 3.3.2 Measurement instruments

The measurement instruments are listed in chapter 2.3 of this report.

#### 3.3.3 Test setup

The test has been performed in a climatic chamber using a test fixture.

#### 3.3.4 Test procedure

According to ANSI C63.10-2013, section 6.8.  
IRN 005 – Method 2.

#### 3.3.5 Test results of Frequency Stability Measurements

Temperature variation:

| Temp. (°C)      | -20     | -10     | 0       | 10      | 20      | 30      | 40      | 50      |
|-----------------|---------|---------|---------|---------|---------|---------|---------|---------|
| Frequency (MHz) | 13.5598 |         |         |         |         |         |         |         |
| After 2 min     | 13.5598 | 13.5598 | 13.5598 | 13.5598 | 13.5598 | 13.5598 | 13.5598 | 13.5596 |
| After 5 min     | 13.5598 | 13.5598 | 13.5597 | 13.5598 | 13.5598 | 13.5599 | 13.5598 | 13.5596 |
| After 10 min    | 13.5598 | 13.5597 | 13.5599 | 13.5598 | 13.5598 | 13.5599 | 13.5598 | 13.5596 |
| Deviation (%)*) | 0       | 0.00339 | 0.00339 | 0       | 0       | 0.00339 | 0       | 0.00678 |
| Limit (%)       | 0.01    | 0.01    | 0.01    | 0.01    | 0.01    | 0.01    | 0.01    | 0.01    |

Voltage variation:

| Voltage | Frequency (MHz) | Deviation (%)*) | Limit (%) |
|---------|-----------------|-----------------|-----------|
| 3V      | 13.5598         | 0               | 0.01      |
| 2.55V   | 13.5598         | 0               | 0.01      |

\*) w.r.t. nominal frequency of  $13.5598$  MHz

#### 3.3.6 Measurement Uncertainty

Measurement uncertainty =  $\pm 10$  Hz.

### 3.4 99% Occupied bandwidth and 20 dB bandwidth

#### 3.4.1 Limit

15.215c: the 20 dB bandwidth shall be contained within the designated frequency band.

RSS-Gen 6.6 : 99% bandwidth = Reporting only.

#### 3.4.2 Measurement instruments

The measurement instruments are listed in chapter 2.4 of this report.

#### 3.4.3 Test setup

The test setup is as shown in chapter 2.3 of this report.

#### 3.4.4 Test procedure

Tests according to ANSI C63.10

IRN 017 - Occupied bandwidth (Hz) Method 4 – DTS Bandwidth.

### 3.5 Uncertainty

$\pm 1$  kHz

### 3.6 99% Occupied bandwidth and 20 dB bandwidth Measurements

