# RADIO REPORT

**FCC 47 CFR Part 15F**
**ISED Canada RSS-220**

**Ultra Wide Band Devices**

| | |
|---|---|
| **Report Reference No** | G0M-2006-9089-TFC15FUW-V01 |
| **Testing Laboratory** | Eurofins Product Service GmbH |
| Address | Storkower Str. 38c<br>15526 Reichenwalde<br>Germany |
| Accreditation | DAkkS - Registration number : D-PL-12092-01-03 (ISED)<br>ISED Testing Laboratory site: 3470A-2<br>DAkkS - Registration number : D-PL-12092-01-04 (FCC)<br>FCC Filed Test Laboratory, Reg.-No.: 96970 |
| **Applicant** | In-Circuit GmbH |
| **Address** | Boltenhagener Str. 124<br>01109 Dresden<br>GERMANY |
| **Test Specification** | 47 CFR Part 15F<br>RSS-220, Issue 1 + A1, 2018-07<br>RSS-Gen, Issue 5, Amendment 1, 2019-03 |
| Non-Standard Test Method | None |
| **Equipment under Test (EUT):** | |
| Product Description | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model(s) | radino40 DW1000 |
| Additional Model(s) | None |
| Brand Name(s) | None |
| Hardware Version(s) | A |
| Software Version(s) | A |
| FCC-ID | 2AWXURADINO40DW1000 |
| IC | N/A |
| **Test Result** | **PASSED** |

| | | |
|---|---|---|
| **Possible test case verdicts:** | | |
| Required by standard but not tested | N/T | |
| Not required by standard | N/R | |
| Not applicable to EUT | N/A | |
| Test object does meet the requirement | P(PASS) | |
| Test object does not meet the requirement | F(FAIL) | |
| **Testing:** | | |
| Test Lab Temperature | 20 °C - 23 °C | |
| Test Lab Humidity | 32 % - 38 % | |
| Date of receipt of test item | 2020-07-20<br>2020-07-30 | Test Sample ID 30163<br>Test Sample ID 30164<br>Test Sample ID 30448<br>Test Sample ID 30449 |
| **Report:** | | |
| Compiled by | Abdullah Al Jamal | |
| Tested by (+ signature)<br>(Responsible for Test) | Abdullah Al Jamal | ..... |
| Approved by (+ signature)<br>(Head of Lab) | Christian Weber | C. Weber<br>..... |
| Date of Issue | 2020-08-05 | |
| Total number of pages | 67 | |
| **General Remarks:** | | |
| **The test results presented in this report relate only to the object tested.**<br>**The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.**<br>This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory. | | |
| **Additional Comments:** | | |
| None. | | |

## VERSION HISTORY

| Version History | | | |
|---|---|---|---|
| Version | Issue Date | Remarks | Revised By |
| 01 | 2020-08-05 | Initial Release | |

## ABBREVIATIONS AND ACRONYMS

| Acronyms | |
|---|---|
| Acronym | Description |
| CH | Channel |
| EUT | Equipment Under Test |
| FCC | Federal Communications Commission |
| ISED | Innovation, Science and Economic Development Canada |
| N/A | Not applicable |
| RBW | Resolution bandwidth |
| RFID | Radio Frequency Identification |
| RMS | Root mean square |
| $T_{NOM}$ | Nominal temperature |
| VBW | Video bandwidth |
| $V_{NOM}$ | Nominal supply voltage |

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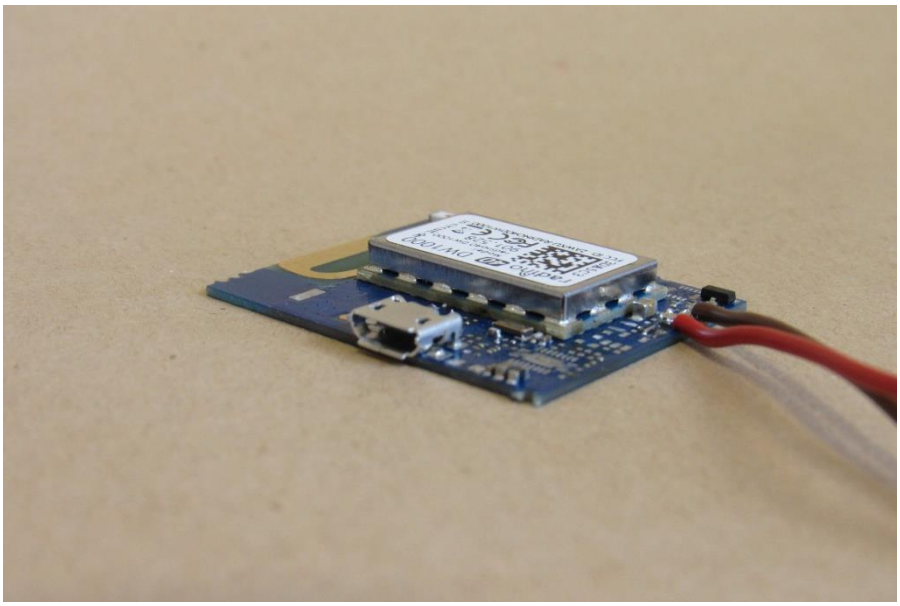
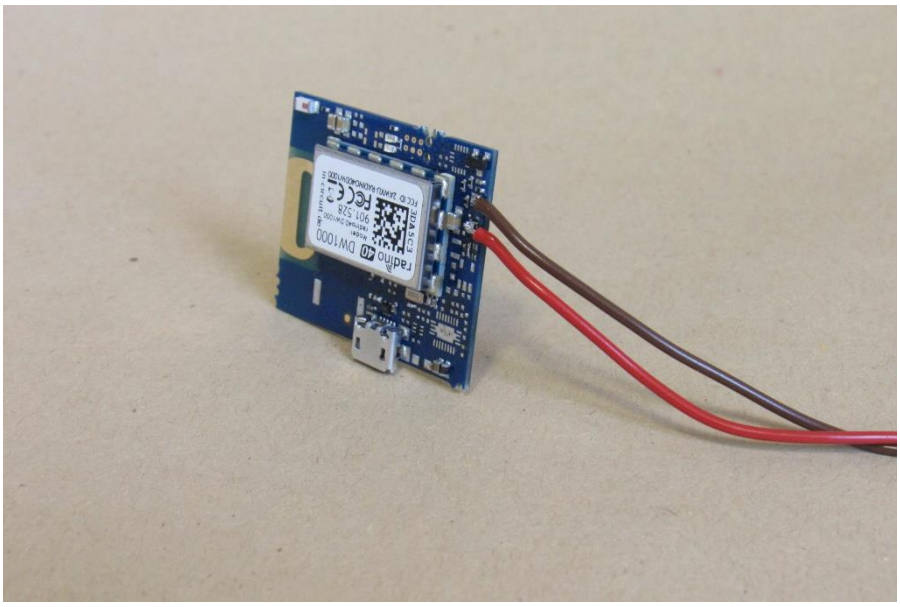
# 1 Equipment (Test Item) Under Test

| | | |
|---|---|---|
| Description | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) | |
| Model | radino40 DW1000 | |
| Additional Model(s) | None | |
| Brand Name(s) | None | |
| Serial Number(s) | Not specified | |
| Hardware Version(s) | A | |
| Software Version(s) | A | |
| PMN | N/A | |
| HVIN | N/A | |
| FVIN | N/A | |
| HMN | N/A | |
| FCC-ID | 2AWXURADINO40DW1000 | |
| IC | N/A | |
| Equipment class | Hand held | |
| Equipment type | End Product | |
| Radio type | Transceiver | |
| Operating frequency range | 3.1 GHz - 10.6 GHz | |
| Radio technology | Ultra Wide-band | |
| Antenna | Type | External antenna |
| | Model | 902.055 PCB-Antenne 3-8GHz RP-SMA |
| | Manufacturer | In-Circuit GmbH |
| | Gain | 2.2 dBi<br>(declared by client) |
| Supply Voltage | $V_{NOM}$ | 3.3 VDC |
| Operating Temperature | $T_{NOM}$ | 25 °C |
| AC/DC-Adaptor | Model | N/A |
| | Vendor | N/A |
| | Input | N/A |
| | Output | N/A |
| Manufacturer | In-Circuit GmbH<br>Boltenhagener Str. 124<br>01109 Dresden<br>GERMANY | |

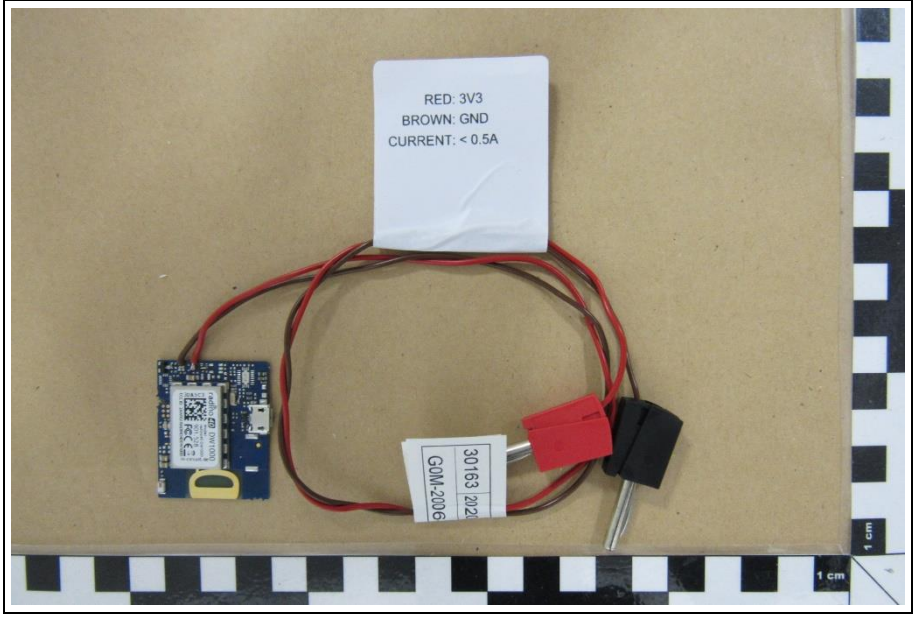
## 1.1 Photos – Equipment

| VIEW A[1] |
|---|
|  |

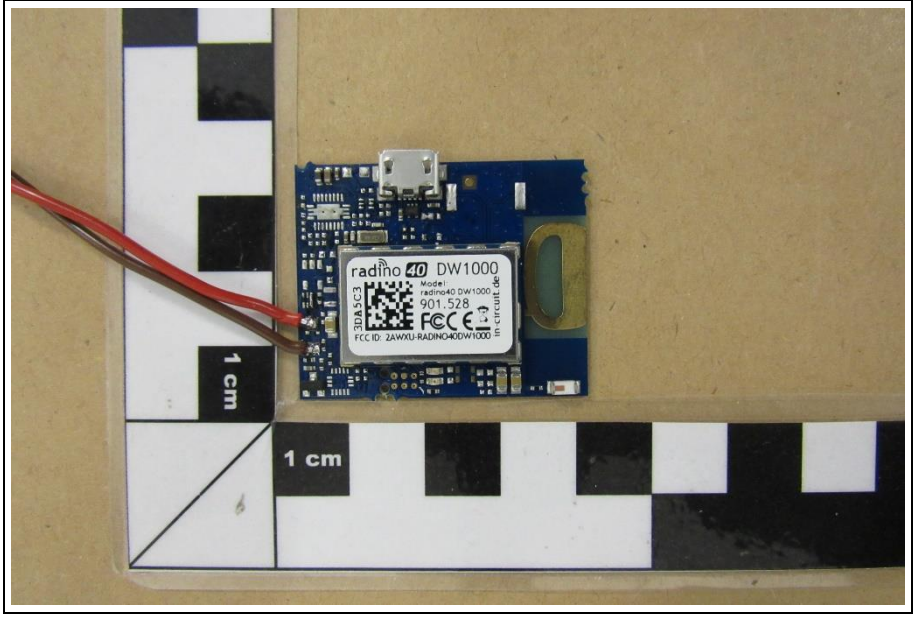
| VIEW B[2] |
|---|
|  |

[1]EUT measurement position HORIZONTAL
[2]EUT measurement position VERTICAL

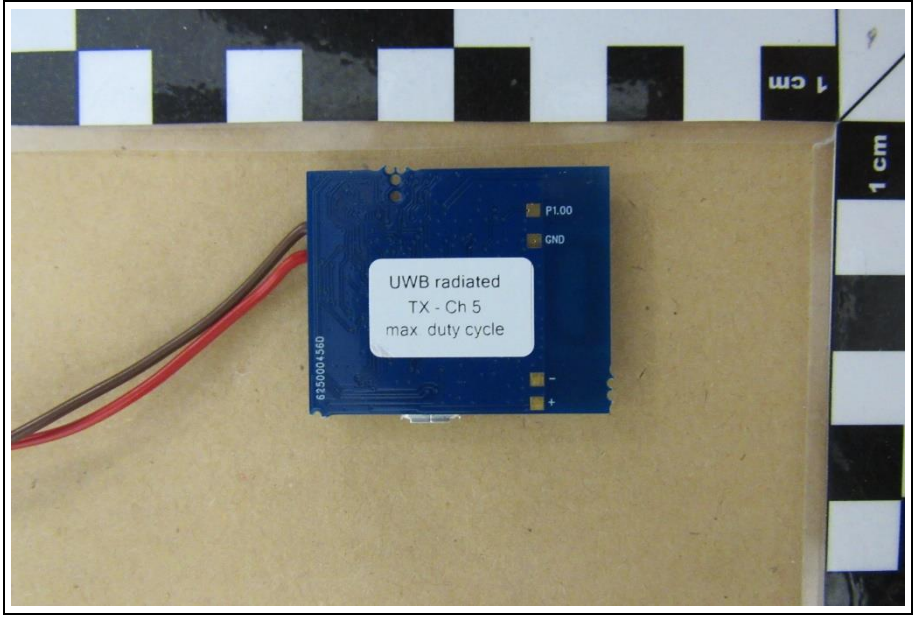
**VIEW C**


RED: 3V3
BROWN: GND
CURRENT: < 0.5A
1 cm

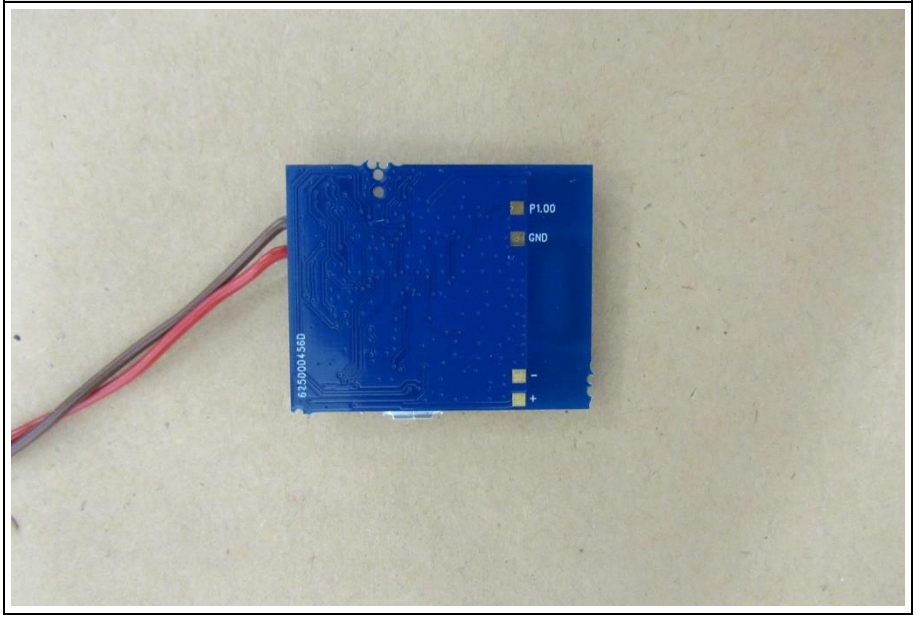
**VIEW D**

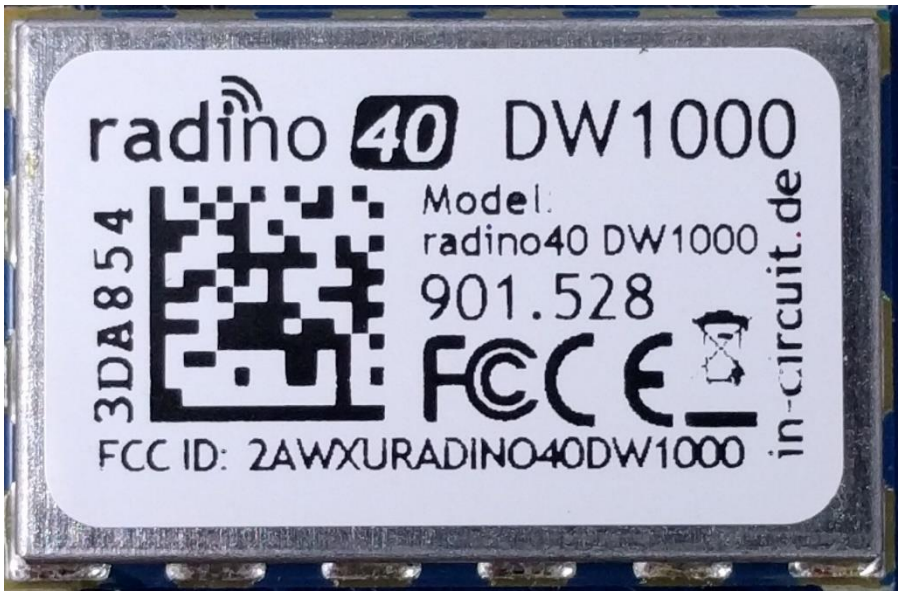

radino 40 DW1000
901.528
1 cm
1 cm

**VIEW E**


1 cm
1 cm
P1.00
GND
UWB radiated
TX - Ch 5
max. duty cycle
6250004560
-
+

**VIEW F**

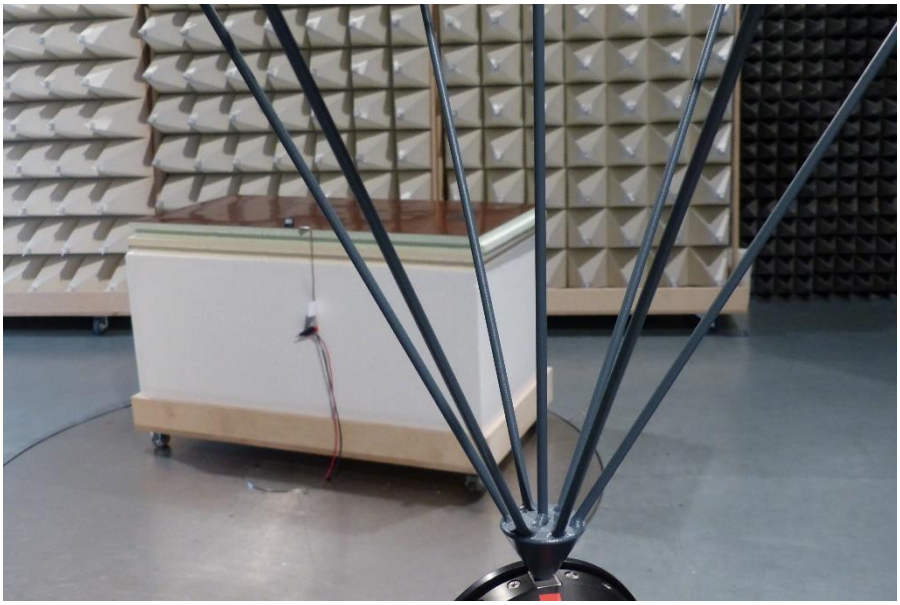

P1.00
GND
6250004560
-
+

| VIEW G[1] |
| --- |
|  |

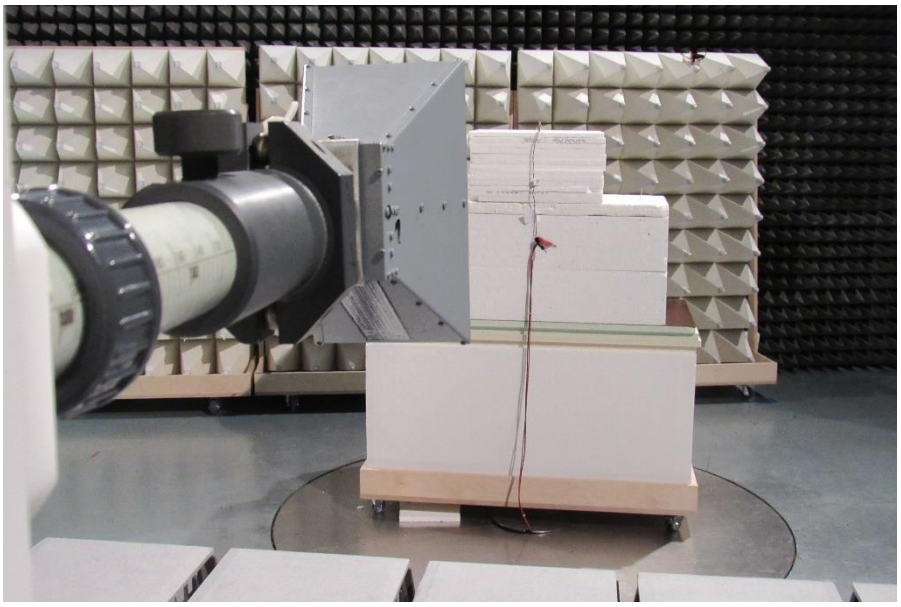


[1]The customer provided the label above as a final label version. Figures VIEW A to VIEW F show the former label version.

## 1.2 Photos – Test Setup

| VIEW A |
| --- |
|  |

| VIEW B |
| --- |
| |

| VIEW C |
| --- |
|  |

## 1.3 Support Equipment

| Product Type | Device | Manufacturer | Model | Comment |
|---|---|---|---|---|
| AE | UWB radio module (Companion device) | In-Circuit GmbH | radino40 DW1000 | Cease of transmitter operation – Test Sample ID 30448 |
| Description: | | | | |
| AE | Auxiliary Equipment | | | |
| SIM | Simulator | | | |
| CBL | Connecting Cable | | | |
| SFT | Software | | | |
| Comment: None. | | | | |

## 1.4 Test Modes

| Mode | Description |
|---|---|
| Transmit | Mode = Transmit<br>Duty cycle = 100% |
| Receive | Mode = Receive |
| Comment: None. | |

## 1.5 Test Frequencies

| Designator | Mode | Channel | Frequency [MHz] |
|---|---|---|---|
| F1 | Tx / Rx | 5 | 6489.6 |

## 1.6 Sample emission level calculation

The following is a description of terms and a sample calculation, as appears in the radiated emissions data table. The numbers used in the calculation are for example only. There is no direct correlation to the specific data taken for the product described in this document:

Reading:

This is the reading obtained on the spectrum analyzer in dBµV. Any external preamplifiers used are taken into account through internal analyzer settings.

A.F.:

This is the antenna factor for the receiving antenna. It is a conversion factor, which converts electric fields strengths to voltages, which can be measured directly on the spectrum analyzer. It is treated as a loss in dB. Cable losses have been included with the A.F. to simplify the calculations. The antenna factor is used in calculations as follows:

Reading on Analyzer (dBµV) + A.F. (dB/m) = Net field strength (dBµV/m)

Net:

This is the net field strength measurement (as shown above).

Limit:

This is the FCC Class B radiated emission limit (in units of dBµV/m). The FCC limits are given in units of µV/m. The following formula is used to convert the units of µV/m to dBµV/m:

Limit (dBµV/m) = 20*log (µV/m)

Margin:

This is the margin of compliance below the FCC limit. The units are given in dB. A negative margin indicates the emission was below the limit. A positive margin indicates that the emission exceeds the limit.

Example only:

| | | | | |
|---|---|---|---|---|
| Reading + AF | = Net Reading | : | Net reading - FCC limit | = Margin |
| +21.5 dBµV + 26 dB/m | = 47.5 dBµV/m | : | 47.5 dBµV/m - 57.0 dBµV/m | = -9.5 dB |

## 2 Result Summary

| FCC 47 CFR Part 15F, ISED RSS-220 | | | | |
|---|---|---|---|---|
| **Product Standard Reference** | **Requirement** | **Reference Method** | **Result** | **Remarks** |
| ISED RSS-220 3.1, RSS-Gen 6.7 | Occupied Bandwidth | ANSI C63.10-2013 | N/R | Informational only |
| FCC 15.503(a), 15.519(b), ISED RSS-220 5.1a | UWB (-10 dB) Bandwidth | ANSI C63.10-2013 | PASS | |
| FCC 15.519(e) ISED RSS-220 5.3.1g | Peak power | ANSI C63.10-2013 | PASS | |
| FCC 15.519(a)(1) ISED RSS-220 5.3.1b | Cease of transmitter operation | ANSI C63.10-2013 | PASS | |
| FCC 15.519(c)(d) ISED RSS-220 5.3.1c-e | Transmitter radiated emissions | ANSI C63.10-2013 | PASS | |
| ISED RSS-220 3.1, ISED RSS-Gen 7.1 | Receiver radiated spurious emissions | ANSI C63.10-2013 | PASS | |
| FCC 15.207 ISED RSS-220 3.1, RSS-Gen 8.8 | AC power line conducted emissions | ANSI C63.10-2013 | N/R | EUT not powered (directly or indirectly) via AC-mains (declared by client) |
| Comment: None. | | | | |

| Possible Test Case Verdicts | |
|---|---|
| PASS | Test object does meet the requirements |
| FAIL | Test object does not meet the requirements |
| N/T | Required by standard but not tested |
| N/R | Not required by standard for the test object |

# 3 Test Conditions and Results

## 3.1 Test Conditions and Results - Occupied bandwidth

### 3.1.1 Information

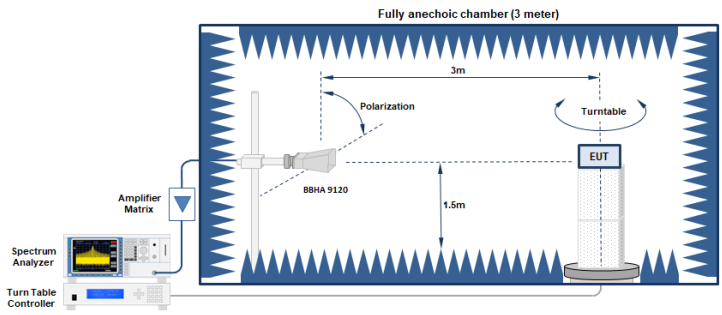
| Test Information | |
|---|---|
| Product Standard Reference | ISED RSS-220 3.1, RSS-Gen 6.7 |
| Measurement Method | ANSI C63.10 6.9.3 |
| Measurement Uncertainty | ± 1.3 % |
| Date | 2020-07-22 |
| Operator | Abdullah Al Jamal |

### 3.1.2 Limits

| Limits |
|---|
| None (Informational only) |

### 3.1.3 Setup

**Test Setup**




### 3.1.4 Equipment

| Test Equipment | | | | | |
|---|---|---|---|---|---|
| Description | Manufacturer | Model | Identifier | Cal. Date | Cal. Due |
| Anechoic Chamber | Frankonia | AC1 | EF00062 | 2018-07 | 2021-07 |
| Spectrum Analyzer | R&S | FSU 26 | EF01003 | 2019-07 | 2020-07 |
| Antenna | Schwarzbeck | BBHA 9120D | EF01159 | 2018-12 | 2020-12 |

### 3.1.5 Procedure

**Test Procedure**

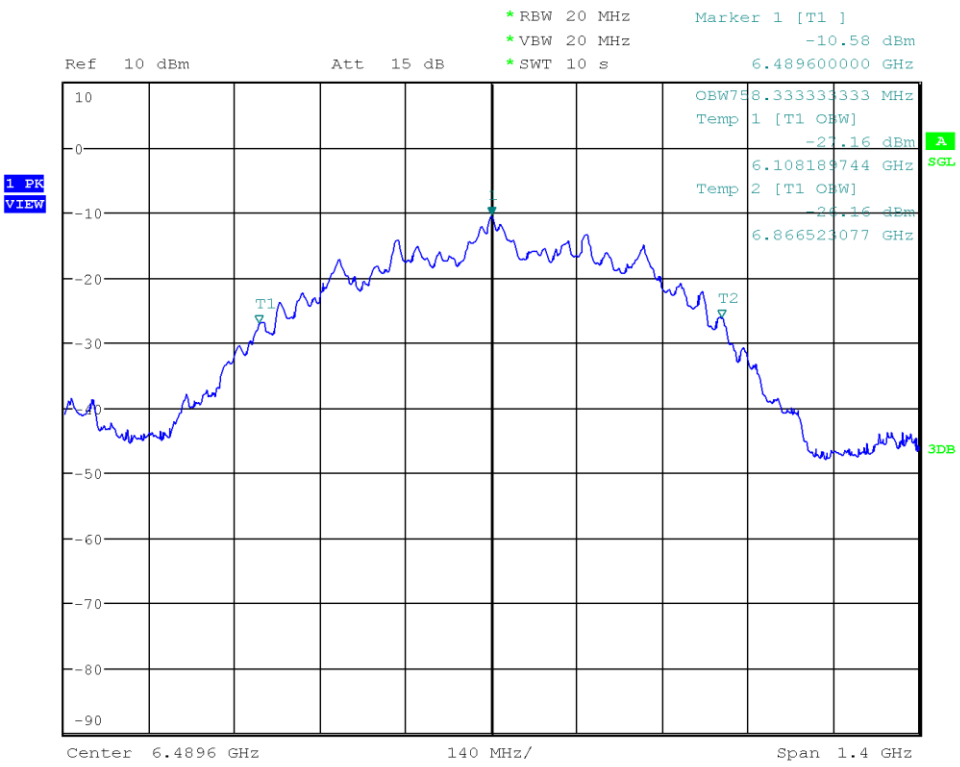
1. EUT set to test mode
2. The turntable and antenna height are set to the maximum emission level for the fundamental emission of the EUT
2. Span set to at least twice the emission spectrum
3. Resolution bandwidth set between 1 % to 5 % of OBW
4. Occupied Bandwidth (99 %) measurement with spectrum analyzer built in measurement function

### 3.1.6 Results

| Test Results | |
|---|---|
| Channel [MHz] | Bandwidth [MHz] |
| 6489.6 | 758.3 |

## Occupied Bandwidth (99% Bandwidth)

| | |
|---|---|
| Project Number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| Model Description: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Sample ID: | 30163 |
| Operator: | Abdullah Al Jamal |
| Test Site: | Eurofins Product Service GmbH |
| Test Date: | 2020-07-22 |
| Operating Conditions: | Tnom/Vnom |




Date: 22.JUL.2020 15:55:08

## 3.2 Test Conditions and Results - UWB (-10 dB) Bandwidth

### 3.2.1 Information

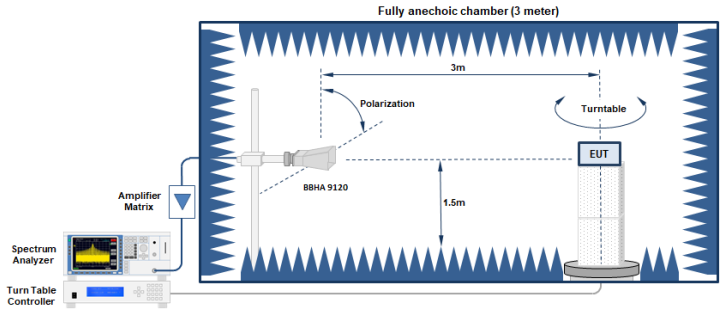
| Test Information | |
|---|---|
| Product Standard Reference | FCC Part 15.519 (a), ISED RSS-220 5.1 a |
| Measurement Method | ANSI C63.10 10.1 |
| Measurement Uncertainty | ± 1.3 % |
| Date | 2020-07-22 |
| Operator | Abdullah Al Jamal |

### 3.2.2 Limits

| Limits |
|---|
| UWB (-10 dB) bandwidth totally contained in the band 3.1 GHz - 10.6 GHz |

### 3.2.3 Setup

**Test Setup**




### 3.2.4 Equipment

| Test Equipment | | | | | |
|---|---|---|---|---|---|
| Description | Manufacturer | Model | Identifier | Cal. Date | Cal. Due |
| Anechoic Chamber | Frankonia | AC1 | EF00062 | 2018-07 | 2021-07 |
| Spectrum Analyzer | R&S | FSU 26 | EF01003 | 2019-07 | 2020-07 |
| Antenna | Schwarzbeck | BBHA 9120D | EF01159 | 2018-12 | 2020-12 |

### 3.2.5 Procedure

**Test Procedure**

1. EUT set to test mode
2. The turntable and antenna polarization are set to the maximum emission level for the fundamental emission of the EUT
3. Span is set so that the complete fundamental emission spectrum is captured
3. Resolution bandwidth set to 1 MHz and the VBW is set to 3 MHz with peak detector and max. hold
4. The emission spectrum is corrected by the antenna gain cable loss, low-noise amplifier gain
5. The maximum of the spectrum envelope is determined as reference
6. The spectrum is searched from the left edge to the center of the spectrum in order to find the lower -10 dB frequency
7. The spectrum is searched from the right edge to the center of the spectrum in order to find the upper -10 dB frequency
8 From the lower frequency ($f_L$) and upper frequency ($f_H$) the center frequency ($f_C$), the -10 dB bandwidth ($B_{-10}$) and the fractional bandwidth ($\mu_{-10}$) are calculated:

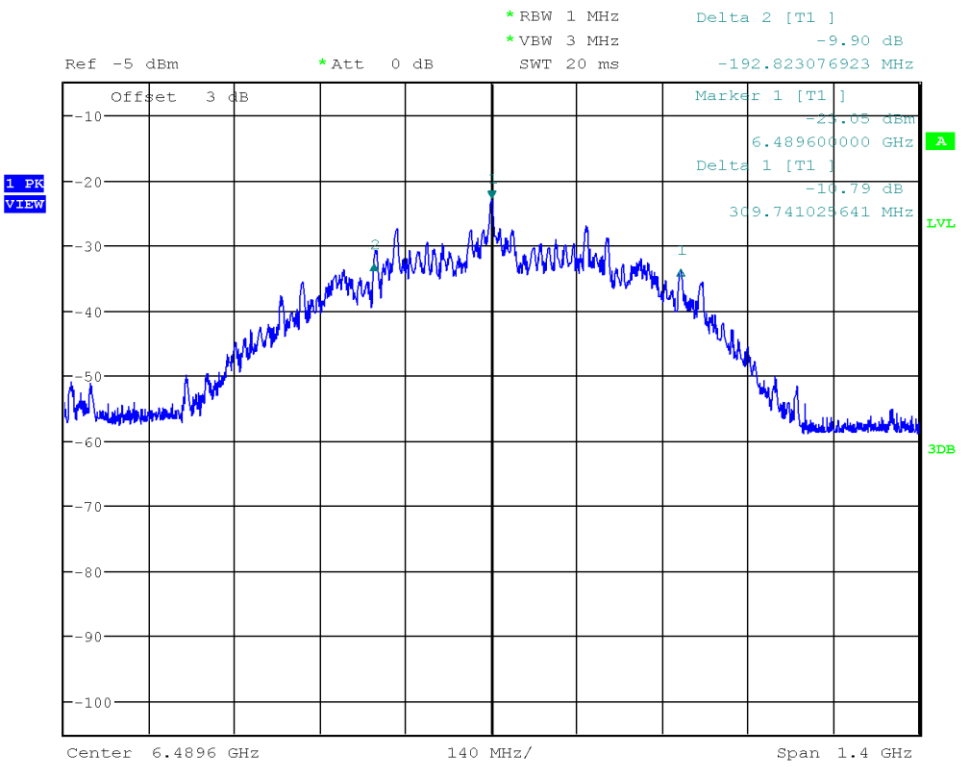
$$B_{-10} = f_H - f_L \qquad \mu_{-10} = B_{-10} \cdot f_C^{-1}$$

### 3.2.6 Results

| Test Results | | |
|---|---|---|
| Channel [MHz] | -10 dB Bandwidth ($B_{-10}$) [MHz] | Fractional Bandwidth ($\mu_{-10}$) [MHz] |
| 6489.6 | 502.5 | 0.08 |

## (-10 dB) Bandwidth

| | |
|---|---|
| Project Number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| Model Description: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Sample ID: | 30163 |
| Operator: | Abdullah Al Jamal |
| Test Site: | Eurofins Product Service GmbH |
| Test Date: | 2020-07-22 |
| Operating Conditions: | Tnom/Vnom |




Date: 22.JUL.2020 16:34:52

## 3.3 Test Conditions and Results - Maximum Peak Power

### 3.3.1 Information

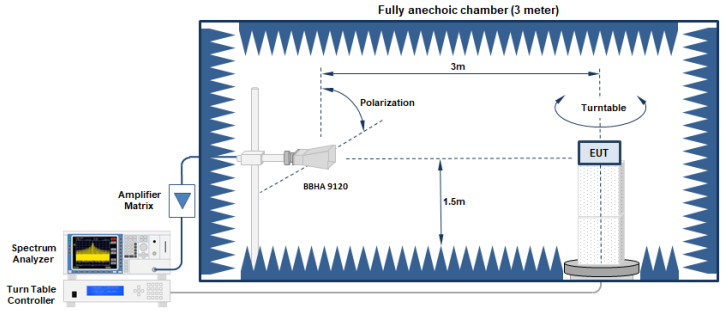
| Test Information | |
|---|---|
| Product Standard Reference | FCC Part 15.519 (e), ISED RSS-220 5.3.1 g |
| Date | 2020-07-22 |
| Operator | Abdullah Al Jamal |
| Measurement Method | ANSI C63.10 10.3.5, 10.3.6, 10.3.9 |
| Measurement Uncertainty | ± 4.4 dB |

### 3.3.2 Limits

| Limits | |
|---|---|
| Bandwidth [MHz] | Power [dBm EIRP] |
| 50 | 0 |

### 3.3.3 Setup

**Test Setup**




### 3.3.4 Equipment

| Test Software | | | |
|---|---|---|---|
| Description | Manufacturer | Name | Version |
| EMC Software | DARE Instruments | RadiMation | 2016.1.10 |

| Test Equipment | | | | | |
|---|---|---|---|---|---|
| Description | Manufacturer | Model | Identifier | Cal. Date | Cal. Due |
| Anechoic Chamber | Frankonia | AC1 | EF00062 | 2018-07 | 2021-07 |
| Spectrum Analyzer | R&S | FSU 26 | EF01003 | 2019-07 | 2020-07 |
| Antenna | Schwarzbeck | BBHA 9120D | EF01159 | 2018-12 | 2020-12 |

### 3.3.5 Procedure

| Test Procedure |
|---|
| 1. EUT set to test mode<br>2. The turntable and antenna polarization are set to the maximum emission level for the fundamental emission of the EUT<br>3. Span is set so that the complete fundamental emission spectrum is captured<br>3. Resolution bandwidth set to 50 MHz and the VBW is set to maximum with peak detector and max. hold<br>4. The emission spectrum is corrected by the antenna gain cable loss, low-noise amplifier gain and path loss<br>5. The maximum of the spectrum envelope is determined and compared to the limit |

### 3.3.6 Results

| Test Results | | | | |
|---|---|---|---|---|
| Channel [MHz] | Emission [MHz] | Power [dBm EIRP] | Limit [dBm EIRP] | Margin [dB] |
| 6489.6 | 6492.48 | -6.30 | 0.00 | -06.30 |

## 3.4 Test Conditions and Results - Cease of transmitter operation

### 3.4.1 Information

| Test Information | |
|---|---|
| Product Standard Reference | FCC Part 15.519 (a)(1), ISED RSS-220 5.3.1 b |
| Date | 2020-07-30 |
| Operator | Abdullah Al Jamal |
| Test Sample ID | 30448 (Rx, sending acknowledgment)<br>30449 (Tx, receiving acknowledgment and transmitting data) |

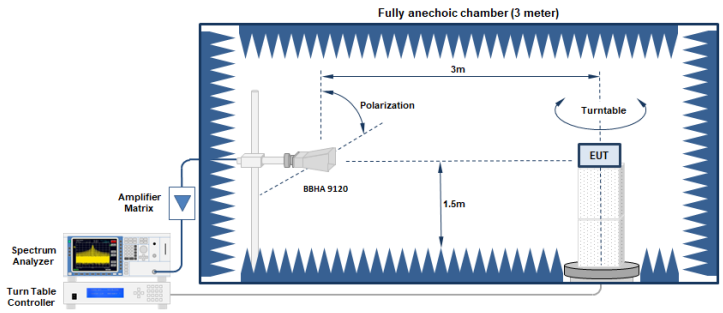
### 3.4.2 Limits

| Limits - FCC |
|---|
| An UWB device shall transmit only when it is sending information to an associated receiver. The UWB intentional radiator shall cease transmission within 10 seconds unless it receives an acknowledgement from the associated receiver that its transmission is being received. An acknowledgment of reception must continue to be received by the UWB intentional radiator at least every 10 seconds or the UWB device must cease transmitting. |

| Limits - ISED |
|---|
| The device is to transmit only when it is sending information to an associated receiver. The device shall cease transmission of information within 10 seconds unless it receives an acknowledgement from the associated receiver that its transmission is being received. An acknowledgment of reception must continue to be received by the UWB device at least every 10 seconds or the UWB device shall cease transmitting any information other than periodic signals used for the establishment or re-establishment of a communication link with an associated receiver. |

### 3.4.3 Setup

**Test Setup**




### 3.4.4 Equipment

| Test Equipment | | | | | |
|---|---|---|---|---|---|
| Description | Manufacturer | Model | Identifier | Cal. Date | Cal. Due |
| Anechoic Chamber | Frankonia | AC1 | EF00062 | 2018-07 | 2021-07 |
| Spectrum Analyzer | R&S | FSU 43 | EF01631 | 2019-12 | 2020-12 |
| Antenna | Schwarzbeck | BBHA 9120D | EF01153 | 2019-10 | 2020-10 |

### 3.4.5 Procedure

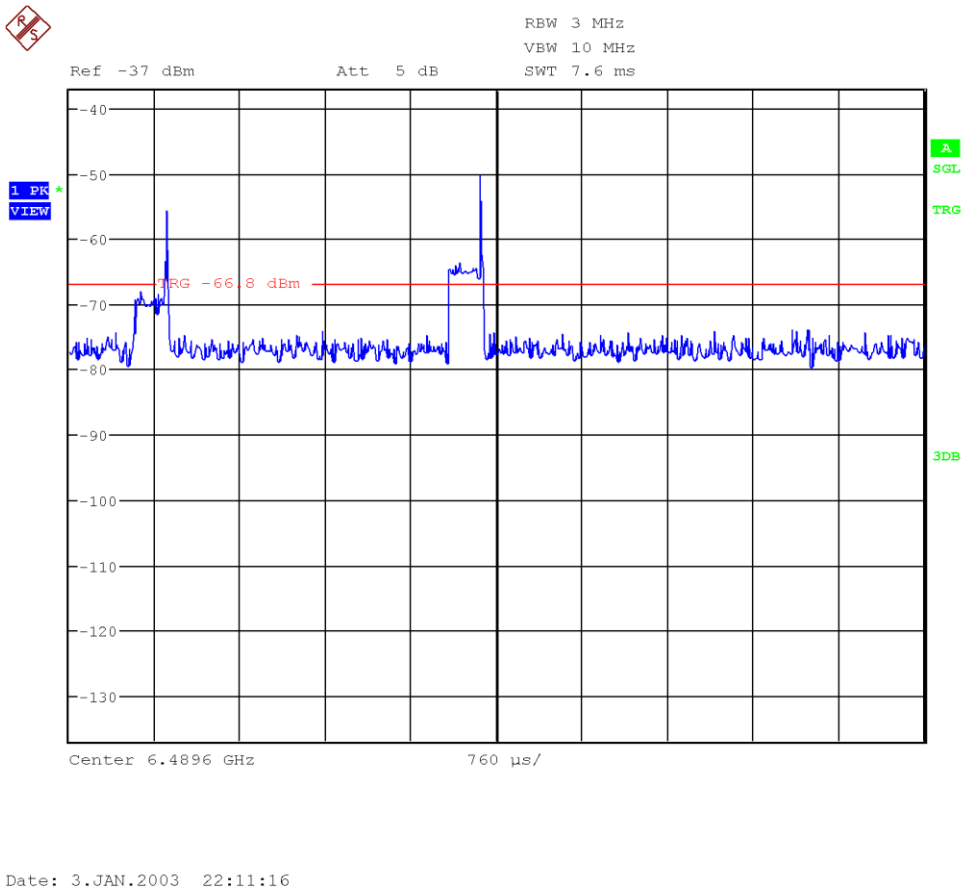
| Test Procedure |
|---|
| 1. EUT set to normal operation<br>2. The emissions of the EUT are captured with a spectrum analyzer<br>3. The transmitter is stopped either by switching off the companion device or by releasing the manual switch<br>4. From the moment the transmitter is released the emission are recorded and a marker is set to the moment the transmitter has switched off<br>5. The marker time is recorded an compared to the limit |

### 3.4.6 Results

| Test Results | | | |
|---|---|---|---|
| Channel [MHz] | Transmission stop time [s] | Limit [s] | Margin [s] |
| 6489.6 | < 0.024 | 10.00 | -09.98 |

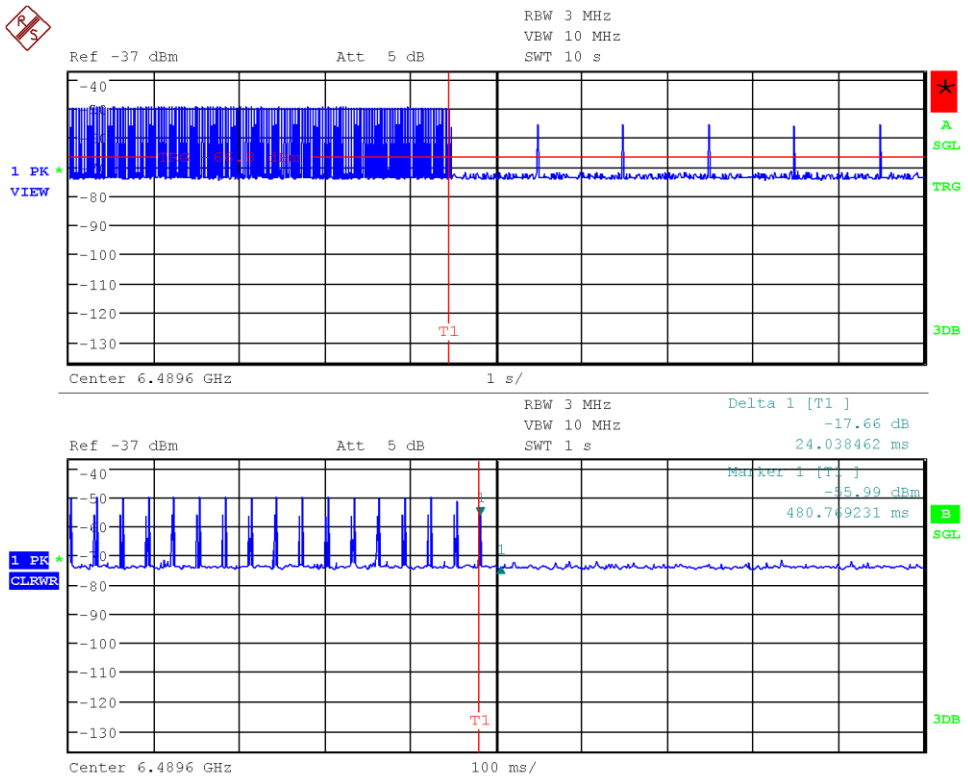
## Cease of transmitter operation (1)

| | |
|---|---|
| Project Number: | G0M-2007-9142 |
| Applicant: | Leica Geosystems AG |
| Model Description: | Motorized Imaging Totalstation |
| Model: | TS16 I R1000 |
| Test Sample ID: | 30448 (Rx) + 30449 (Tx) |
| Operator: | Abdullah Al Jamal |
| Test Site: | Eurofins Product Service GmbH |
| Test Date: | 2020-07-30 |
| Operating Conditions: | Tnom/Vnom |
| Description: | Rx Sending acknowledgment (companion device) – second (higher) burst in the plot below |
| | Tx Receiving acknowledgment and transmitting data (EUT) – first (lower) burst in the plot below |



## Cease of transmitter operation (2)

| | |
|---|---|
| Project Number: | G0M-2007-9142 |
| Applicant: | Leica Geosystems AG |
| Model Description: | Motorized Imaging Totalstation |
| Model: | TS16 I R1000 |
| Test Sample ID: | 30448 (Rx) + 30449 (Tx) |
| Operator: | Abdullah Al Jamal |
| Test Site: | Eurofins Product Service GmbH |
| Test Date: | 2020-07-30 |
| Operating Conditions: | Tnom/Vnom |
| Description: | Upper figure: The bursts from *Cease of transmitter operation (2)* in a larger time span are shown. The red line (display line T1) marks the end of transmission as no acknowledgements are received from the EUT.<br><br>Lower below: The observation period is shortened. The red line (display line T1) marks the end of transmission as no acknowledgements are received from the EUT. The marker (M1) represents the point in time when a new transmission by the transmitter was expected. |



## 3.5 Test Conditions and Results - Transmitter radiated emissions

### 3.5.1 Information

| Test Information | |
|---|---|
| Product Standard Reference | FCC Part 15.519 (c)(d), ISED RSS-220 5.3.1 c-f |
| Measurement Method | ANSI C63.10 10.2, 10.3 |
| Measurement Uncertainty | ± 5.7 dB |
| Date | 2020-07-21<br>2020-07-22 |
| Operator | Abdullah Al Jamal |
| Test Sample ID | 30163 |
| Measurement note | Measurement plots not listed in this test report (related to the frequency range to be measured) contain noise floor only. No significant emissions detected in these measurement ranges. An evaluation was performed manually with the spectrum analyser. |

### 3.5.2 Limits

| Limits - below 960 MHz | | | |
|---|---|---|---|
| Frequency [MHz] | Detector | Field strength [µV/m] | Measurement distance [m] |
| 0.009 - 0.09 | Average | 2400/F[kHz] | 300 |
| 0.09 - 0.110 | Quasi-Peak | 2400/F[kHz] | 300 |
| 0.110 - 0.490 | Average | 2400/F[kHz] | 300 |
| 0.490 - 1.705 | Quasi-Peak | 24000/F[kHz] | 30 |
| 1.705 - 30.0 | Quasi-Peak | 30 | 30 |
| 30 - 88 | Quasi-Peak | 100 | 3 |
| 88 - 216 | Quasi-Peak | 150 | 3 |
| 216 - 960 | Quasi-Peak | 200 | 3 |

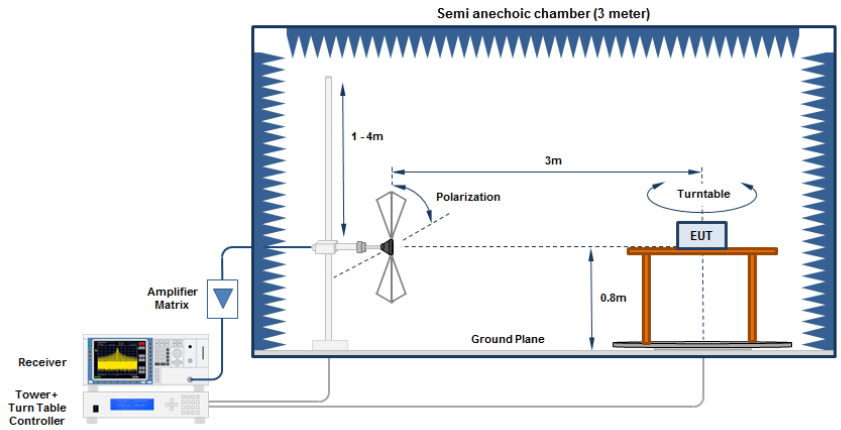
| Limits - FCC - above 960 MHz | | | | | |
|---|---|---|---|---|---|
| Frequency [MHz] | Bandwidth | Detector | Power [dBm EIRP] | Field Strength [dBµV/m@3m] | Field Strength [dBµV/m@1m] |
| 960-1610 | 1 MHz | RMS | -75.3 | 19.9 | 29.5 |
| 1610-1990 | 1 MHz | RMS | -63.3 | 31.9 | 41.5 |
| 1990-3100 | 1 MHz | RMS | -61.3 | 33.9 | 43.5 |
| 3100-10600 | 1 MHz | RMS | -41.3 | 53.9 | 63.5 |
| > 10600 | 1 MHz | RMS | -61.3 | 33.9 | 43.5 |

| Limits - ISED - above 960 MHz | | | | | |
|---|---|---|---|---|---|
| Frequency [MHz] | Bandwidth | Detector | Power [dBm EIRP] | Field Strength [dBµV/m@3m] | Field Strength [dBµV/m@1m] |
| 960-1610 | 1 MHz | RMS | -75.3 | 19.9 | 29.5 |
| 1610-4750 | 1 MHz | RMS | -70.0 | 25.2 | 34.7 |
| 4750-10600 | 1 MHz | RMS | -41.3 | 53.9 | 63.5 |
| > 10600 | 1 MHz | RMS | -61.3 | 33.9 | 43.5 |

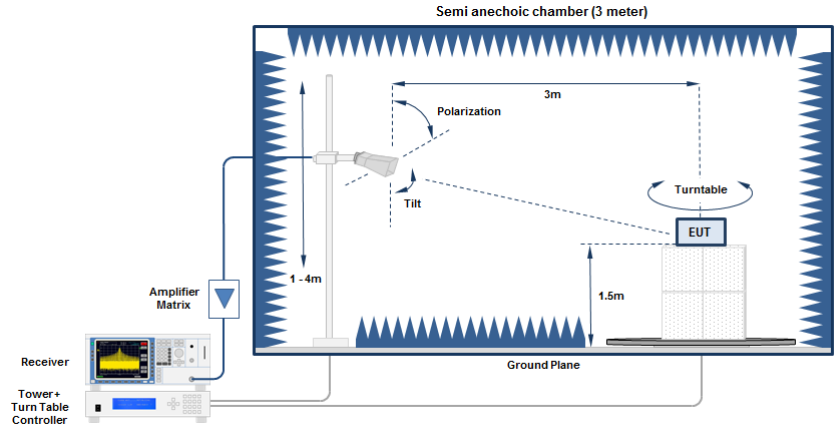
| Limits - GPS Band | | | | | |
|---|---|---|---|---|---|
| Frequency [MHz] | Bandwidth | Detector | Power [dBm EIRP] | Field Strength [dBµV/m@3m] | Field Strength [dBµV/m@1m] |
| 1164-1240 | 1 kHz | RMS | -85.3 | 9.9 | 19.5 |
| 1559-1610 | 1 kHz | RMS | -85.3 | 9.9 | 19.5 |

### 3.5.3 Setup

**Test Setup 30 MHz - 1000 MHz**




**Test Setup > 1 GHz**




### 3.5.4 Equipment

| Test Software | | | |
|---|---|---|---|
| Description | Manufacturer | Name | Version |
| EMC Software | DARE Instruments | RadiMation | 2016.1.10 |

| Test Equipment 30 MHz - 1000 MHz | | | | | |
|---|---|---|---|---|---|
| Description | Manufacturer | Model | Identifier | Cal. Date | Cal. Due |
| Anechoic Chamber | Frankonia | AC1 | EF00062 | 2018-07 | 2021-07 |
| Measurement Receiver | Agilent | N9038A-526/WXP | EF01070 | 2020-06 | 2021-06 |
| Antenna | R&S | HK 116 | EF00030 | 2019-04 | 2022-04 |
| Antenna | R&S | HL 223 | EF00187 | 2019-05 | 2022-05 |

| Test Equipment > 1 GHz | | | | | |
|---|---|---|---|---|---|
| Description | Manufacturer | Model | Identifier | Cal. Date | Cal. Due |
| Anechoic Chamber | Frankonia | AC1 | EF00062 | 2018-07 | 2021-07 |
| Measurement Receiver | Agilent | N9038A-526/WXP | EF01070 | 2020-06 | 2021-06 |
| Spectrum Analyser | R&S | FSW 43 | EF00896 | 2019-07 | 2020-07 |
| Antenna | Schwarzbeck | BBHA 9120D | EF01153 | 2019-10 | 2020-10 |
| Antenna | Amplifier Research | ATH18G40 | EF01152 | 2018-10 | 2020-10 |
| Antenna | Amplifier Research | 22240-25 | EF00301 | 2019-12 | 2022-12 |

### 3.5.5 Procedure

| Test Procedure 30 MHz - 1000 MHz |
|---|
| 1. EUT is placed on a non conducting support at the center of a turn table 0.8 m above the ground |
| 2. EUT set to test mode |
| 3. The receiver is set to peak detection with max hold |
| 4. The EUT is rotated through 360° and the height of the antenna is varied from 1 m to 4 m |
| 5. All significant emissions are measured again using the corresponding final detector |

| Test Procedure > 1 GHz |
|---|
| 1. EUT is placed on a non conducting support at the center of a turn table 1.5 m above the ground |
| 2. EUT set to test mode |
| 3. The receiver is set to peak detection with max hold |
| 4. The EUT is rotated through 360° and the height of the antenna is varied from 1 m to 4 m |
| 5. All significant emissions are measured again using the corresponding final detector |

### 3.5.6 Results

| Test Results 30 MHz - 960 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Channel [MHz] | Emission [MHz] | Level [dBµV/m] | Det. | Pol. | Limit [dBµV/m] | Margin [dB] |
| 6489.6 | No significant emission detected. | | | | | |

| Test Results 960 MHz - 40 GHz | | | | | | |
|---|---|---|---|---|---|---|
| Channel [MHz] | Emission [MHz] | Level [dBµV/m] | Det. | Pol. | Limit [dBµV/m] | Margin [dB] |
| 6489.6 | 1235.6 | -80.5 dBm | RMS | hor | -75.3 dBm | -05.21 |
| 6489.6 | 6493.6 | -50 dBm | RMS | hor | -41.3 dBm | -08.67 |
| 6489.6 | 14046.5 | -67.4 dBm | RMS | ver | -61.3 dBm | -06.14 |
| 6489.6 | 14579 | -68.8 dBm | RMS | hor | -61.3 dBm | -07.46 |

| Test Results GPS Band | | | | | | |
|---|---|---|---|---|---|---|
| Channel [MHz] | Emission [MHz] | Level [dBµV/m] | Det. | Pol. | Limit [dBµV/m] | Margin [dB] |
| 6489.6 | No significant emission detected. | | | | | |

## 3.6 Test Conditions and Results - Receiver radiated emissions

### 3.6.1 Information

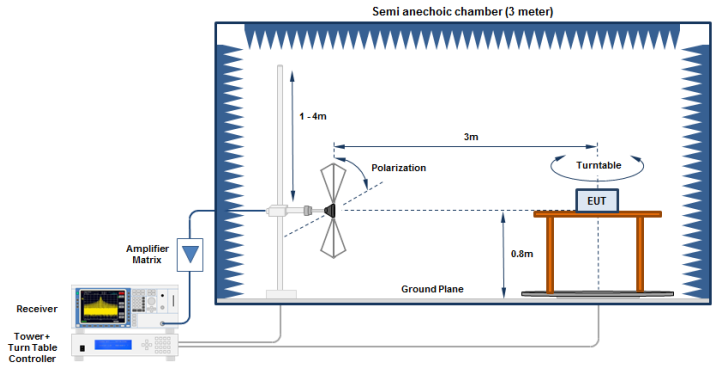
| Test Information | |
|---|---|
| Product Standard Reference | ISED RSS-220 3.1, RSS-Gen 7.3 |
| Measurement Method | ANSI C63.10 6.5, 6.6 |
| Operator | Abdullah Al Jamal |
| Date | 2020-07-21 |
| Test Sample ID | 30164 |
| Measurement note | Measurement plots not listed in this test report (related to the frequency range to be measured) contain noise floor only. No significant emissions detected in these measurement ranges. An evaluation was performed manually with the spectrum analyser. |

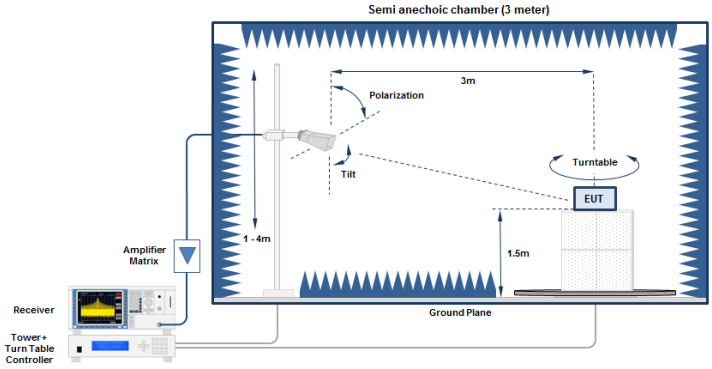
### 3.6.2 Limits

| Limits | | | |
|---|---|---|---|
| Frequency [MHz] | Detector | Field strength [dBµV/m] | Measurement distance [m] |
| 30 - 88 | Quasi-Peak | 100 | 3 |
| 88 - 216 | Quasi-Peak | 150 | 3 |
| 216 - 960 | Quasi-Peak | 200 | 3 |
| 960 - 1000 | Quasi-Peak | 500 | 3 |
| >1000 | Average | 500 | 3 |

### 3.6.3 Setup

**Test Setup 30 MHz - 1000 MHz**



| Test Setup > 1 GHz |
|---|
|  |



### 3.6.4 Equipment

| Test Software | | | |
|---|---|---|---|
| Description | Manufacturer | Name | Version |
| EMC Software | DARE Instruments | RadiMation | 2016.1.10 |

| Test Equipment 30 MHz - 1000 MHz | | | | | |
|---|---|---|---|---|---|
| Description | Manufacturer | Model | Identifier | Cal. Date | Cal. Due |
| Anechoic Chamber | Frankonia | AC1 | EF00062 | 2018-07 | 2021-07 |
| Measurement Receiver | Agilent | N9038A-526/WXP | EF01070 | 2020-06 | 2021-06 |
| Antenna | R&S | HK 116 | EF00030 | 2019-04 | 2022-04 |
| Antenna | R&S | HL 223 | EF00187 | 2019-05 | 2022-05 |

| Test Equipment > 1 GHz | | | | | |
|---|---|---|---|---|---|
| Description | Manufacturer | Model | Identifier | Cal. Date | Cal. Due |
| Anechoic Chamber | Frankonia | AC1 | EF00062 | 2018-07 | 2021-07 |
| Measurement Receiver | Agilent | N9038A-526/WXP | EF01070 | 2020-06 | 2021-06 |
| Spectrum Analyser | R&S | FSW 43 | EF00896 | 2019-07 | 2020-07 |
| Antenna | Schwarzbeck | BBHA 9120D | EF01153 | 2019-10 | 2020-10 |
| Antenna | Amplifier Research | ATH18G40 | EF01152 | 2018-10 | 2020-10 |
| Antenna | Amplifier Research | 22240-25 | EF00301 | 2019-12 | 2022-12 |

### 3.6.5 Procedure

| Test Procedure 30 MHz - 1000 MHz |
|---|
| 1. EUT is placed on a non conducting support at the center of a turn table 0.8 m above the ground<br>2. EUT set to test mode<br>3. The receiver is set to peak detection with max hold<br>4. The EUT is rotated through 360° and the height of the antenna is varied from 1 m to 4 m<br>5. All significant emissions are measured again using the corresponding final detector |

| Test Procedure > 1 GHz |
|---|
| 1. EUT is placed on a non conducting support at the center of a turn table 1.5 m above the ground<br>2. EUT set to test mode<br>3. The receiver is set to peak detection with max hold<br>4. The EUT is rotated through 360° and the height of the antenna is varied from 1 m to 4 m<br>5. All significant emissions are measured again using the corresponding final detector |

### 3.6.6 Results

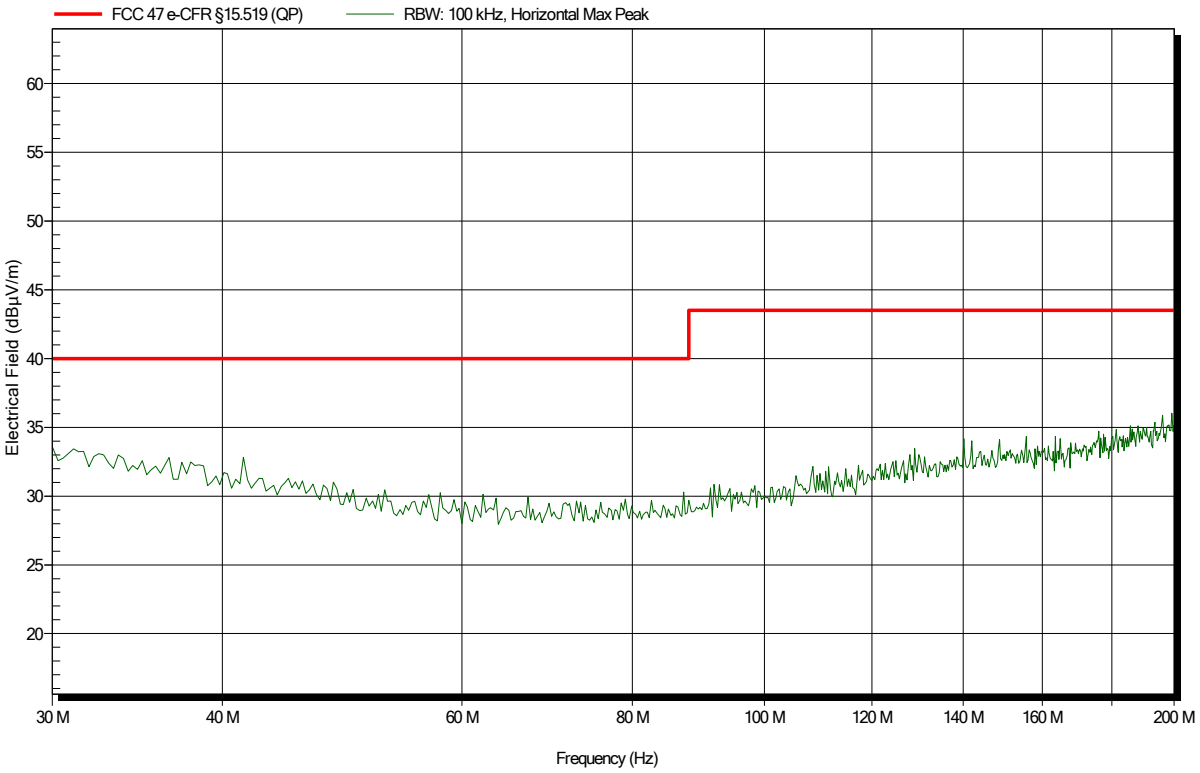
| Test Results | | | | | | |
|---|---|---|---|---|---|---|
| Channel [MHz] | Emission [MHz] | Level [dBµV/m] | Det. | Pol. | Limit [dBµV/m] | Margin [dB] |
| 6489.6 | 219.231 | 36.89 | pk | hor | 46.00 | -09.11 |
| 6489.6 | 14620 | 47.19 | pk | hor | 53.98 | -06.79 |

# ANNEX A Transmitter radiated emissions

**Spurious emissions according to FCC 47 CFR § 15.519 and ISED RSS-220 Issue 1, Amendment 1 (July 2018)**

| | |
|---|---|
| Project number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| EUT Name: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Site: | Eurofins Product Service GmbH |
| Operator: | Abdullah Al Jamal |
| Test Conditions: | Tnom: 25°C, Vnom: 3.3 VDC |
| Antenna: | Rohde & Schwarz HK 116, Horizontal |
| Measurement distance: | 3 m |
| Mode: | TX; CH5 |
| Test Date: | 2020-07-21 |
| Note: | EUT vertical |

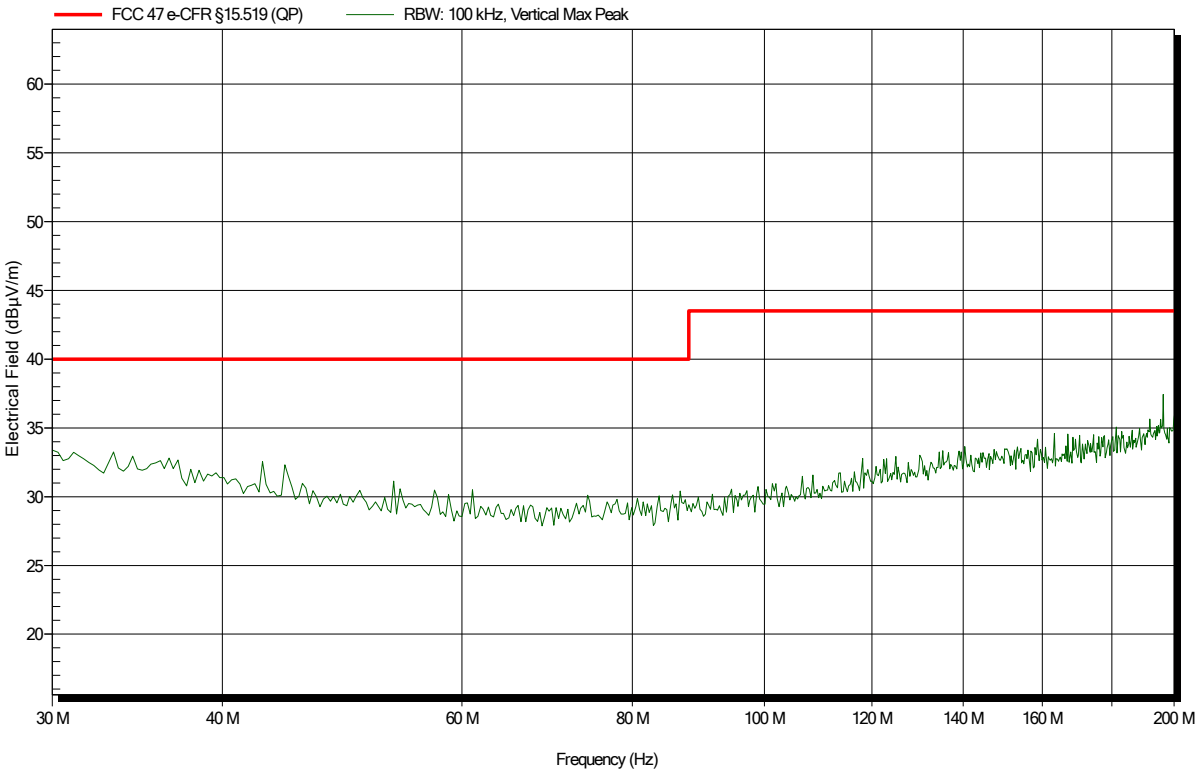
Index 1



**Spurious emissions according to FCC 47 CFR § 15.519 and ISED RSS-220 Issue 1, Amendment 1 (July 2018)**

| | |
|---|---|
| Project number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| EUT Name: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Site: | Eurofins Product Service GmbH |
| Operator: | Abdullah Al Jamal |
| Test Conditions: | Tnom: 25°C, Vnom: 3.3 VDC |
| Antenna: | Rohde & Schwarz HK 116, Vertical |
| Measurement distance: | 3 m |
| Mode: | TX; CH5 |
| Test Date: | 2020-07-21 |
| Note: | EUT vertical |

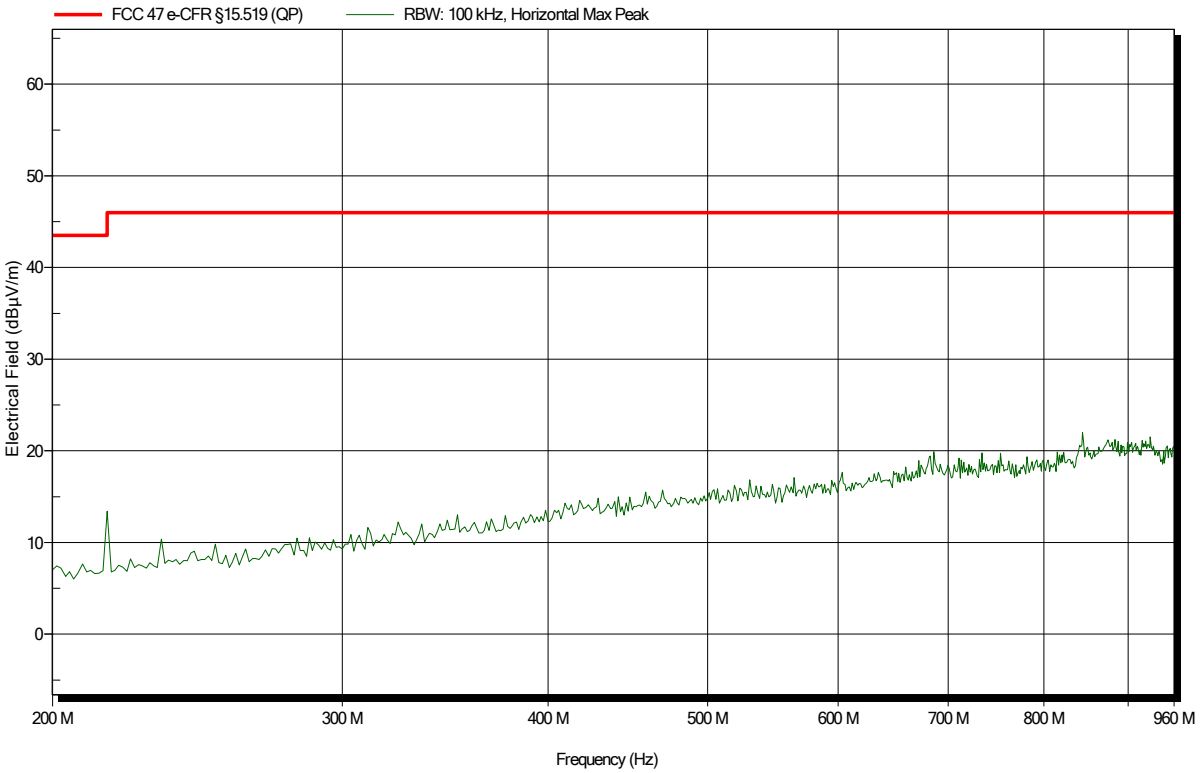
Index 2



**Spurious emissions according to FCC 47 CFR § 15.519 and ISED RSS-220 Issue 1, Amendment 1 (July 2018)**

| | |
|---|---|
| Project number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| EUT Name: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Site: | Eurofins Product Service GmbH |
| Operator: | Abdullah Al Jamal |
| Test Conditions: | Tnom: 25°C, Vnom: 3.3 VDC |
| Antenna: | Rohde & Schwarz HL 223, Horizontal |
| Measurement distance: | 3 m |
| Mode: | TX; CH5 |
| Test Date: | 2020-07-21 |
| Note: | EUT vertical |

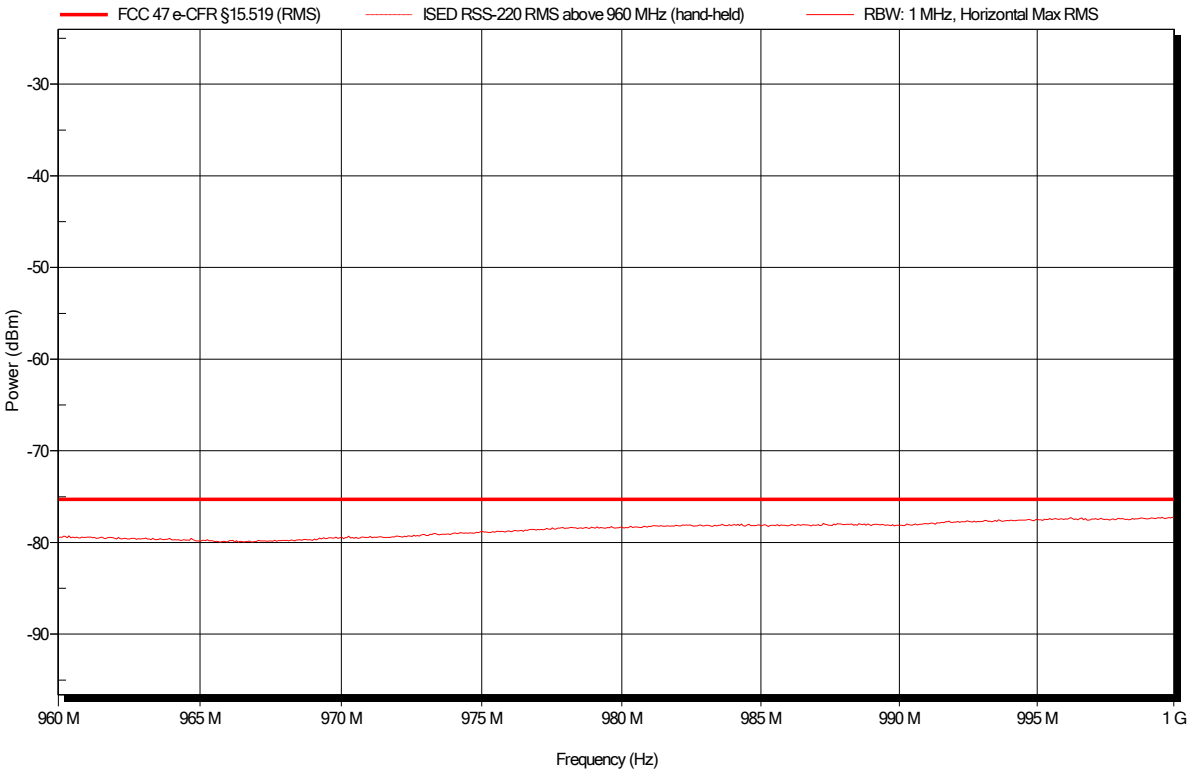
Index 3



**Spurious emissions according to FCC 47 CFR § 15.519 and ISED RSS-220 Issue 1, Amendment 1 (July 2018)**

| | |
|---|---|
| Project number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| EUT Name: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Site: | Eurofins Product Service GmbH |
| Operator: | Abdullah Al Jamal |
| Test Conditions: | Tnom: 25°C, Vnom: 3.3 VDC |
| Antenna: | Rohde & Schwarz HL 223, Horizontal |
| Measurement distance: | 3 m |
| Mode: | TX; CH5 |
| Test Date: | 2020-07-21 |
| Note: | EUT vertical |

Index 4



**Spurious emissions according to FCC 47 CFR § 15.519 and ISED RSS-220 Issue 1, Amendment 1 (July 2018)**

| | |
|---|---|
| Project number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| EUT Name: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Site: | Eurofins Product Service GmbH |
| Operator: | Abdullah Al Jamal |
| Test Conditions: | Tnom: 25°C, Vnom: 3.3 VDC |
| Antenna: | Rohde & Schwarz HL 223, Horizontal |
| Measurement distance: | 3 m |
| Mode: | TX; CH5 |
| Test Date: | 2020-07-21 |
| Note: | EUT horizontal |

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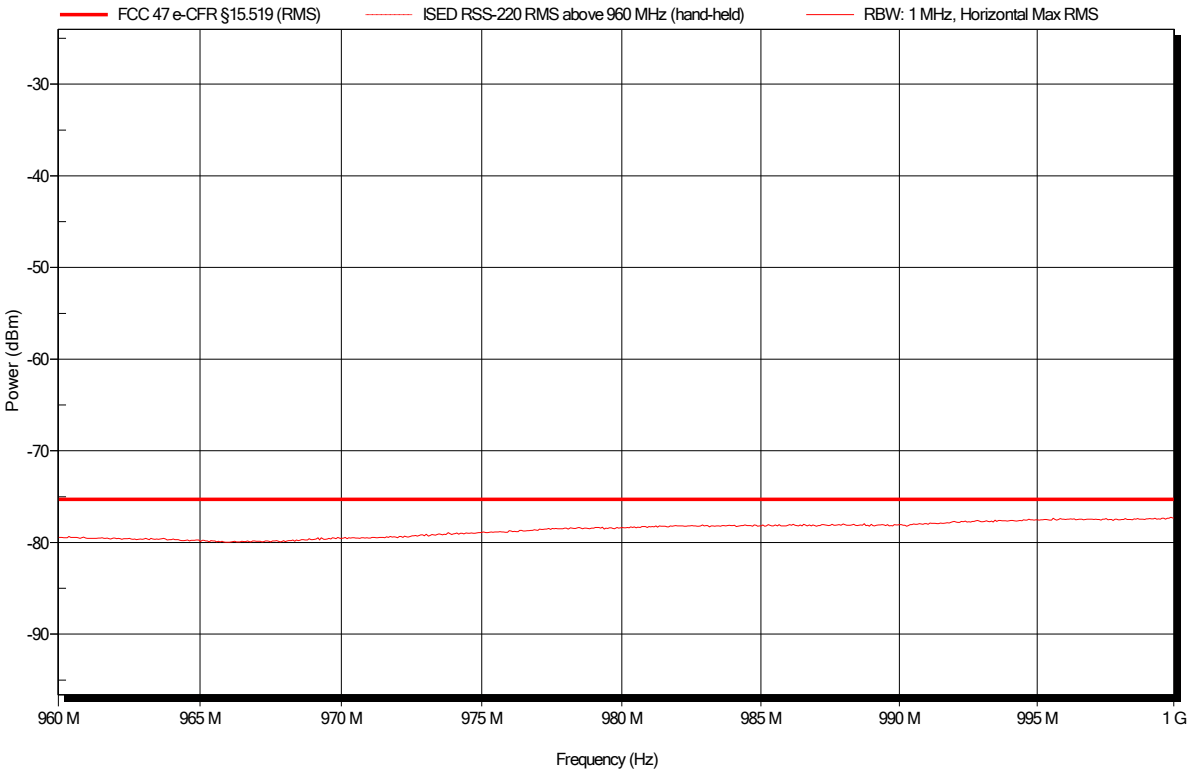
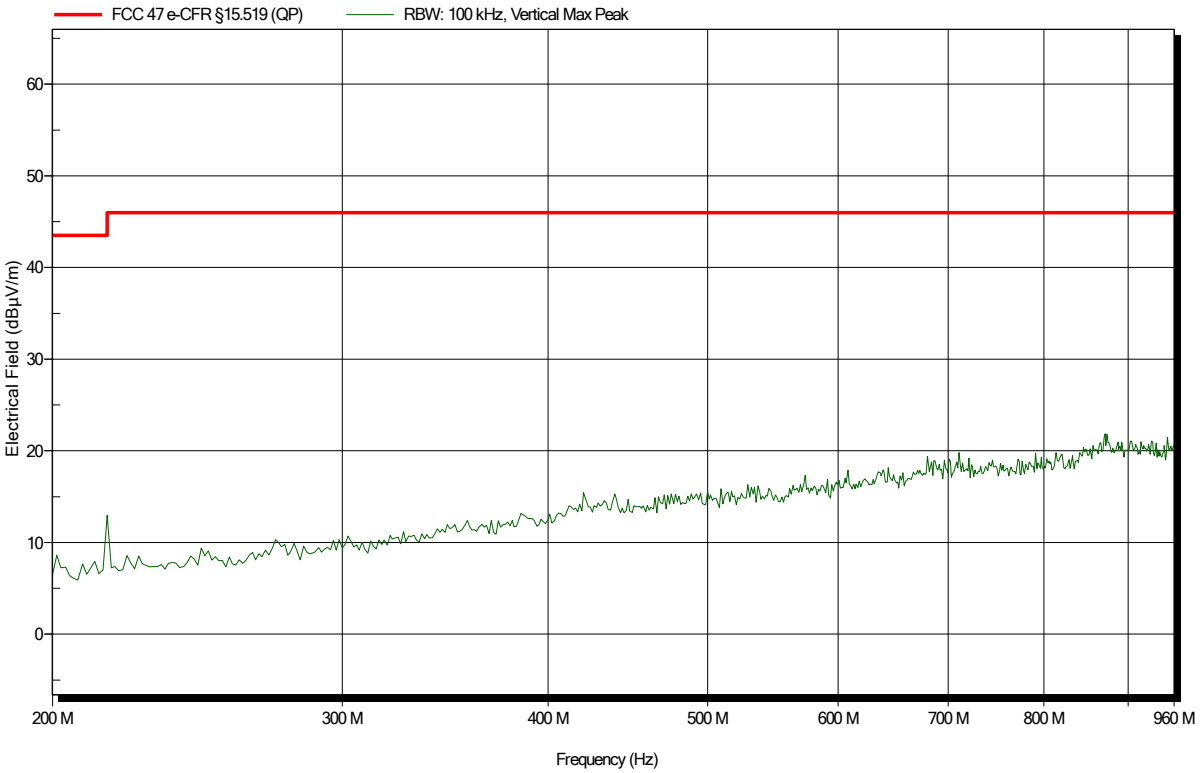


**Spurious emissions according to FCC 47 CFR § 15.519 and ISED RSS-220 Issue 1, Amendment 1 (July 2018)**

| | |
|---|---|
| Project number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| EUT Name: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Site: | Eurofins Product Service GmbH |
| Operator: | Abdullah Al Jamal |
| Test Conditions: | Tnom: 25°C, Vnom: 3.3 VDC |
| Antenna: | Rohde & Schwarz HL 223, Vertical |
| Measurement distance: | 3 m |
| Mode: | TX; CH5 |
| Test Date: | 2020-07-21 |
| Note: | EUT vertical |

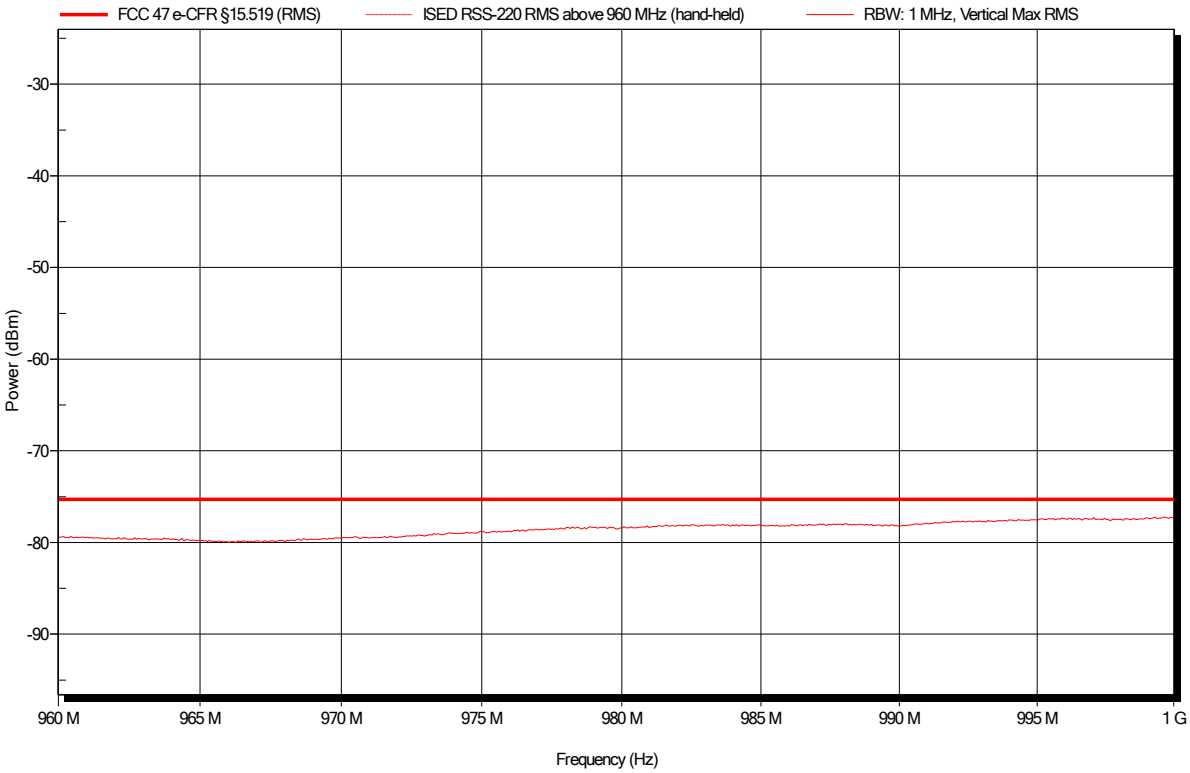
Index 5



**Spurious emissions according to FCC 47 CFR § 15.519 and ISED RSS-220 Issue 1, Amendment 1 (July 2018)**

| | |
|---|---|
| Project number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| EUT Name: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Site: | Eurofins Product Service GmbH |
| Operator: | Abdullah Al Jamal |
| Test Conditions: | Tnom: 25°C, Vnom: 3.3 VDC |
| Antenna: | Rohde & Schwarz HL 223, Vertical |
| Measurement distance: | 3 m |
| Mode: | TX; CH5 |
| Test Date: | 2020-07-21 |
| Note: | EUT vertical |

Index 6



**Spurious emissions according to FCC 47 CFR § 15.519 and ISED RSS-220 Issue 1, Amendment 1 (July 2018)**

| | |
|---|---|
| Project number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| EUT Name: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Site: | Eurofins Product Service GmbH |
| Operator: | Abdullah Al Jamal |
| Test Conditions: | Tnom: 25°C, Vnom: 3.3 VDC |
| Antenna: | Rohde & Schwarz HL 223, Vertical |
| Measurement distance: | 3 m |
| Mode: | TX; CH5 |
| Test Date: | 2020-07-21 |
| Note: | EUT horizontal |

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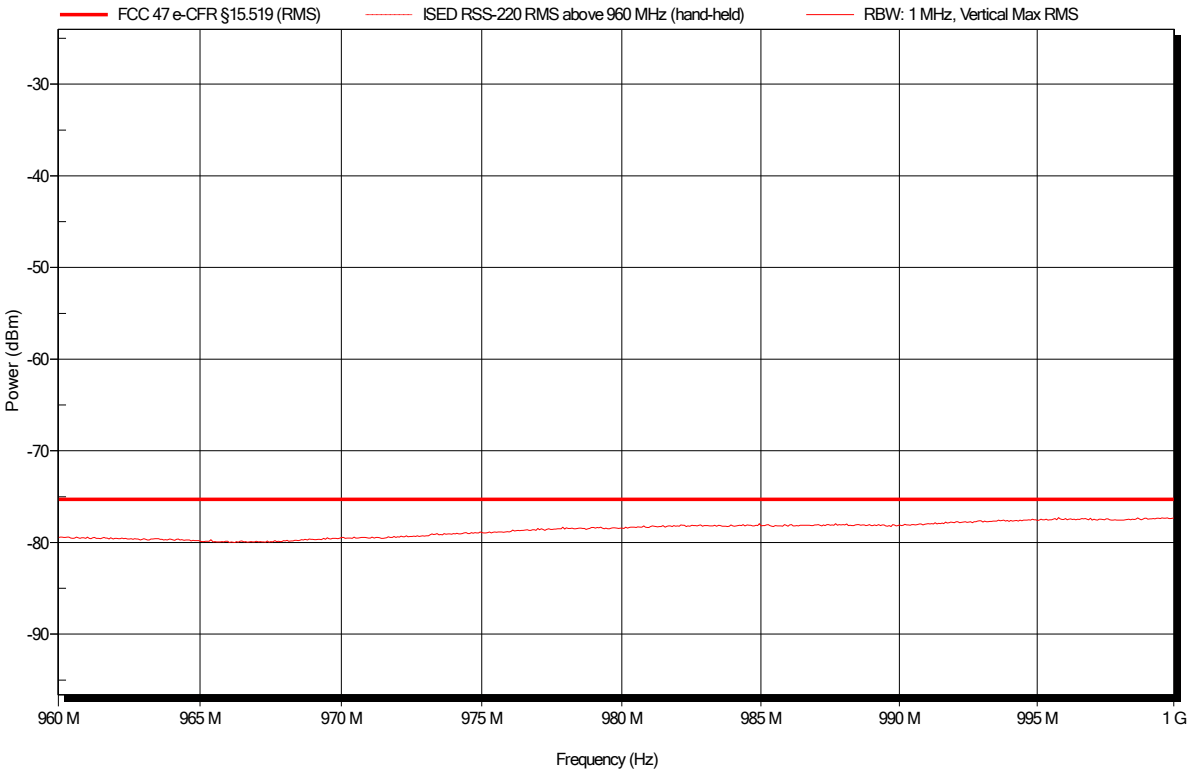

**Spurious emissions according to FCC 47 CFR § 15.519 and ISED RSS-220 Issue 1, Amendment 1 (July 2018)**

| | |
|---|---|
| Project number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| EUT Name: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Site: | Eurofins Product Service GmbH |
| Operator: | Abdullah Al Jamal |
| Test Conditions: | Tnom: 25°C, Vnom: 3.3 VDC |
| Antenna: | Schwarzbeck BBHA 9120D, Horizontal |
| Measurement distance: | 1 m converted to 3m |
| Mode: | TX; CH5 |
| Test Date: | 2020-07-21 |
| Note: | EUT vertical |

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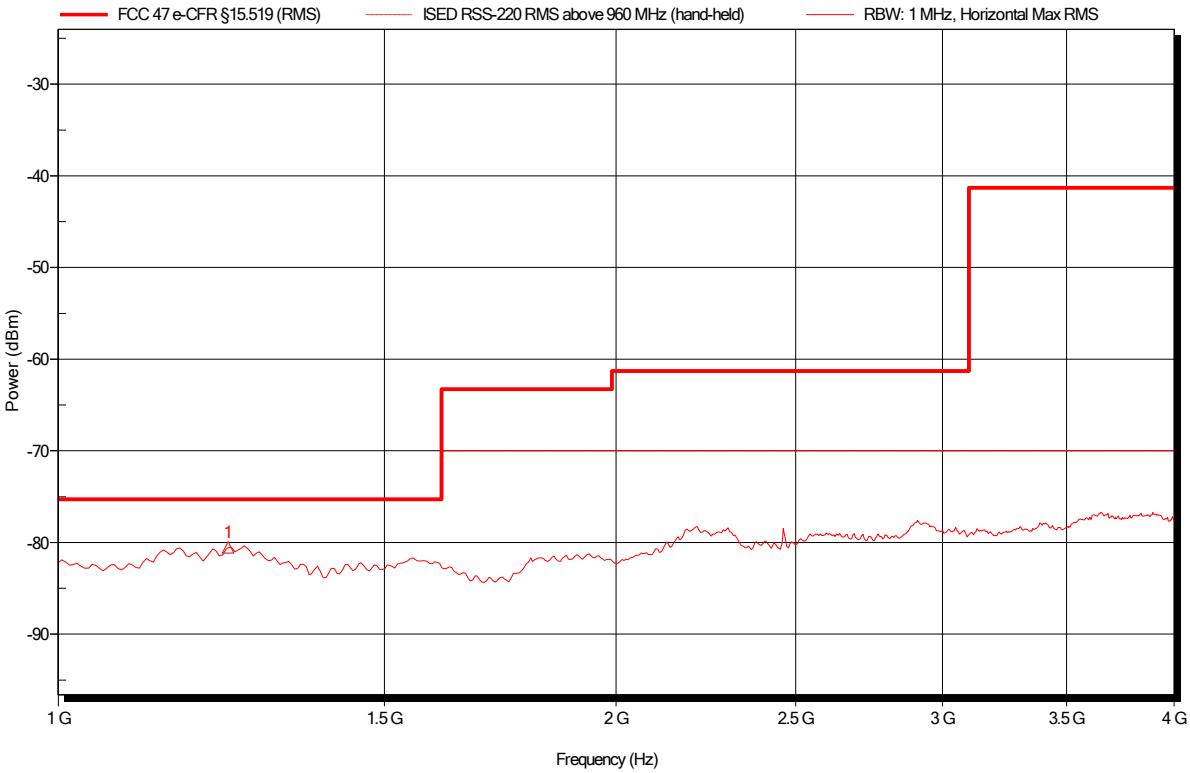


| Frequency | RMS | RMS Limit | RMS Difference | RMS Status |
|---|---|---|---|---|
| 1.2356 GHz | -80.5 dBm | -75.3 dBm | -5.21 dB | Pass |

**Spurious emissions according to FCC 47 CFR § 15.519 and ISED RSS-220 Issue 1, Amendment 1 (July 2018)**

| | |
|---|---|
| Project number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| EUT Name: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Site: | Eurofins Product Service GmbH |
| Operator: | Abdullah Al Jamal |
| Test Conditions: | Tnom: 25°C, Vnom: 3.3 VDC |
| Antenna: | Schwarzbeck BBHA 9120D, Vertical |
| Measurement distance: | 1 m converted to 3m |
| Mode: | TX; CH5 |
| Test Date: | 2020-07-22 |
| Note: | EUT vertical |

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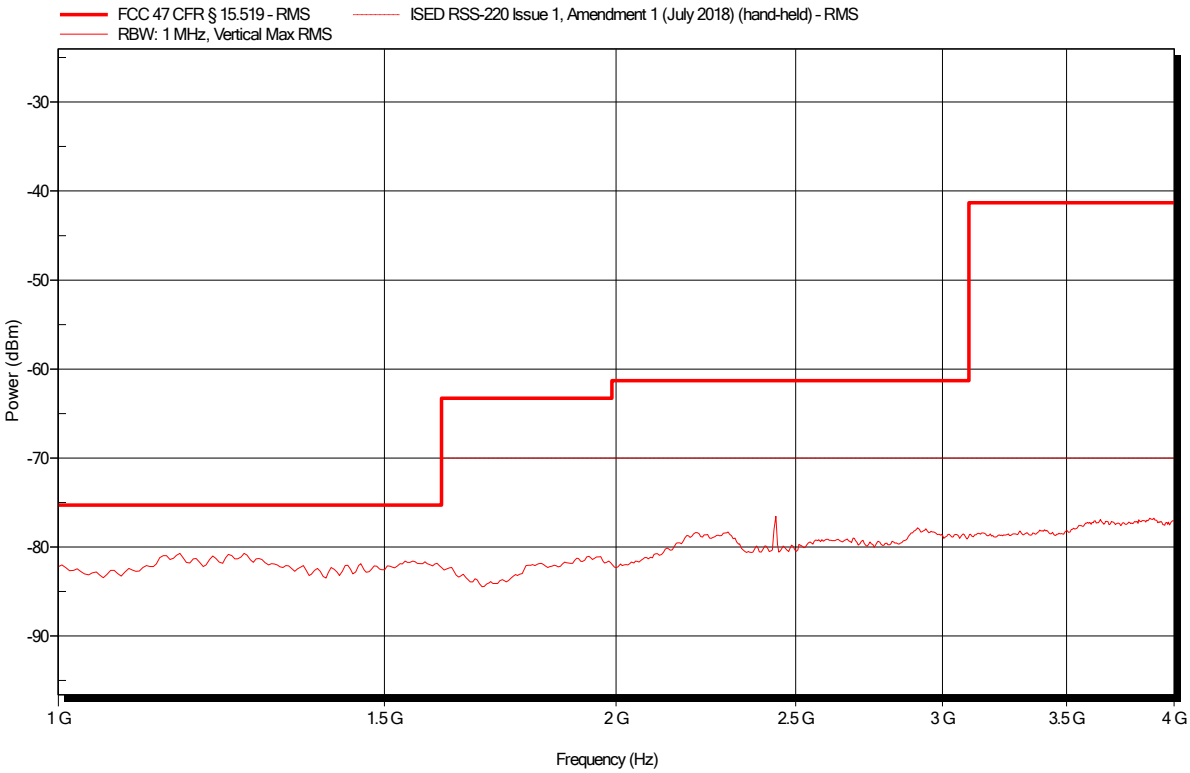

**Spurious emissions according to FCC 47 CFR § 15.519 and ISED RSS-220 Issue 1, Amendment 1 (July 2018)**

| | |
|---|---|
| Project number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| EUT Name: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Site: | Eurofins Product Service GmbH |
| Operator: | Abdullah Al Jamal |
| Test Conditions: | Tnom: 25°C, Vnom: 3.3 VDC |
| Antenna: | Schwarzbeck BBHA 9120D, Horizontal |
| Measurement distance: | 1 m converted to 3m |
| Mode: | TX; CH5 |
| Test Date: | 2020-07-21 |
| Note: | EUT vertical |

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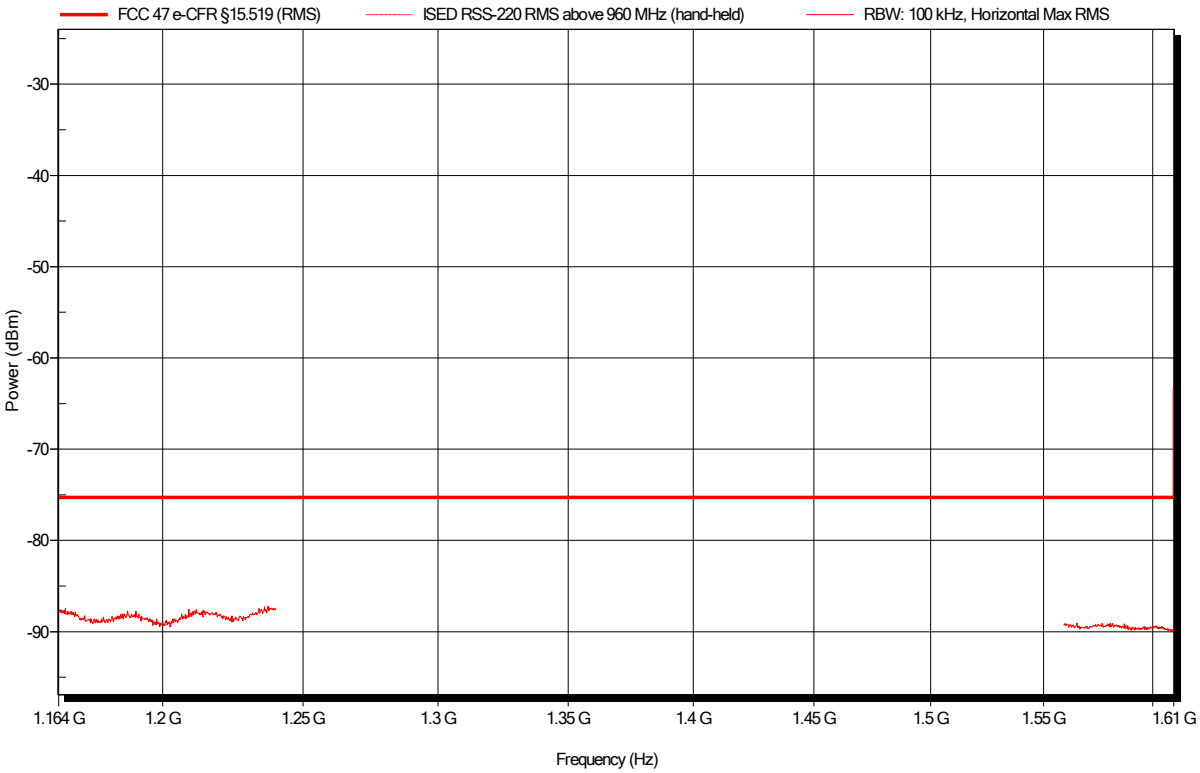

**Spurious emissions according to FCC 47 CFR § 15.519 and ISED RSS-220 Issue 1, Amendment 1 (July 2018)**

| | |
|---|---|
| Project number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| EUT Name: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Site: | Eurofins Product Service GmbH |
| Operator: | Abdullah Al Jamal |
| Test Conditions: | Tnom: 25°C, Vnom: 3.3 VDC |
| Antenna: | Schwarzbeck BBHA 9120D, Vertical |
| Measurement distance: | 1 m converted to 3m |
| Mode: | TX; CH5 |
| Test Date: | 2020-07-22 |
| Note: | EUT vertical |

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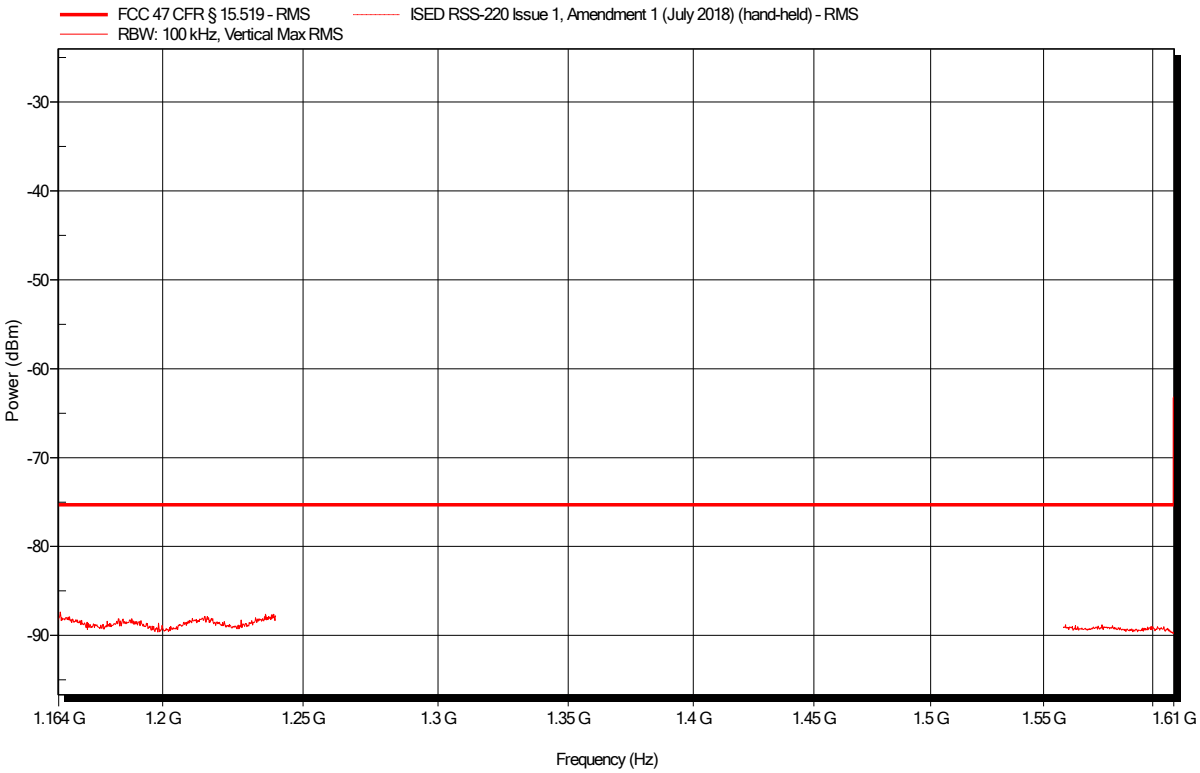
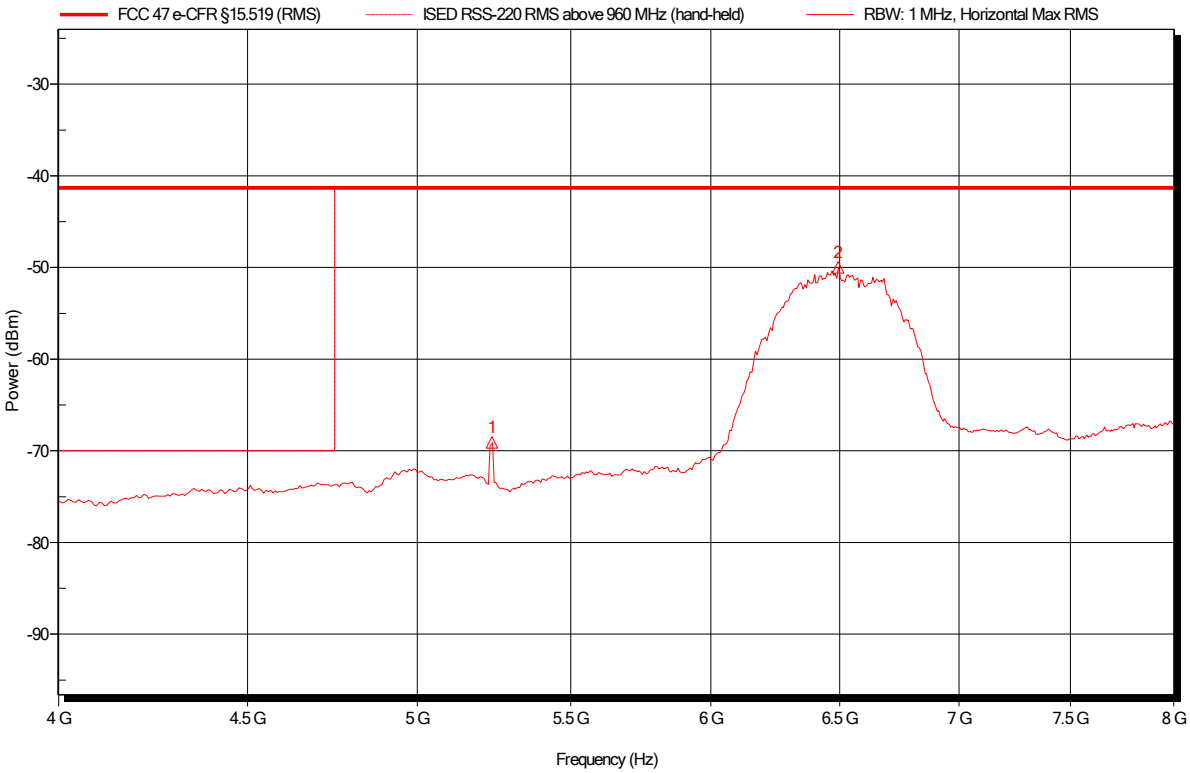


**Spurious emissions according to FCC 47 CFR § 15.519 and ISED RSS-220 Issue 1, Amendment 1 (July 2018)**

| | |
|---|---|
| Project number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| EUT Name: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Site: | Eurofins Product Service GmbH |
| Operator: | Abdullah Al Jamal |
| Test Conditions: | Tnom: 25°C, Vnom: 3.3 VDC |
| Antenna: | Schwarzbeck BBHA 9120D, Horizontal |
| Measurement distance: | 1 m converted to 3m |
| Mode: | TX; CH5 |
| Test Date: | 2020-07-21 |
| Note: | EUT vertical |

Index 11




| Frequency | RMS | RMS Limit | RMS Difference | RMS Status |
|---|---|---|---|---|
| 5.2372 GHz | -69.1 dBm | -41.3 dBm | -27.79 dB | Pass |
| 6.4936 GHz | -50 dBm | -41.3 dBm | -8.67 dB | Pass |

**Spurious emissions according to FCC 47 CFR § 15.519 and ISED RSS-220 Issue 1, Amendment 1 (July 2018)**

| | |
|---|---|
| Project number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| EUT Name: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Site: | Eurofins Product Service GmbH |
| Operator: | Abdullah Al Jamal |
| Test Conditions: | Tnom: 25°C, Vnom: 3.3 VDC |
| Antenna: | Schwarzbeck BBHA 9120D, Vertical |
| Measurement distance: | 1 m converted to 3m |
| Mode: | TX; CH5 |
| Test Date: | 2020-07-22 |
| Note: | EUT vertical |

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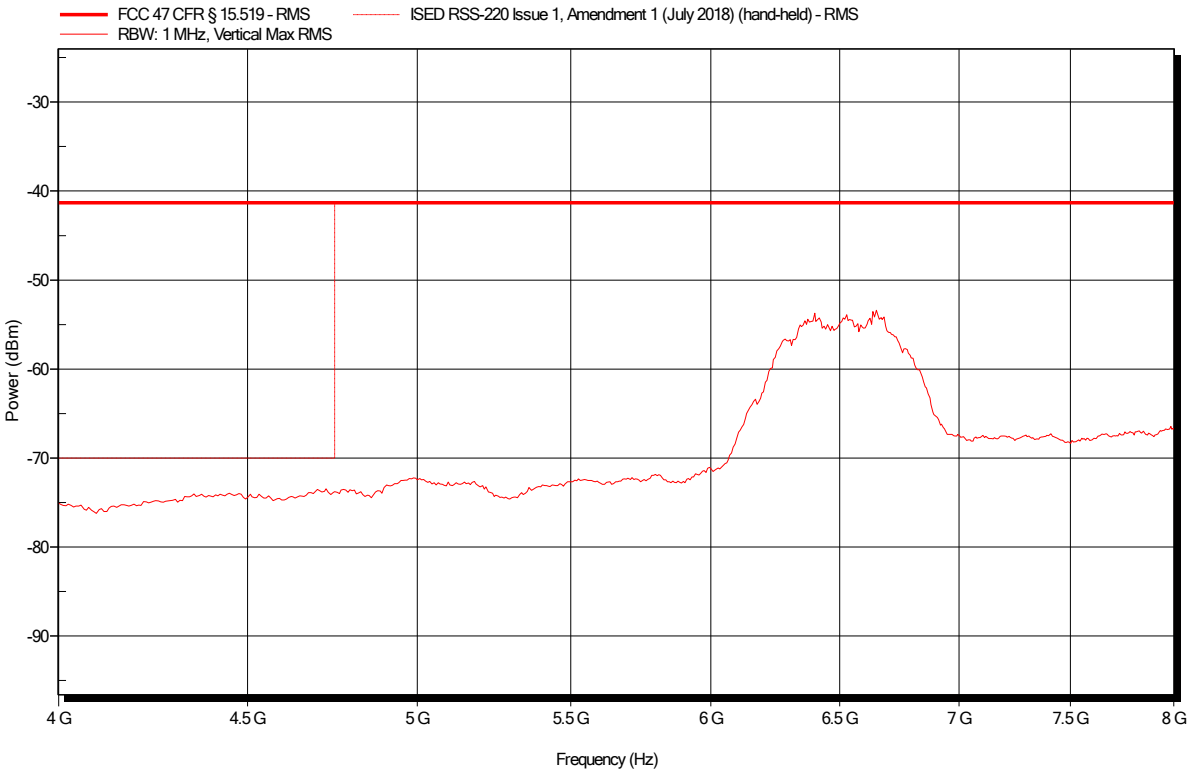

**Spurious emissions according to FCC 47 CFR § 15.519 and ISED RSS-220 Issue 1, Amendment 1 (July 2018)**

| | |
|---|---|
| Project number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| EUT Name: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Site: | Eurofins Product Service GmbH |
| Operator: | Abdullah Al Jamal |
| Test Conditions: | Tnom: 25°C, Vnom: 3.3 VDC |
| Antenna: | Schwarzbeck BBHA 9120D, Horizontal |
| Measurement distance: | 1 m converted to 3m |
| Mode: | TX; CH5 |
| Test Date: | 2020-07-22 |
| Note: | EUT vertical |

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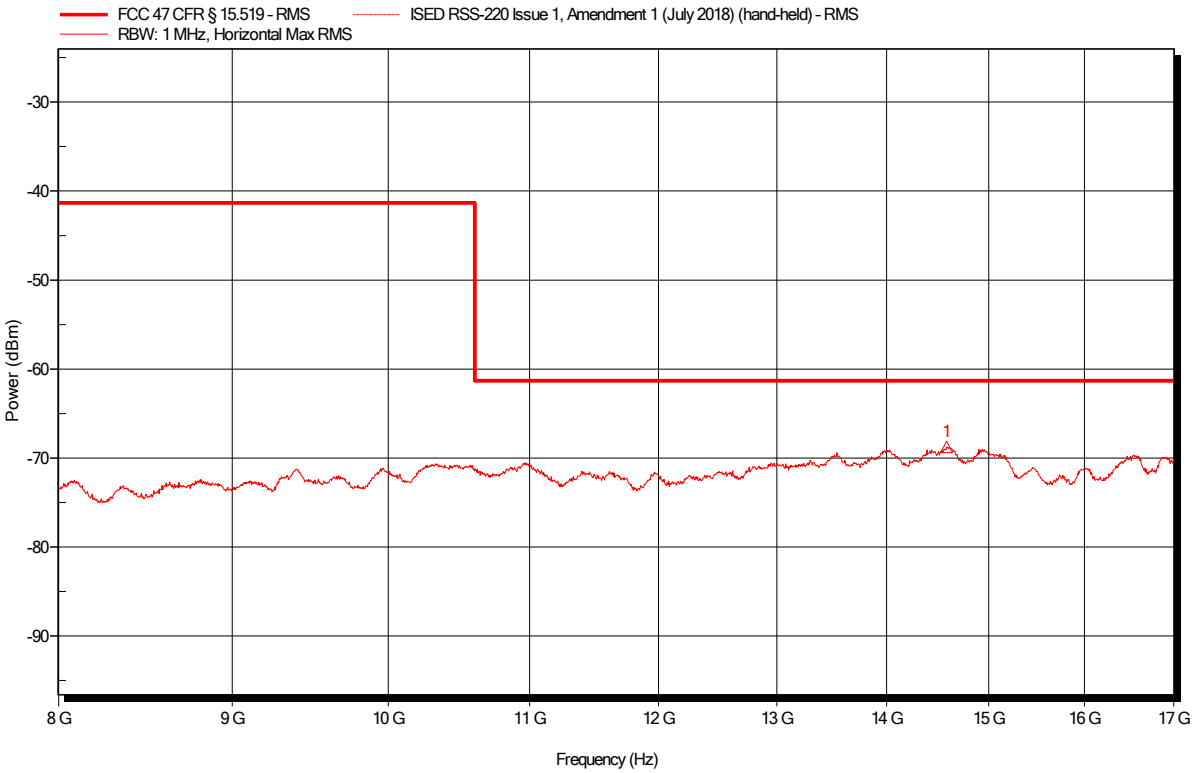


| Frequency | RMS | RMS Limit | RMS Difference | RMS Status |
|---|---|---|---|---|
| 14.579 GHz | -68.8 dBm | -61.3 dBm | -7.46 dB | Pass |

**Spurious emissions according to FCC 47 CFR § 15.519 and ISED RSS-220 Issue 1, Amendment 1 (July 2018)**

| | |
|---|---|
| Project number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| EUT Name: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Site: | Eurofins Product Service GmbH |
| Operator: | Abdullah Al Jamal |
| Test Conditions: | Tnom: 25°C, Vnom: 3.3 VDC |
| Antenna: | Schwarzbeck BBHA 9120D, Vertical |
| Measurement distance: | 1 m converted to 3m |
| Mode: | TX; CH5 |
| Test Date: | 2020-07-22 |
| Note: | EUT vertical |

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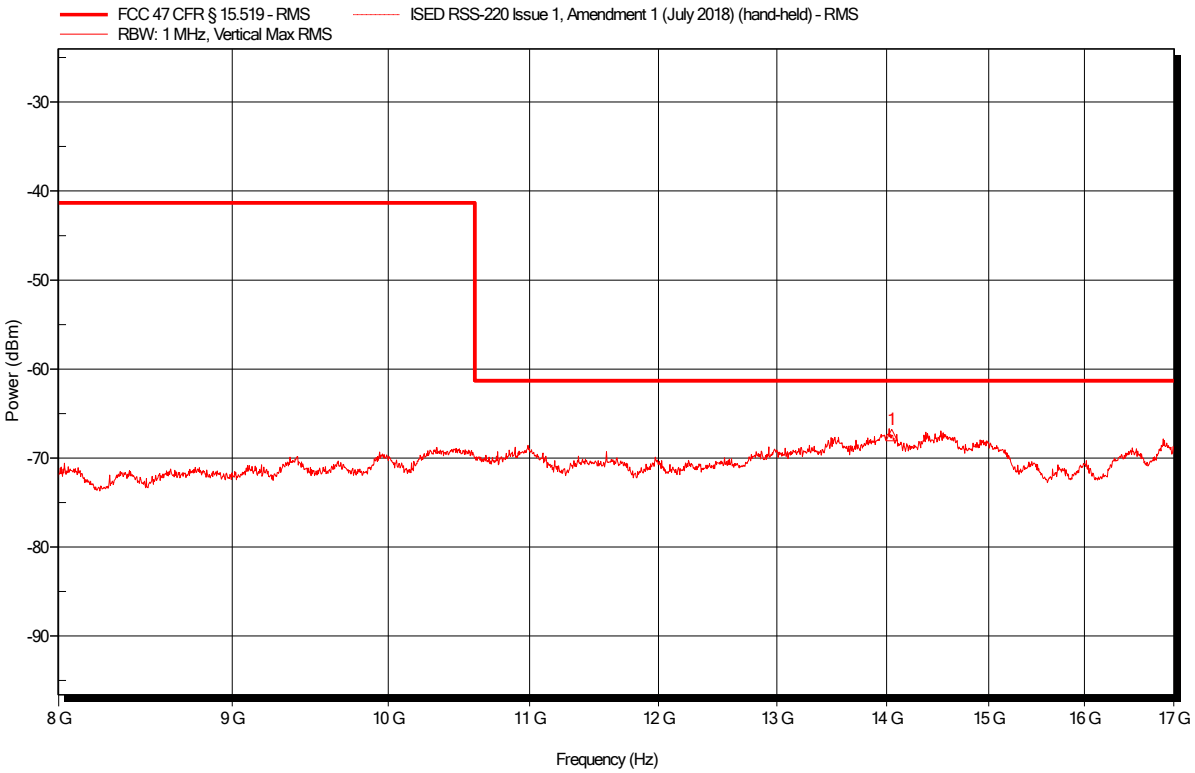


| Frequency | RMS | RMS Limit | RMS Difference | RMS Status |
|---|---|---|---|---|
| 14.0465 GHz | -67.4 dBm | -61.3 dBm | -6.14 dB | Pass |

**Spurious emissions according to FCC 47 CFR § 15.519 and ISED RSS-220 Issue 1, Amendment 1 (July 2018)**

| | |
|---|---|
| Project number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| EUT Name: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Site: | Eurofins Product Service GmbH |
| Operator: | Abdullah Al Jamal |
| Test Conditions: | Tnom: 25°C, Vnom: 3.3 VDC |
| Antenna: | Amplifier Research AT4560, Horizontal |
| Measurement distance: | 1 m converted to 3m |
| Mode: | TX; CH5 |
| Test Date: | 2020-07-22 |
| Note: | EUT vertical |

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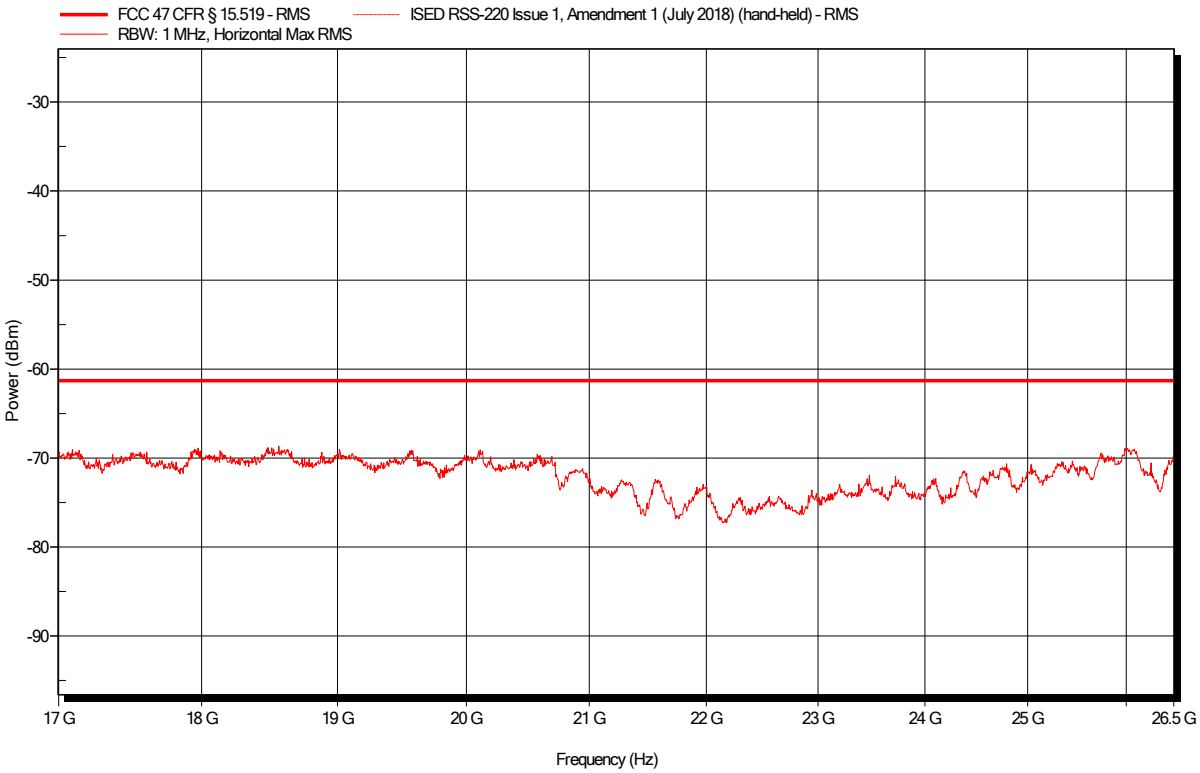

**Spurious emissions according to FCC 47 CFR § 15.519 and ISED RSS-220 Issue 1, Amendment 1 (July 2018)**

| | |
|---|---|
| Project number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| EUT Name: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Site: | Eurofins Product Service GmbH |
| Operator: | Abdullah Al Jamal |
| Test Conditions: | Tnom: 25°C, Vnom: 3.3 VDC |
| Antenna: | Amplifier Research AT4560, Vertical |
| Measurement distance: | 1 m converted to 3m |
| Mode: | TX; CH5 |
| Test Date: | 2020-07-22 |
| Note: | EUT vertical |

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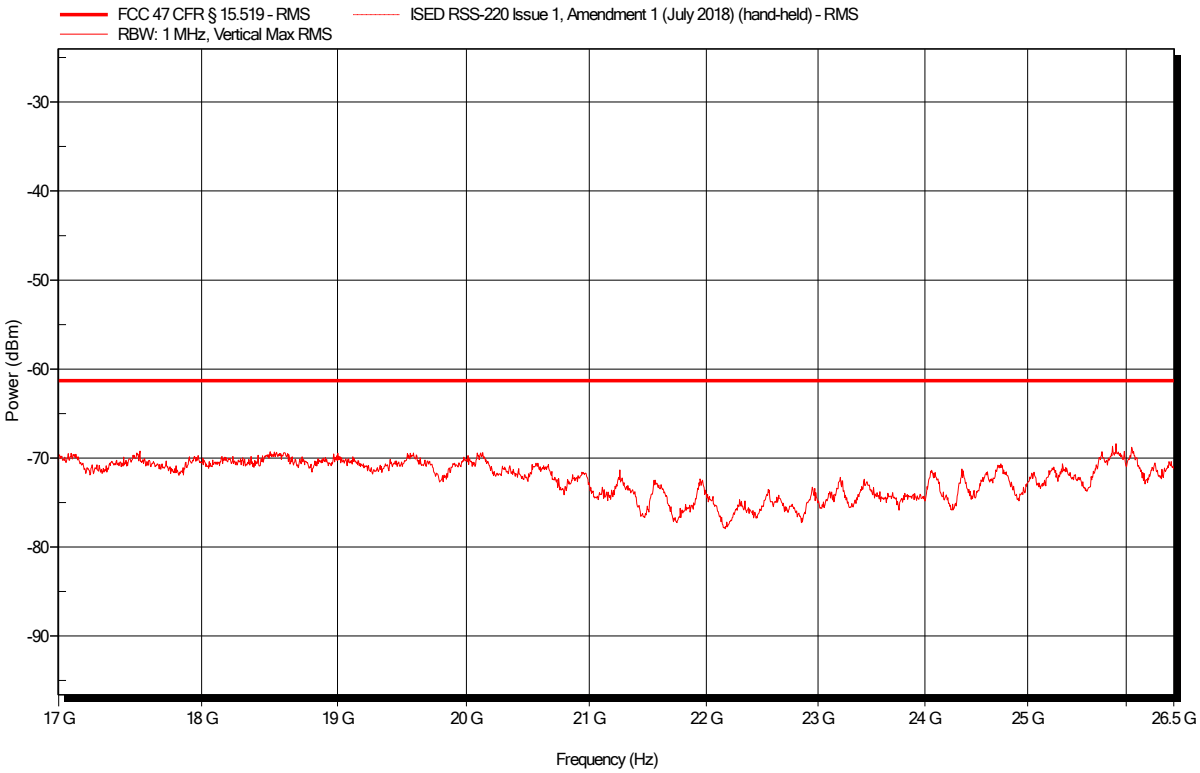

# ANNEX B Receiver radiated emissions

**Spurious emissions according to ISED RSS-220 Issue 1, Amendment 1 (July 2018) and ISED RSS-Gen Issue 5, Amendment 1 (March 2019)**

| | |
|---|---|
| Project number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| EUT Name: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Site: | Eurofins Product Service GmbH |
| Operator: | Abdullah Al Jamal |
| Measurement software: | RadiMation, version 2016.1.10 |
| Test Conditions: | Tnom: 25.1°C, Vnom: 3.3 VDC |
| Antenna: | Rohde & Schwarz HK 116, Horizontal |
| Measurement distance: | 3 m |
| Mode: | RX; CH5 |
| Test Date: | 2020-07-21 |
| Note: | EUT vertical |

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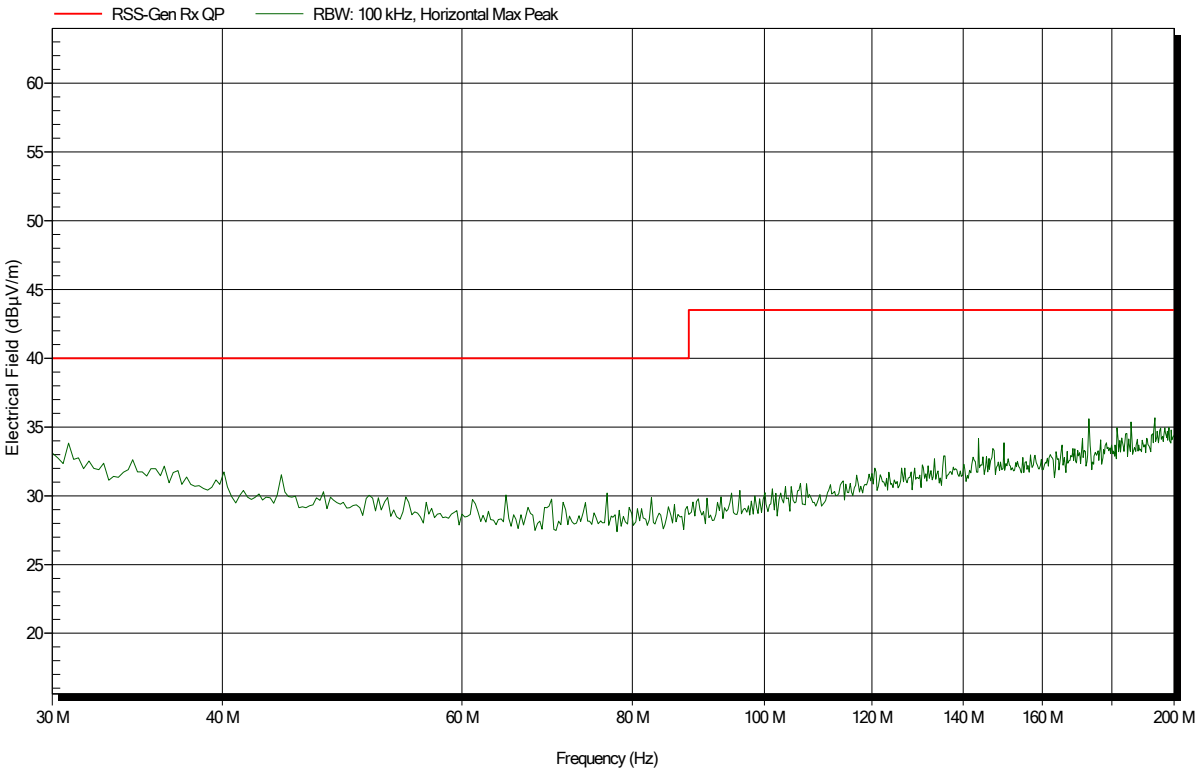

**Spurious emissions according to ISED RSS-220 Issue 1, Amendment 1 (July 2018) and ISED RSS-Gen Issue 5, Amendment 1 (March 2019)**

| | |
|---|---|
| Project number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| EUT Name: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Site: | Eurofins Product Service GmbH |
| Operator: | Abdullah Al Jamal |
| Measurement software: | RadiMation, version 2016.1.10 |
| Test Conditions: | Tnom: 25.1°C, Vnom: 3.3 VDC |
| Antenna: | Rohde & Schwarz HK 116, Vertical |
| Measurement distance: | 3 m |
| Mode: | RX; CH5 |
| Test Date: | 2020-07-21 |
| Note: | EUT vertical |

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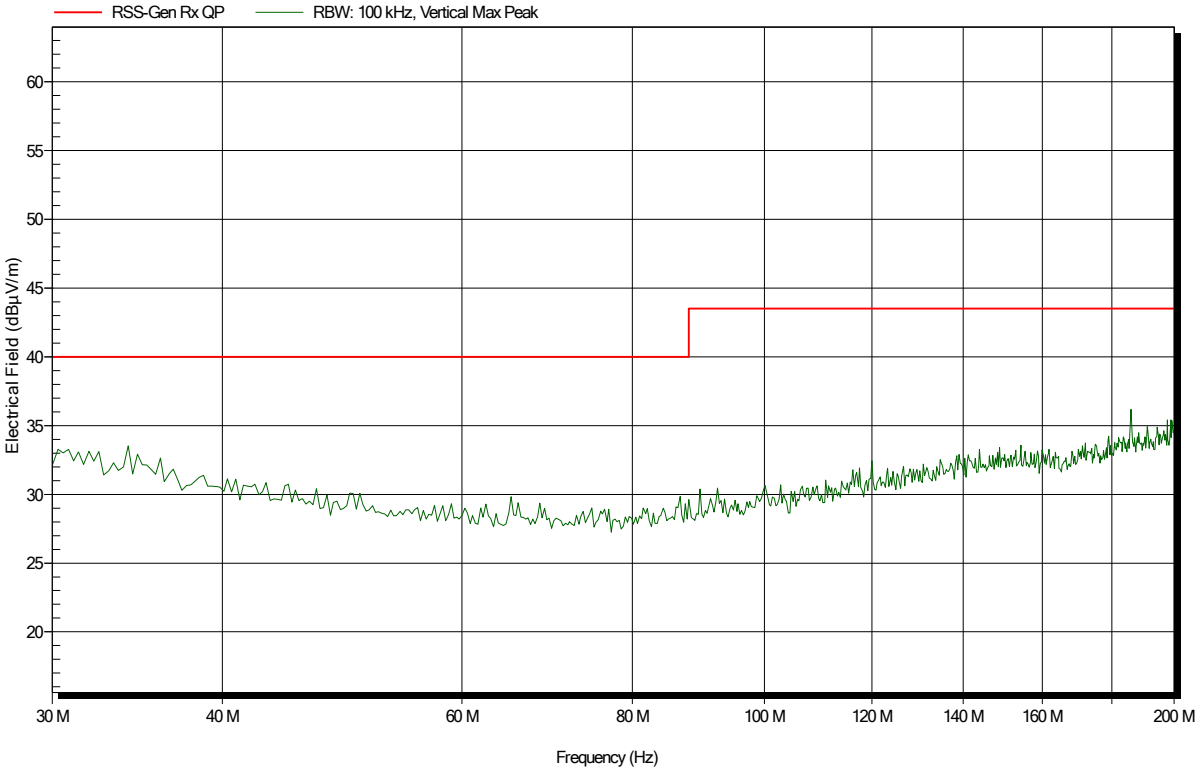

**Spurious emissions according to ISED RSS-220 Issue 1, Amendment 1 (July 2018) and ISED RSS-Gen Issue 5, Amendment 1 (March 2019)**

| | |
|---|---|
| Project number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| EUT Name: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Site: | Eurofins Product Service GmbH |
| Operator: | Abdullah Al Jamal |
| Measurement software: | RadiMation, version 2016.1.10 |
| Test Conditions: | Tnom: 25.1°C, Vnom: 3.3 VDC |
| Antenna: | Rohde & Schwarz HL 223, Horizontal |
| Measurement distance: | 3 m |
| Mode: | RX; CH5 |
| Test Date: | 2020-07-21 |
| Note: | EUT vertical |

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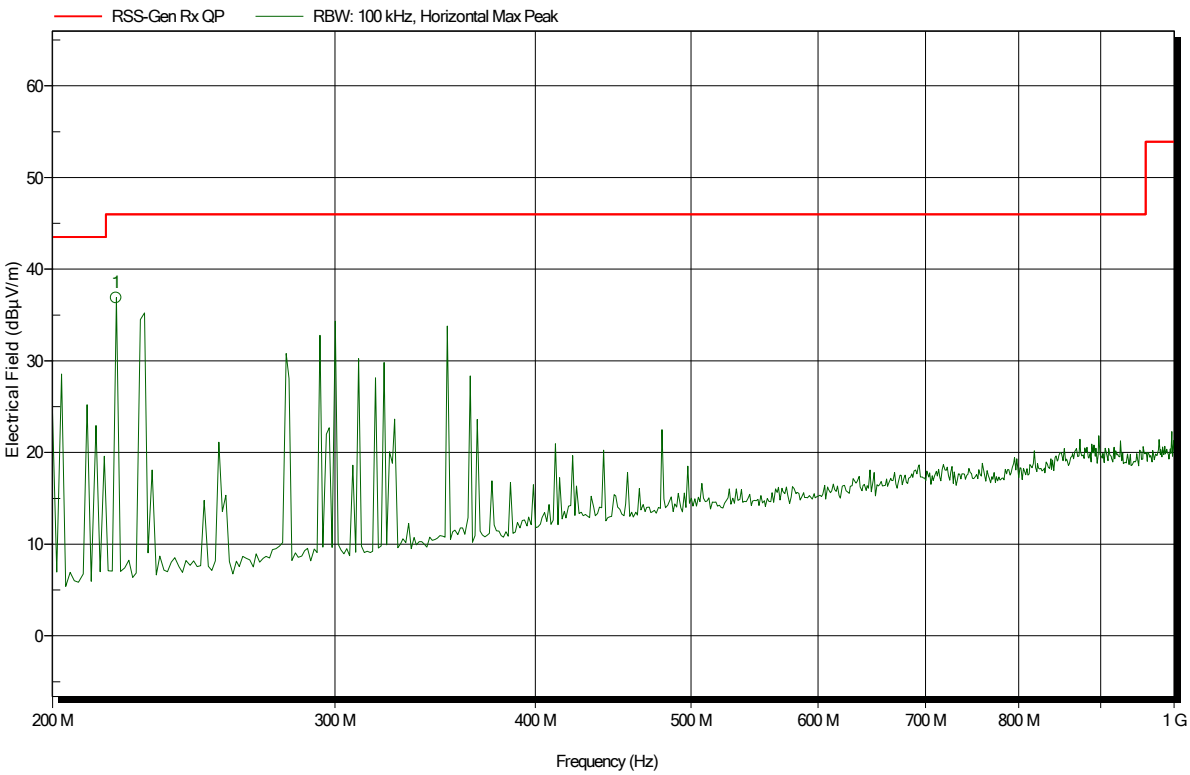


| Frequency | Peak | Peak Limit | Peak Difference | Status | Angle | Height |
|---|---|---|---|---|---|---|
| 219.231 MHz | 36.89 dBµV/m | 46 dBµV/m | -9.11 dB | Pass | 315 Degree | 1.2 m |

**Spurious emissions according to ISED RSS-220 Issue 1, Amendment 1 (July 2018) and ISED RSS-Gen Issue 5, Amendment 1 (March 2019)**

| | |
|---|---|
| Project number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| EUT Name: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Site: | Eurofins Product Service GmbH |
| Operator: | Abdullah Al Jamal |
| Measurement software: | RadiMation, version 2016.1.10 |
| Test Conditions: | Tnom: 25.1°C, Vnom: 3.3 VDC |
| Antenna: | Rohde & Schwarz HL 223, Horizontal |
| Measurement distance: | 3 m |
| Mode: | RX; CH5 |
| Test Date: | 2020-07-21 |
| Note: | EUT horizontal |

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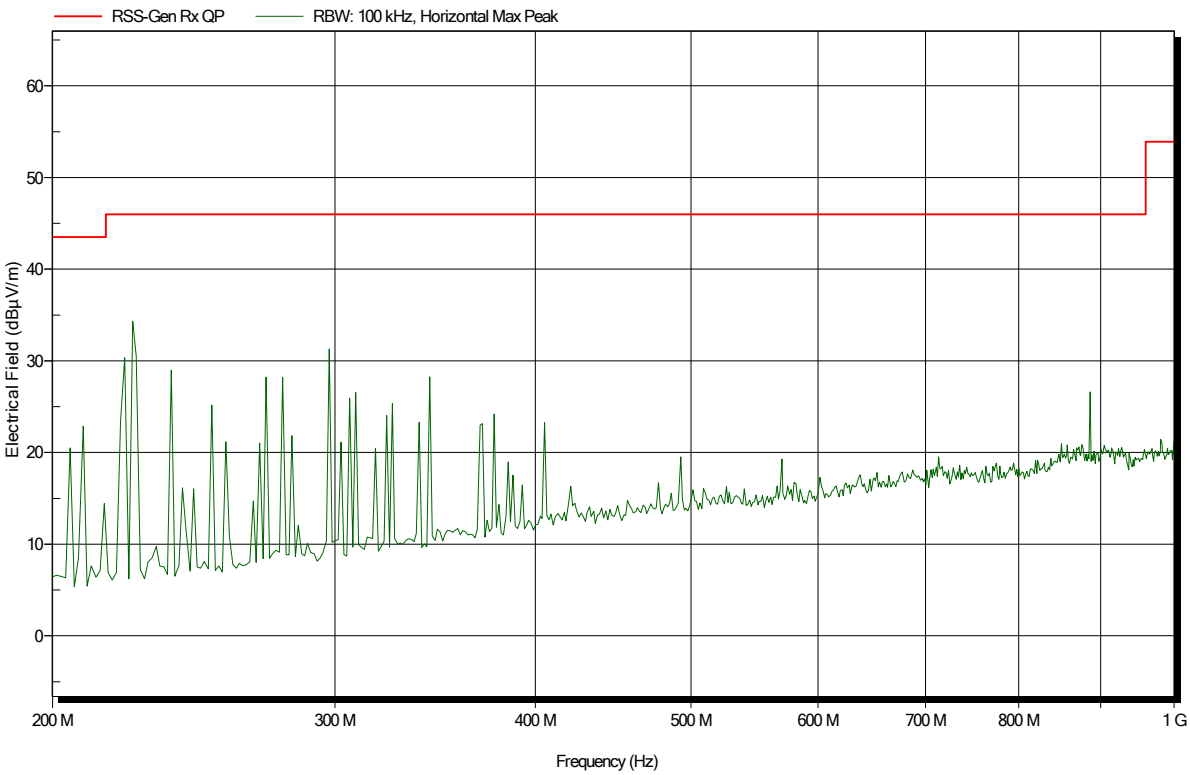
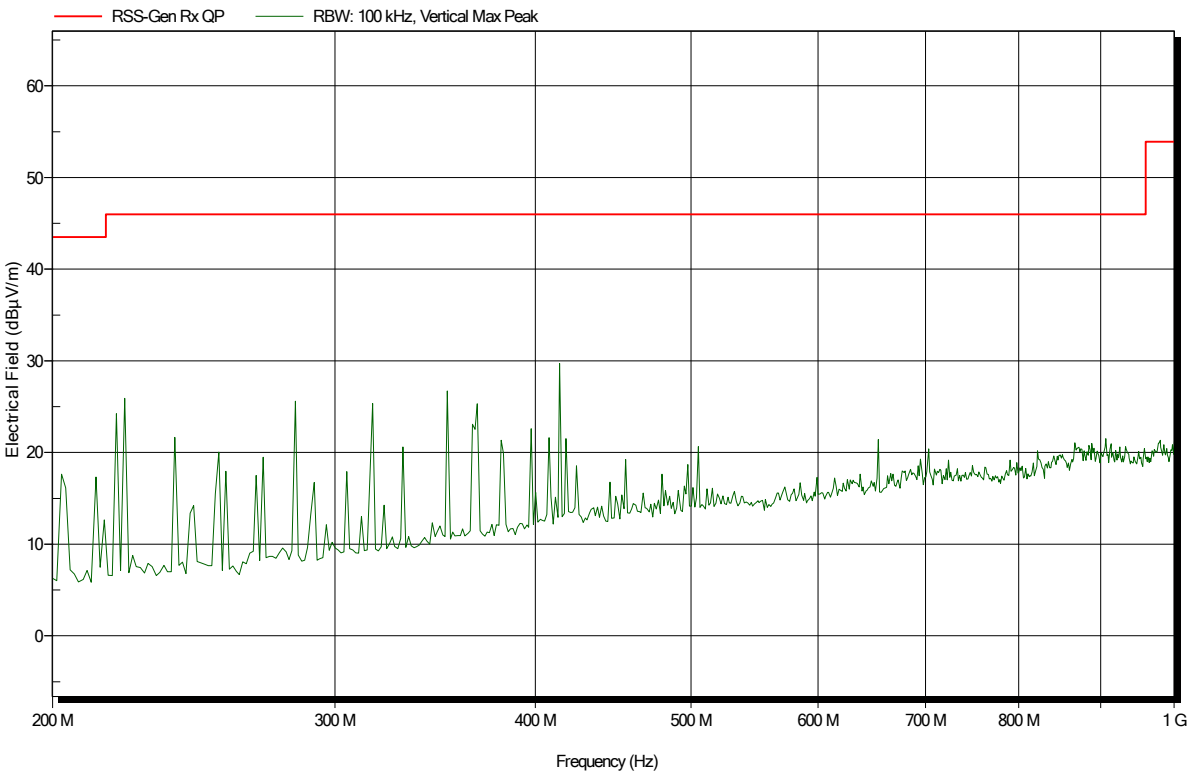


**Spurious emissions according to ISED RSS-220 Issue 1, Amendment 1 (July 2018) and ISED RSS-Gen Issue 5, Amendment 1 (March 2019)**

| | |
|---|---|
| Project number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| EUT Name: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Site: | Eurofins Product Service GmbH |
| Operator: | Abdullah Al Jamal |
| Measurement software: | RadiMation, version 2016.1.10 |
| Test Conditions: | Tnom: 25.1°C, Vnom: 3.3 VDC |
| Antenna: | Rohde & Schwarz HL 223, Vertical |
| Measurement distance: | 3 m |
| Mode: | RX; CH5 |
| Test Date: | 2020-07-21 |
| Note: | EUT vertical |

Index 10



**Spurious emissions according to ISED RSS-220 Issue 1, Amendment 1 (July 2018) and ISED RSS-Gen Issue 5, Amendment 1 (March 2019)**

| | |
|---|---|
| Project number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| EUT Name: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Site: | Eurofins Product Service GmbH |
| Operator: | Abdullah Al Jamal |
| Measurement software: | RadiMation, version 2016.1.10 |
| Test Conditions: | Tnom: 25.1°C, Vnom: 3.3 VDC |
| Antenna: | Rohde & Schwarz HL 223, Vertical |
| Measurement distance: | 3 m |
| Mode: | RX; CH5 |
| Test Date: | 2020-07-21 |
| Note: | EUT horizontal |

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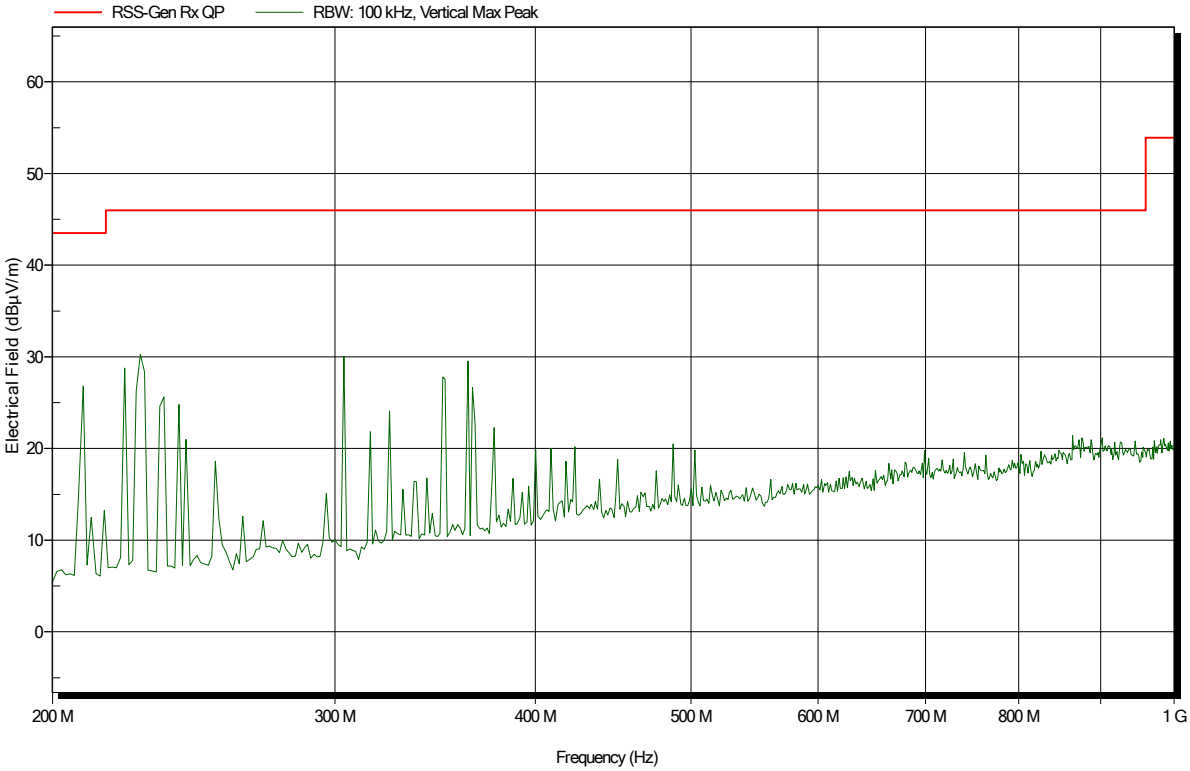
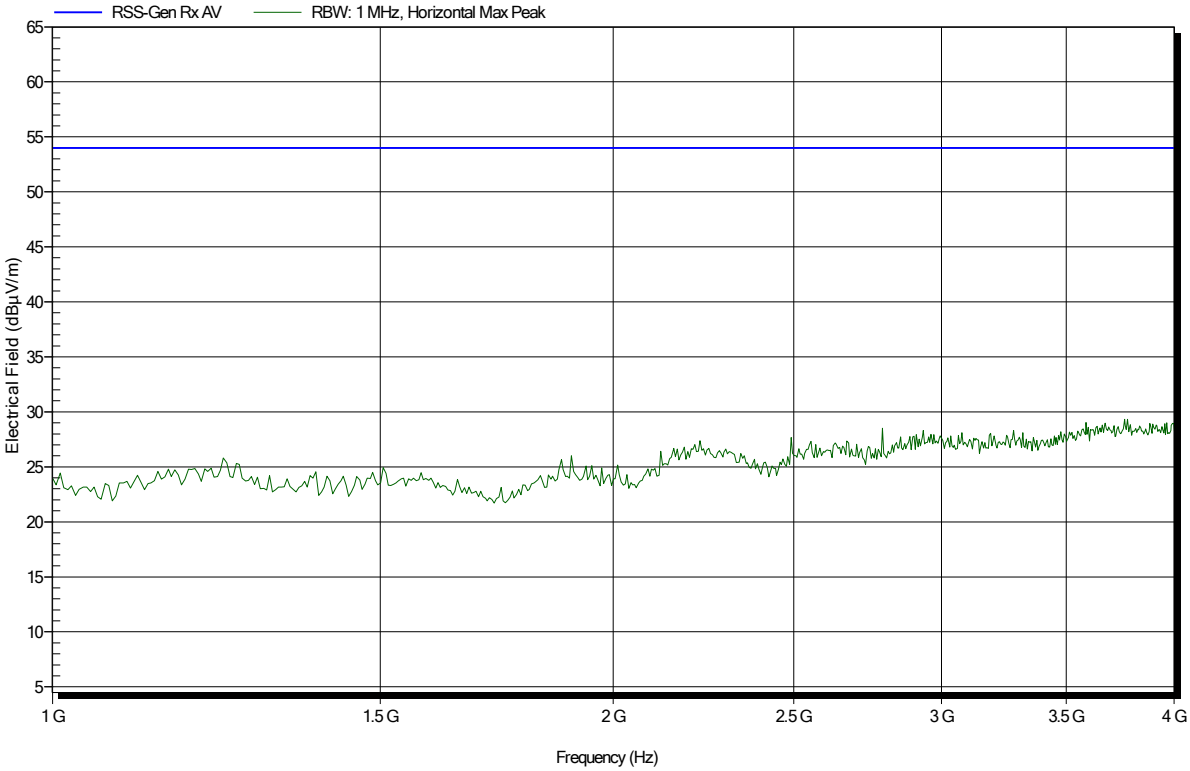


**Spurious emissions according to ISED RSS-220 Issue 1, Amendment 1 (July 2018) and ISED RSS-Gen Issue 5, Amendment 1 (March 2019)**

| | |
|---|---|
| Project number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| EUT Name: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Site: | Eurofins Product Service GmbH |
| Measurement software: | RadiMation, version 2016.1.10 |
| Operator: | Abdullah Al Jamal |
| Test Conditions: | Tnom: 25.1°C, Vnom: 3.3 VDC |
| Antenna: | Schwarzbeck BBHA 9120D, Horizontal |
| Measurement distance: | 1 m converted to 3m |
| Mode: | RX; CH5 |
| Test Date: | 2020-07-21 |
| Note: | EUT vertical |

Index 1



**Spurious emissions according to ISED RSS-220 Issue 1, Amendment 1 (July 2018) and ISED RSS-Gen Issue 5, Amendment 1 (March 2019)**

| | |
|---|---|
| Project number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| EUT Name: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Site: | Eurofins Product Service GmbH |
| Measurement software: | RadiMation, version 2016.1.10 |
| Operator: | Abdullah Al Jamal |
| Test Conditions: | Tnom: 25.1°C, Vnom: 3.3 VDC |
| Antenna: | Schwarzbeck BBHA 9120D, Vertical |
| Measurement distance: | 1 m converted to 3m |
| Mode: | RX; CH5 |
| Test Date: | 2020-07-21 |
| Note: | EUT vertical |

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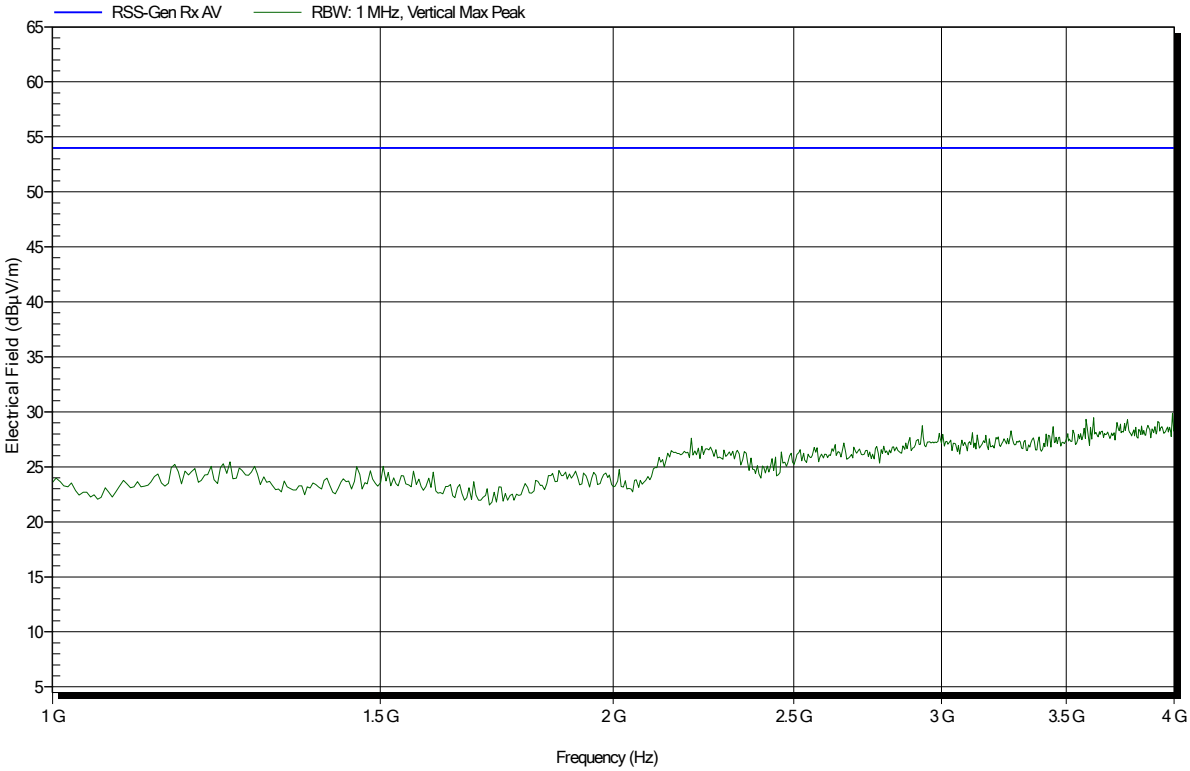
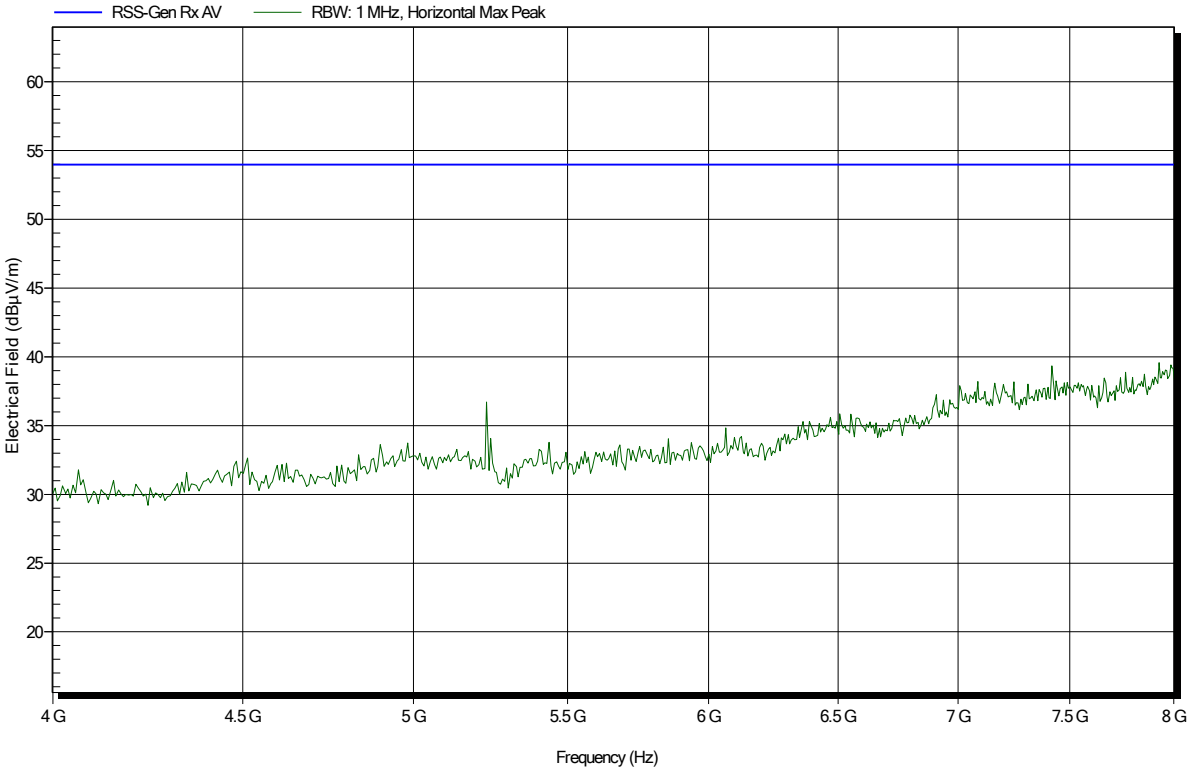


**Spurious emissions according to ISED RSS-220 Issue 1, Amendment 1 (July 2018) and ISED RSS-Gen Issue 5, Amendment 1 (March 2019)**

| | |
|---|---|
| Project number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| EUT Name: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Site: | Eurofins Product Service GmbH |
| Measurement software: | RadiMation, version 2016.1.10 |
| Operator: | Abdullah Al Jamal |
| Test Conditions: | Tnom: 25.1°C, Vnom: 3.3 VDC |
| Antenna: | Schwarzbeck BBHA 9120D, Horizontal |
| Measurement distance: | 1 m converted to 3m |
| Mode: | RX; CH5 |
| Test Date: | 2020-07-21 |
| Note: | EUT vertical |

Index 2



**Spurious emissions according to ISED RSS-220 Issue 1, Amendment 1 (July 2018) and ISED RSS-Gen Issue 5, Amendment 1 (March 2019)**

| | |
|---|---|
| Project number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| EUT Name: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Site: | Eurofins Product Service GmbH |
| Measurement software: | RadiMation, version 2016.1.10 |
| Operator: | Abdullah Al Jamal |
| Test Conditions: | Tnom: 25.1°C, Vnom: 3.3 VDC |
| Antenna: | Schwarzbeck BBHA 9120D, Vertical |
| Measurement distance: | 1 m converted to 3m |
| Mode: | RX; CH5 |
| Test Date: | 2020-07-21 |
| Note: | EUT vertical |

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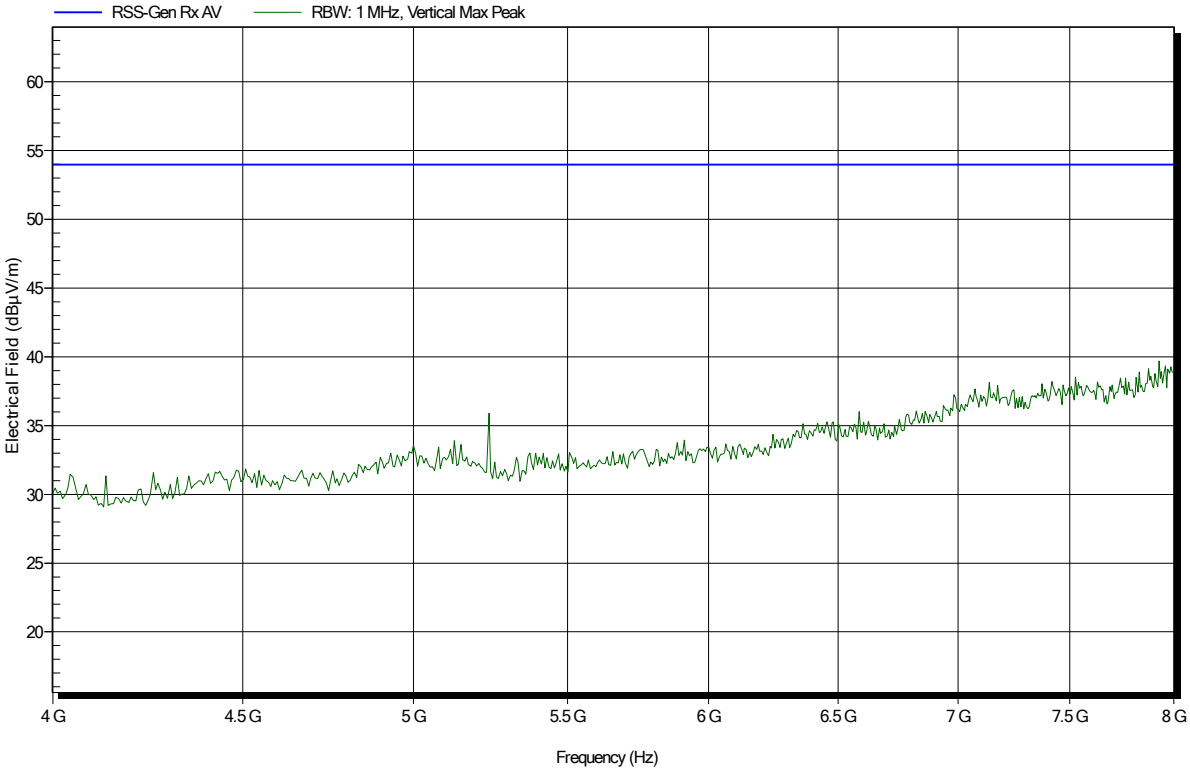
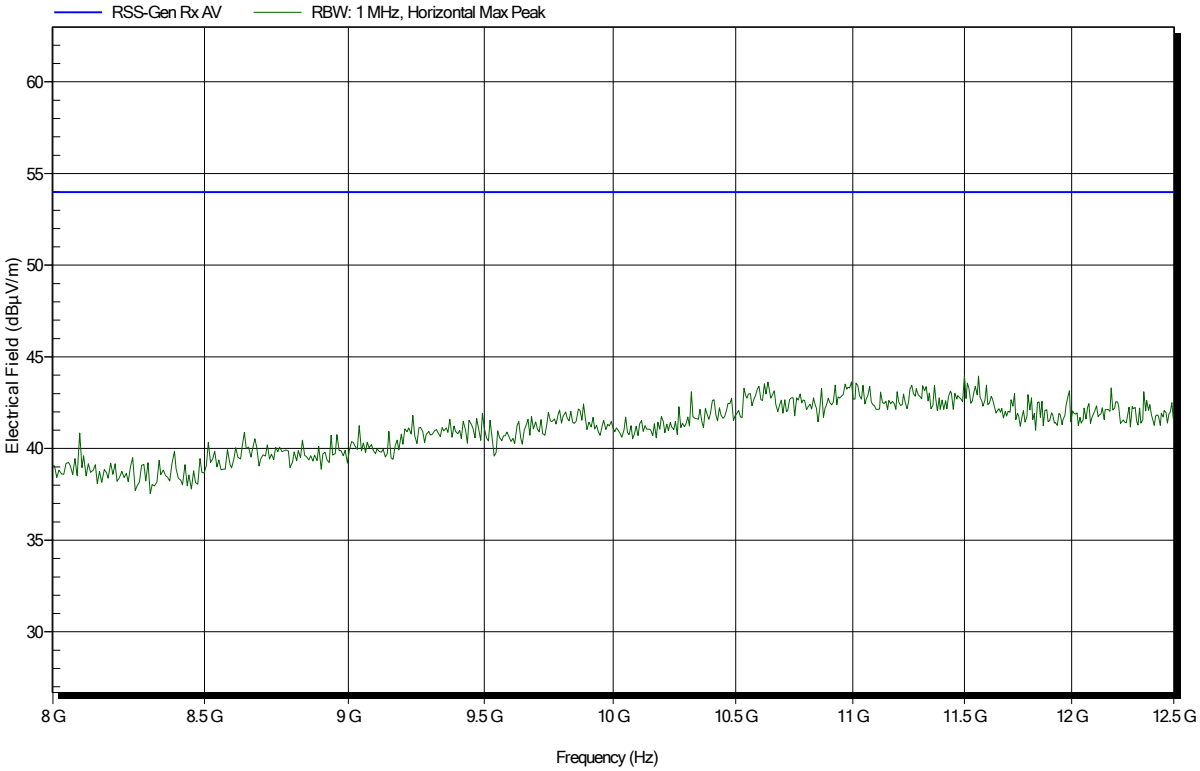


**Spurious emissions according to ISED RSS-220 Issue 1, Amendment 1 (July 2018) and ISED RSS-Gen Issue 5, Amendment 1 (March 2019)**

| | |
|---|---|
| Project number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| EUT Name: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Site: | Eurofins Product Service GmbH |
| Measurement software: | RadiMation, version 2016.1.10 |
| Operator: | Abdullah Al Jamal |
| Test Conditions: | Tnom: 25.1°C, Vnom: 3.3 VDC |
| Antenna: | Schwarzbeck BBHA 9120D, Horizontal |
| Measurement distance: | 1 m converted to 3m |
| Mode: | RX; CH5 |
| Test Date: | 2020-07-21 |
| Note: | EUT vertical |

Index 3



**Spurious emissions according to ISED RSS-220 Issue 1, Amendment 1 (July 2018) and ISED RSS-Gen Issue 5, Amendment 1 (March 2019)**

| | |
|---|---|
| Project number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| EUT Name: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Site: | Eurofins Product Service GmbH |
| Measurement software: | RadiMation, version 2016.1.10 |
| Operator: | Abdullah Al Jamal |
| Test Conditions: | Tnom: 25.1°C, Vnom: 3.3 VDC |
| Antenna: | Schwarzbeck BBHA 9120D, Vertical |
| Measurement distance: | 1 m converted to 3m |
| Mode: | RX; CH5 |
| Test Date: | 2020-07-21 |
| Note: | EUT vertical |

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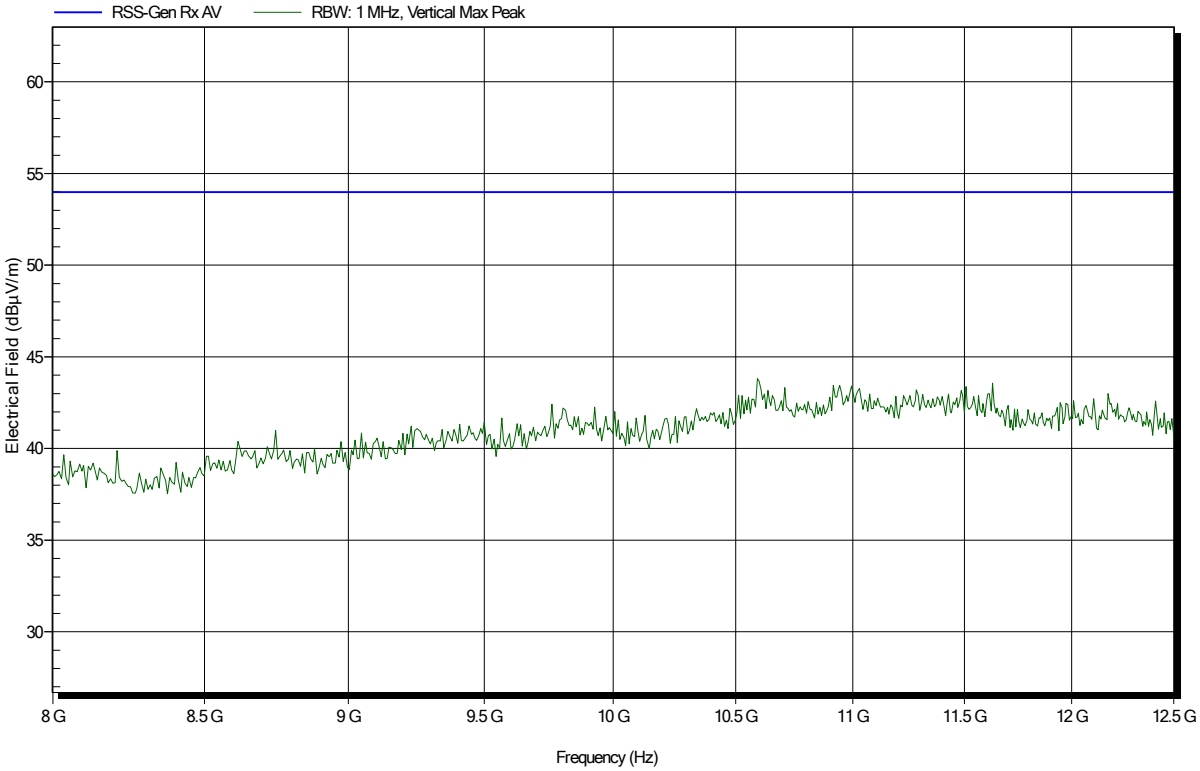

**Spurious emissions according to ISED RSS-220 Issue 1, Amendment 1 (July 2018) and ISED RSS-Gen Issue 5, Amendment 1 (March 2019)**

| | |
|---|---|
| Project number: | G0M-2006-9089 |
| Applicant: | In-Circuit GmbH |
| EUT Name: | radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000) |
| Model: | radino40 DW1000 |
| Test Site: | Eurofins Product Service GmbH |
| Measurement software: | RadiMation, version 2016.1.10 |
| Operator: | Abdullah Al Jamal |
| Test Conditions: | Tnom: 25.1°C, Vnom: 3.3 VDC |
| Antenna: | Schwarzbeck BBHA 9120D, Horizontal |
| Measurement distance: | 1 m converted to 3m |
| Mode: | RX; CH5 |
| Test Date: | 2020-07-21 |
| Note: | EUT vertical |

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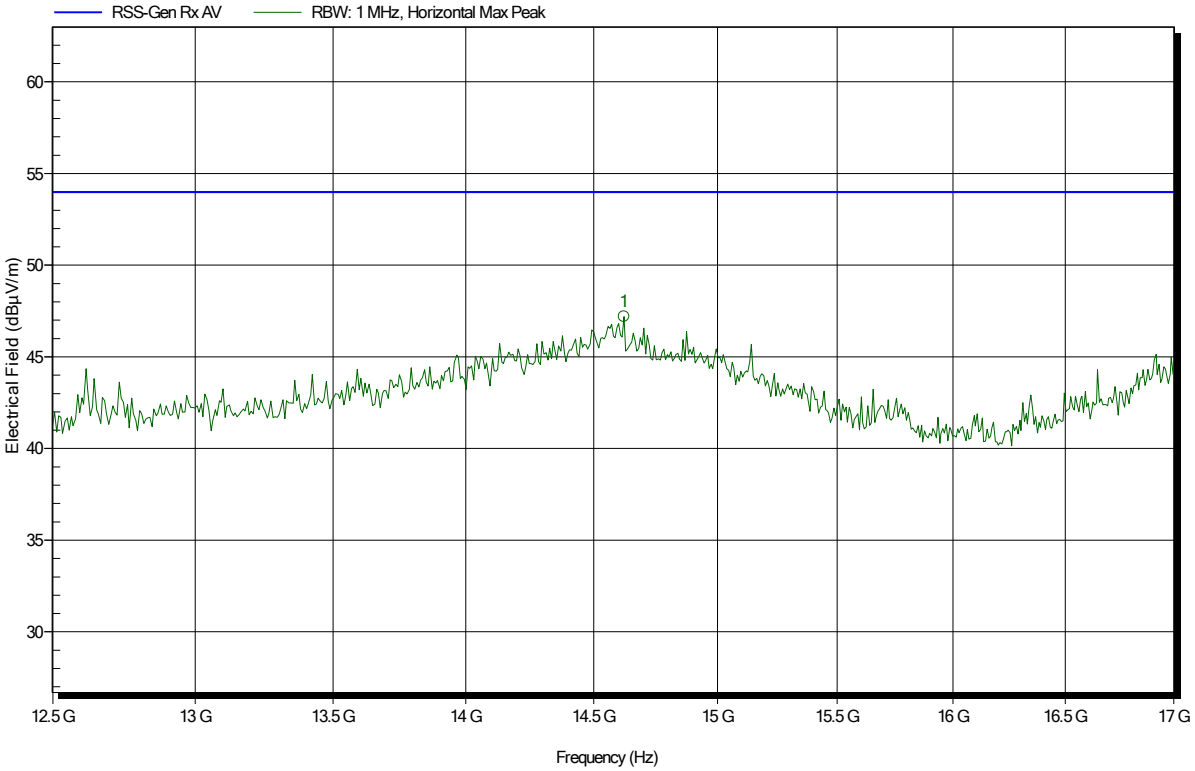


| Frequency | Peak | Peak Limit | Peak Difference | Status |
|---|---|---|---|---|
| 14.62 GHz | 47.19 dBµV/m | 53.98 dBµV/m | -6.79 dB | Pass |

**Spurious emissions according to ISED RSS-220 Issue 1, Amendment 1 (July 2018) and ISED RSS-Gen Issue 5, Amendment 1 (March 2019)**

| | |
|---|---|
| Project number: | G0M-2006-9089 |
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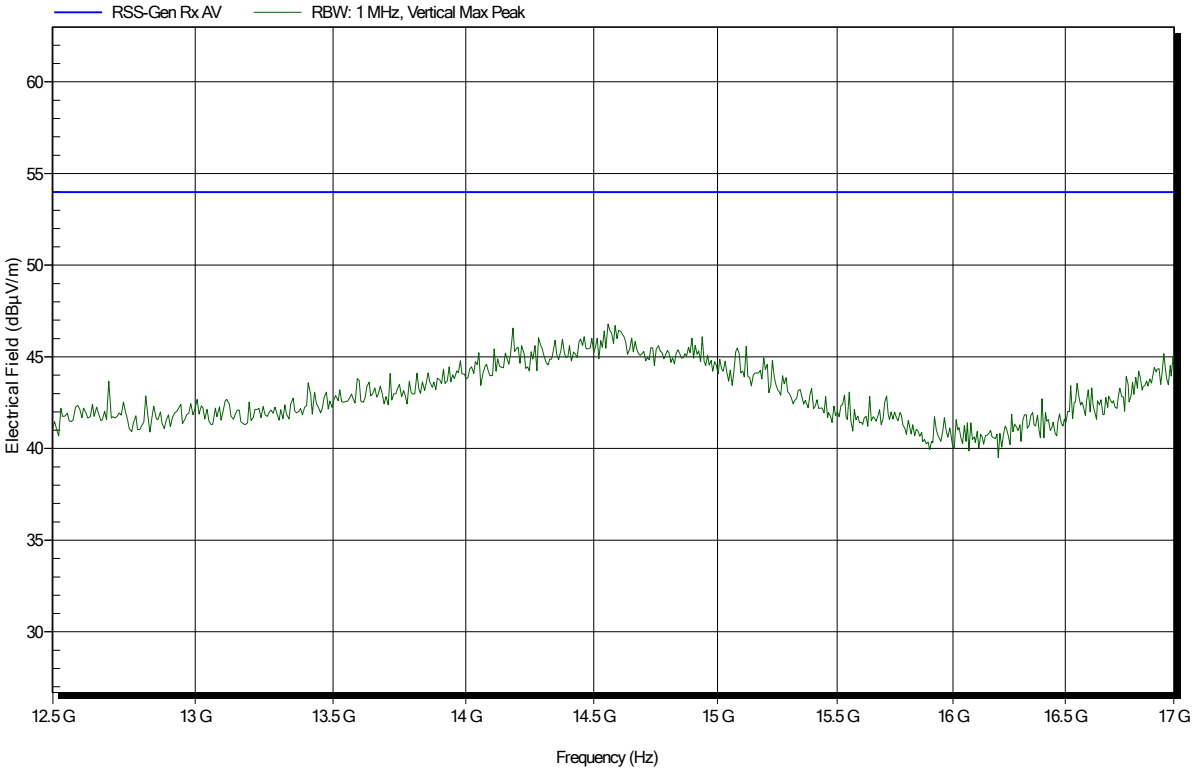
| Measurement software: | RadiMation, version 2016.1.10 |
| Operator: | Abdullah Al Jamal |
| Test Conditions: | Tnom: 25.1°C, Vnom: 3.3 VDC |
| Antenna: | Schwarzbeck BBHA 9120D, Vertical |
| Measurement distance: | 1 m converted to 3m |
| Mode: | RX; CH5 |
| Test Date: | 2020-07-21 |
| Note: | EUT vertical |

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