RADIO REPORT

FCC 47 CFR Part 15C
ISED Canada RSS-247

Digital transmission systems operating within the 2400 – 2483.5 MHz band

Report Reference No	G0M-2006-9089-TFC247BL-V01
Testing Laboratory	Eurofins Product Service GmbH
Address	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation	DAkkS - Registration number : D-PL-12092-01-03 (ISED) ISED Testing Laboratory site: 3470A-2 DAkkS - Registration number : D-PL-12092-01-04 (FCC) FCC Filed Test Laboratory, Reg.-No.: 96970
Applicant	In-Circuit GmbH
Address	Boltenhagener Str. 124 01109 Dresden GERMANY
Test Specification	47 CFR Part 15C RSS-247, Issue 2, 2017-02 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 - 23 °C	
Test Lab Humidity	32 – 38 %	
Date of receipt of test item	2020-06-18	
Report:		
Compiled by	Florian Voigt	
Tested by (+ signature) (Responsible for Test)	Florian Voigt supervised by Wilfried Treffke	F. Voigt W. Treffke
Approved by (+ signature) (Head of Lab)	Christian Weber	C. Weber
Date of Issue	2020-08-03	
Total number of pages	112	
General Remarks:		
The test results presented in this report relate only to the object tested. **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.** This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.		
Additional Comments:		

VERSION HISTORY

Version History			
Version	Issue Date	Remarks	Revised By
01	2020-08-03	Initial Release	

ABBREVIATIONS AND ACRONYMS

Acronyms	
Acronym	Description
EUT	Equipment Under Test
FCC	Federal Communications Commission
ISED	Innovation, Science and Economic Development Canada
RBW	Resolution bandwidth
RMS	Root mean square
VBW	Video bandwidth
V_{NOM}	Nominal supply voltage

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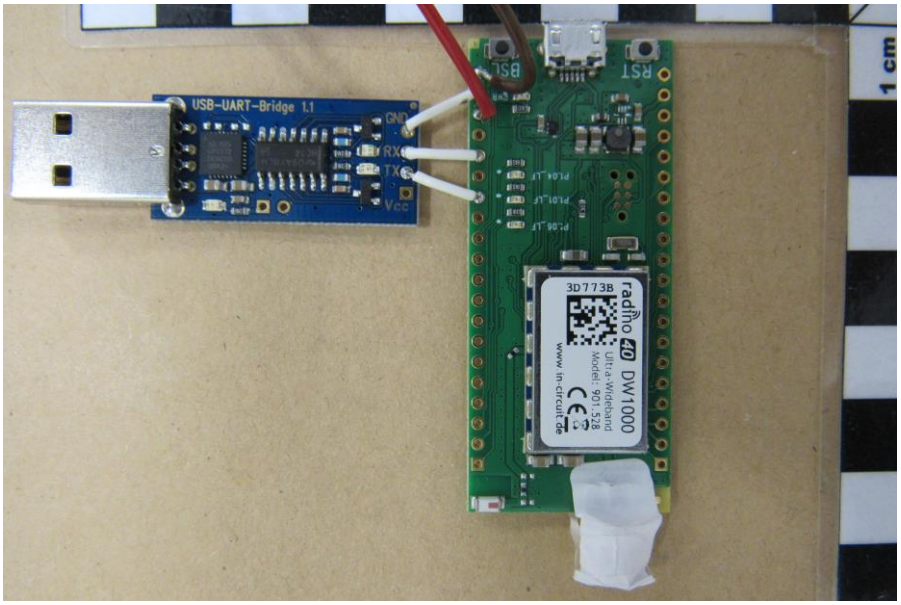
1 Equipment (Test Item) Under Test

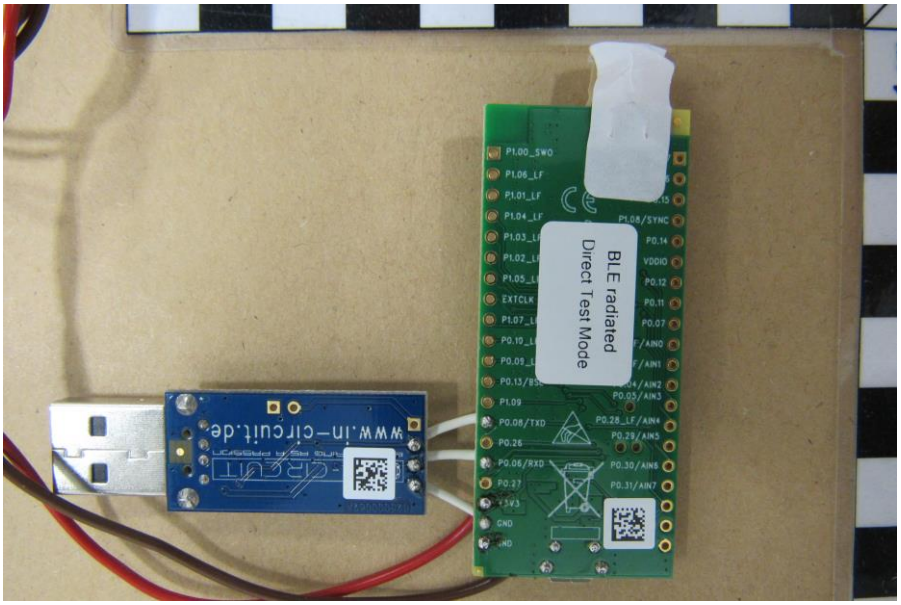
Description	radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000)	
Model	radino40 DW1000	
Additional Model(s)	None	
Brand Name(s)	None	
Serial Number(s)	Not specified	
Hardware Version(s)	A	
Software Version(s)	A	
PMN	n/a	
HVIN	n/a	
FVIN	n/a	
HMN	n/a	
FCC-ID	2AWXURADINO40DW1000	
IC	n/a	
Equipment type	Radio Module	
Radio type	Transceiver	
Assigned frequency bands	2400 - 2483.5 MHz	
Radio technology	Bluetooth LE 5.0	
Bluetooth Specification	LE 1M PHY	Yes
	LE 2M PHY	No (Customer declaration)
	LE Coded PHY S=2 (125 kbit)	No
	LE Coded PHY S=8 (500 kbit)	No
	Stable Modulation Index - Transmitter	No
	Stable Modulation Index - Receiver	No
Modulation	GFSK	
Number of antenna ports	1	
Antenna	Type	Integrated
	Model	2450AT18B100
	Manufacturer	Johanson
	Gain	0.5 dBi
Supply Voltage	V_{NOM}	3.3 VDC
Operating Temperature	T_{NOM}	25 °C
AC/DC-Adaptor	N/A	
Manufacturer	In-Circuit GmbH Boltenhagener Str. 124 01109 Dresden GERMANY	

1.1 Photos – Equipment External

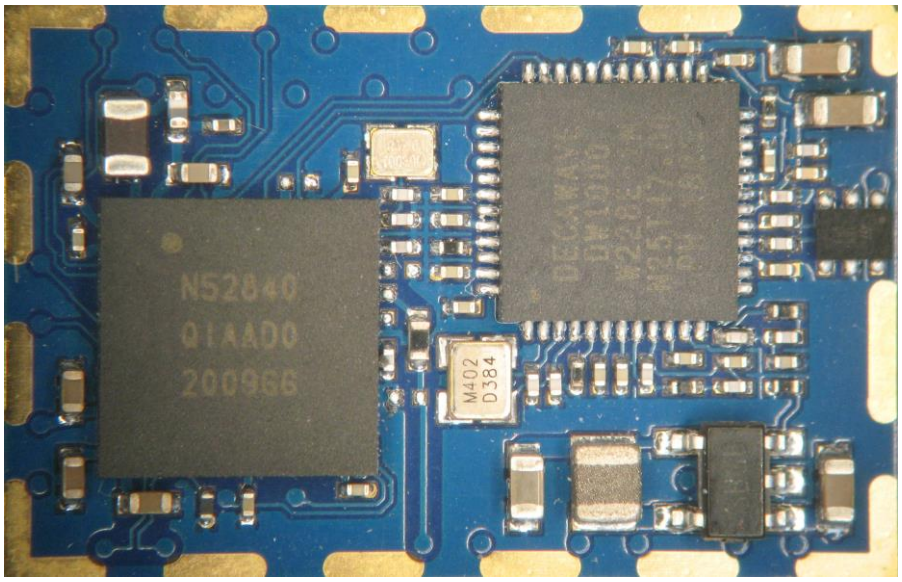
EUT PCB top side



EUT PCB bottom side

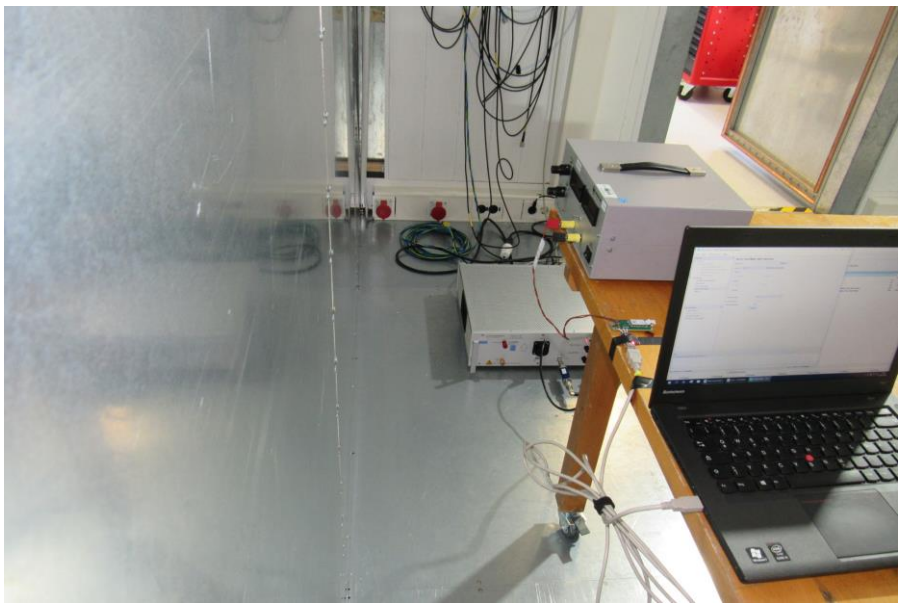


1.2 Photos – Equipment Internal

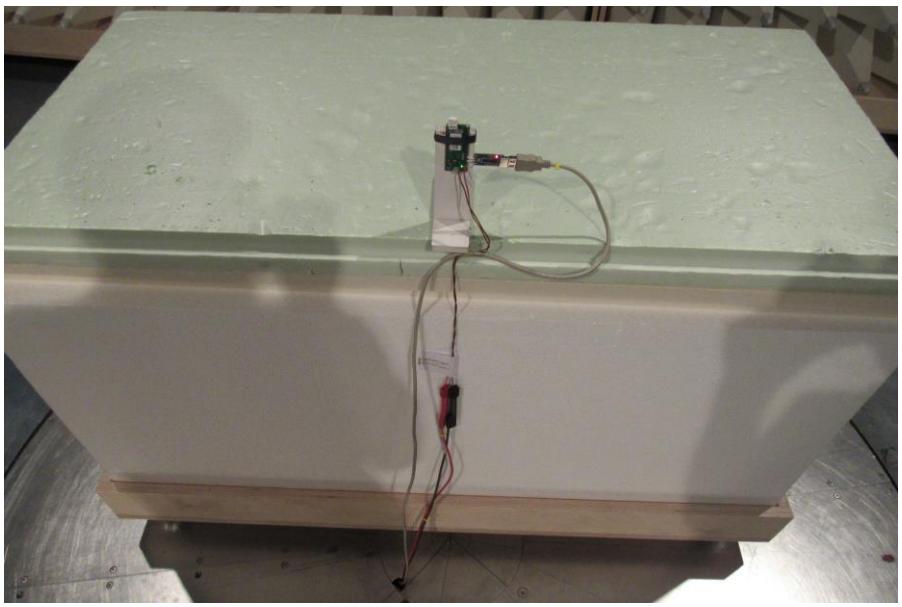
EUT internal view


1.3 Photos – Test Setup

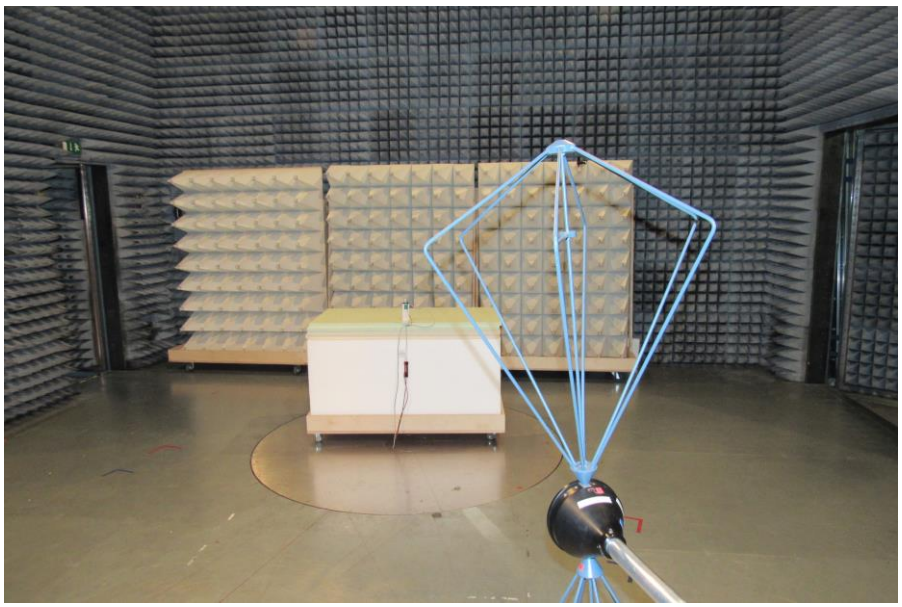
AC-Powerline Conducted Emission



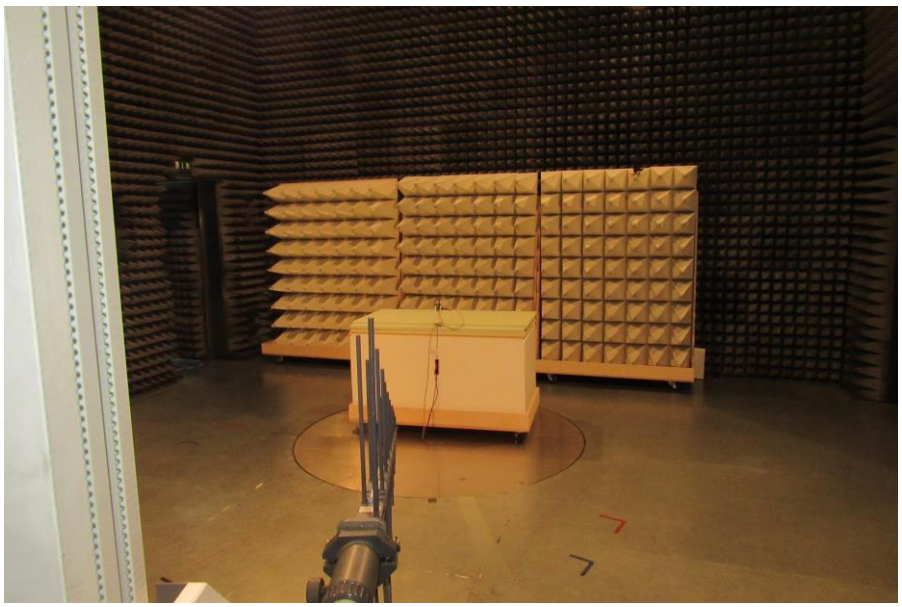
Test setup radiated EUT view

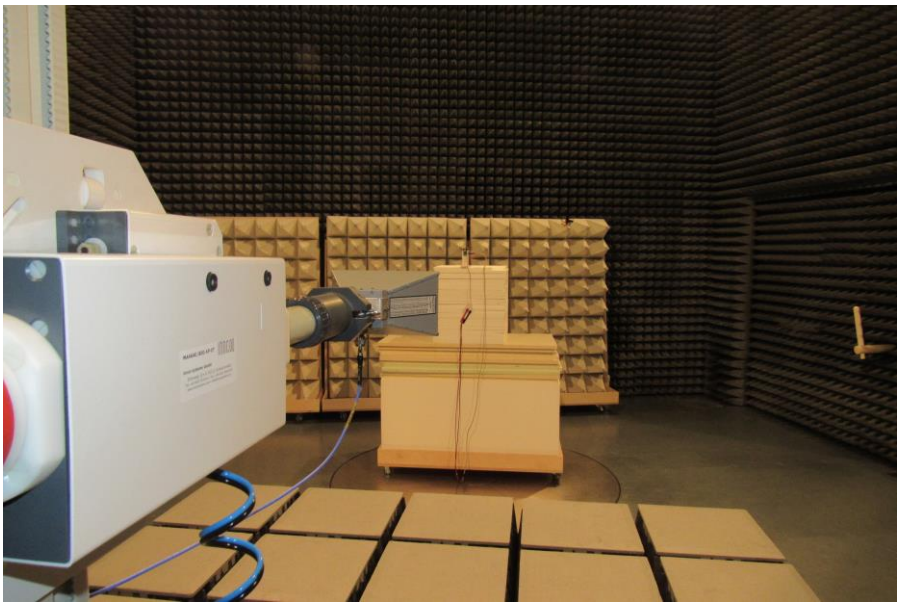


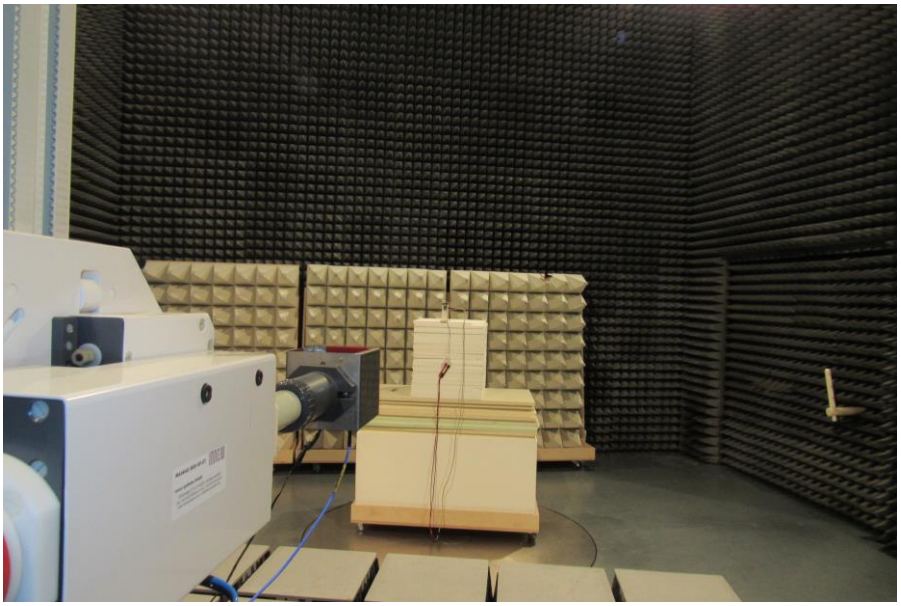
Test setup radiated below 200MHz



Test setup radiated between 200MHz and 1GHz



Test setup between 1 GHz and 17 GHz


Test setup above 17 GHz


1.4 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
AE	Notebook	Lenovo	ThinkPad T510	
AE	Power Supply AC Adapter	Liteon	ADLX90NLC3A	
AE	Laboratory Power Supply	Statron	2224.2	Power for EUT
SFT	nRFgo Studio	Nordic Semiconductor	---	
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
CBL	Connecting Cable			
SFT	Software			
Comment:				

1.5 Test Modes

Mode	Description
GFSK	Mode = Transmit Modulation = GFSK Spreading = None Duty cycle = 64%
Receive	Mode = Receive
Comment:	

1.6 Test Frequencies

Designator	Mode	Channel	Frequency [MHz]
F1	Tx / Rx	0	2402
F2	Tx / Rx	19	2440
F3	Tx / Rx	39	2480

1.7 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 15C, ISED RSS-247				
Product Standard Reference	**Requirement**	**Reference Method**	**Result**	**Remarks**
ISED RSS-Gen, Issue 5 (section 6.6)	Occupied Bandwidth	ANSI C63.10-2013	N/R	Informational only
FCC § 15.247(a)(2) ISED RSS-247, Issue 2 (section 5.2)	6 dB Bandwidth	ANSI C63.10-2013	PASS	
FCC § 15.247(b)(1) ISED RSS-247, Issue 2 (section 5.4)	Maximum peak conducted power	ANSI C63.10-2013	PASS	
FCC § 15.247(e) ISED RSS-247, Issue 2 (section 5.2)	Power spectral density	ANSI C63.10-2013	PASS	
FCC § 15.207 ISED RSS-247, Issue 2 (section 3.1)	AC power line conducted emissions	ANSI C63.10-2013	PASS	
FCC § 15.247(d) ISED RSS-247, Issue 2 (section 5.5)	Band edge compliance	ANSI C63.10-2013	PASS	
FCC § 15.247(d) ISED RSS-247, Issue 2 (section 5.5)	Conducted spurious emissions	ANSI C63.10-2013	PASS	
FCC § 15.247(d) FCC § 15.209 ISED RSS-Gen, Issue 5 (section 6.13)	Transmitter radiated spurious emissions	ANSI C63.10-2013	PASS	
ISED RSS-247, Issue 2 (section 3.1)	Receiver radiated spurious emissions	ANSI C63.10-2013	PASS	
Comment:				

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

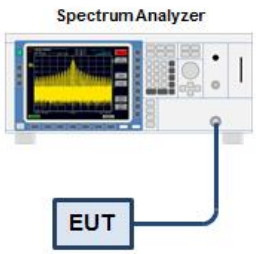
Test Information	
Reference	ISED RSS-Gen, Issue 5 (section 6.6)
Measurement Method	ANSI C63.10 6.9.3
Operator	Florian Voigt
Date	2020-07-06

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
Spectrum Analyzer	R&S	FSU 26	EF01407	2019-07	2020-07

3.1.5 Procedure

Test Procedure

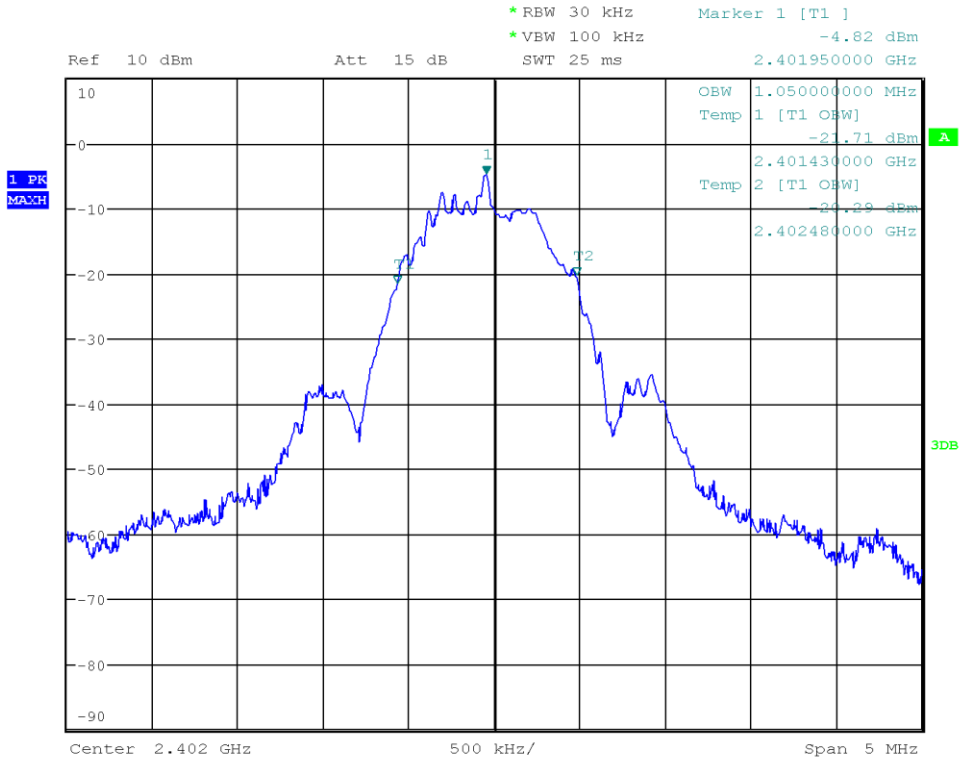
1. EUT transmitter is activated in test mode under normal conditions
2. The spectrum analyzer is set to peak detection and maximum hold with a span twice the emission spectrum
3. The resolution bandwidth is set to the range of 1 % to 5 % of the occupied bandwidth
4. The occupied bandwidth is measured with the build-in analyzer function

3.1.6 Results

Test Results		
Mode	Frequency [MHz]	Bandwidth [MHz]
GFSK	2402	1.045
GFSK	2440	1.050
GFSK	2480	1.050

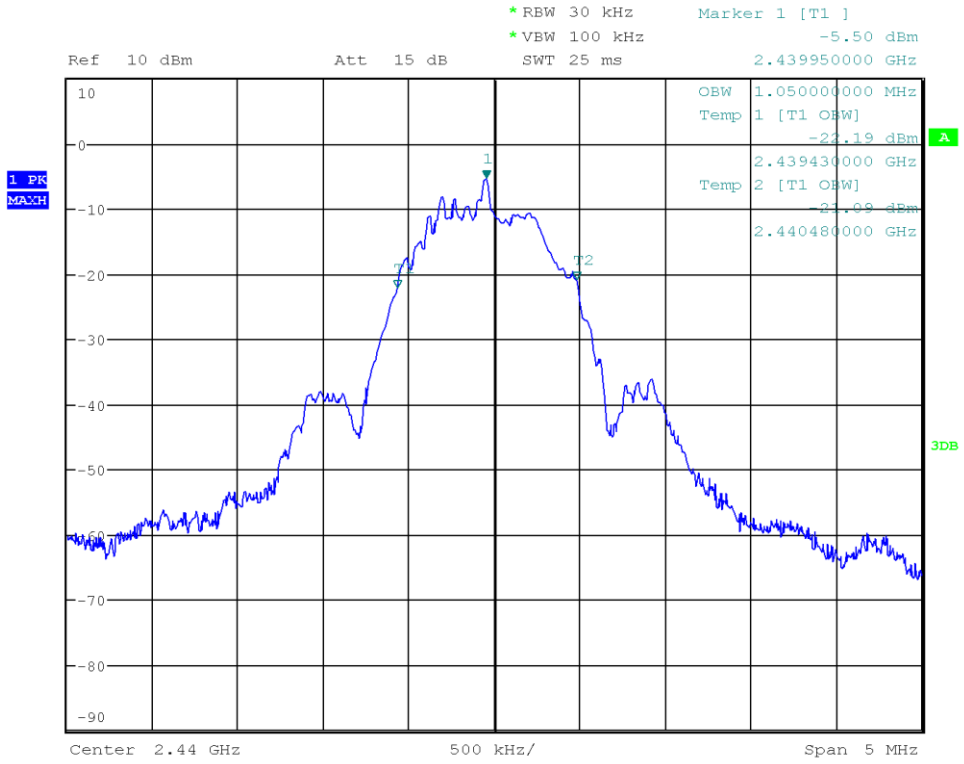
Occupied Bandwidth

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:	29804
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	GFSK, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Florian Voigt
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-07-06
Occupied Bandwidth [MHz]:	1.045



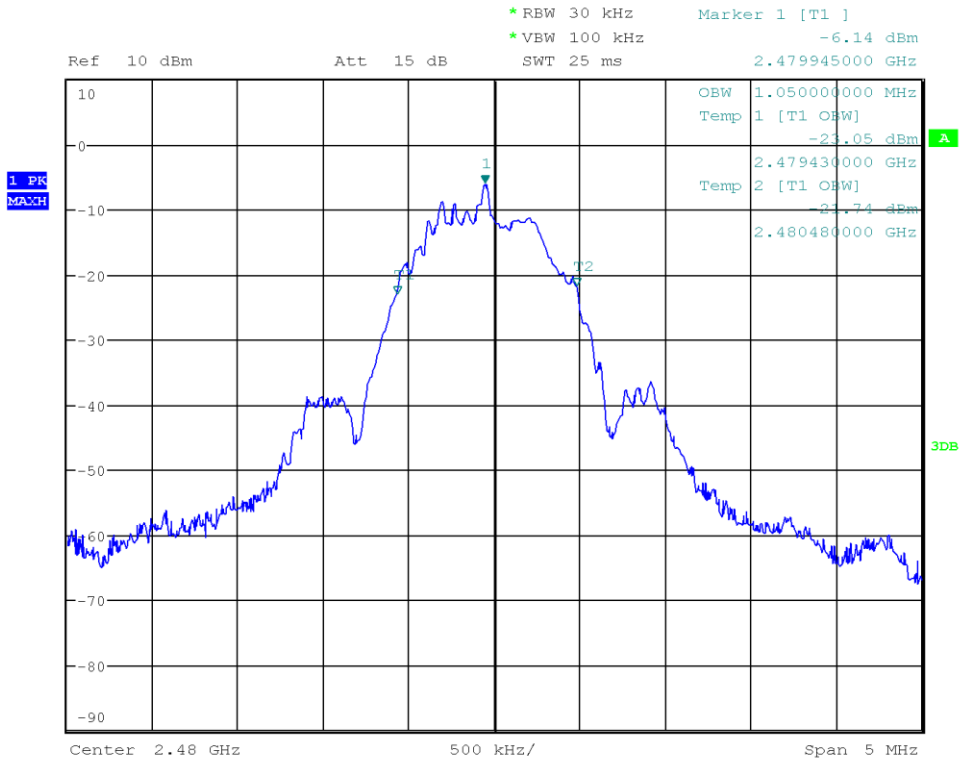
Occupied Bandwidth

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:	29804
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	GFSK, Channel: 19, 2440 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Florian Voigt
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-07-06
Occupied Bandwidth [MHz]:	1.050



Occupied 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:	29804
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	GFSK, Channel: 39, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Florian Voigt
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-07-06
Occupied Bandwidth [MHz]:	1.050



3.2 Test Conditions and Results - 6 dB bandwidth

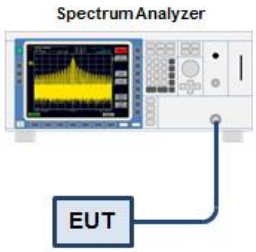
3.2.1 Information

Test Information	
Reference	FCC § 15.247(a)(2); ISED RSS-247, Issue 2 (section 5.2)
Measurement Method	ANSI C63.10 11.8
Operator	Florian Voigt
Date	2020-07-06

3.2.2 Limits

Limits
≥ 500kHz

3.2.3 Setup

Test Setup


3.2.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSU 26	EF01407	2019-07	2020-07

3.2.5 Procedure

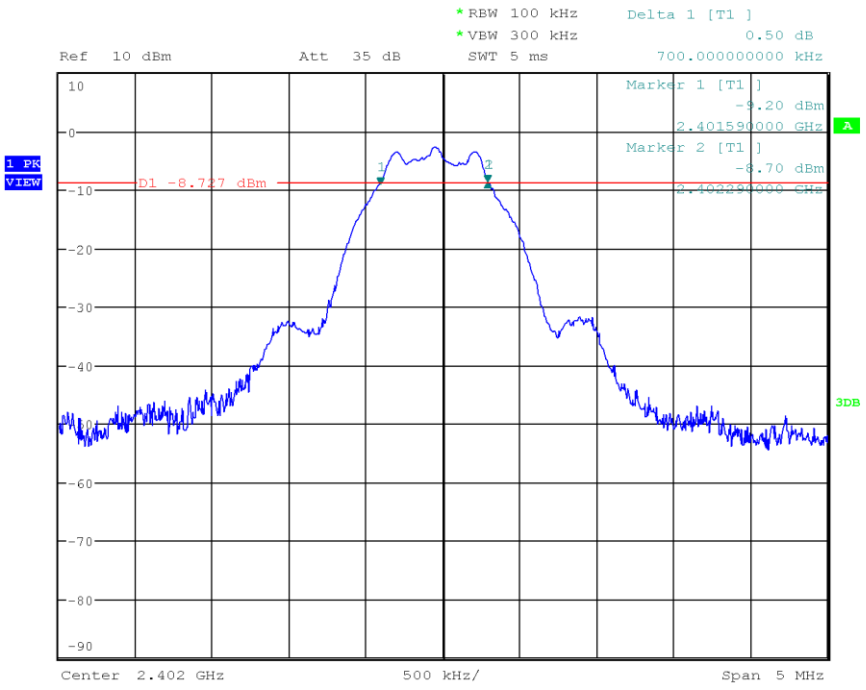
Test Procedure
1. EUT set to test mode 2. Span set to at least twice the emission spectrum 3. Detector set to peak and max hold and RBW is set to 100 kHz 4. Envelope peak value of emission spectrum is selected 5. Marker on envelope of spectrum is set to level of -6 dB to the left of the peak 6. Marker on envelope of spectrum is set to level of -6 dB to the right of the peak 7. 6 dB Bandwidth is determined by marker frequency separation

3.2.6 Results

Test Results				
Mode	Frequency [MHz]	Bandwidth [kHz]	Limit [kHz]	Verdict
GFSK	2402	700	500	PASS
GFSK	2440	700	500	PASS
GFSK	2480	720	500	PASS

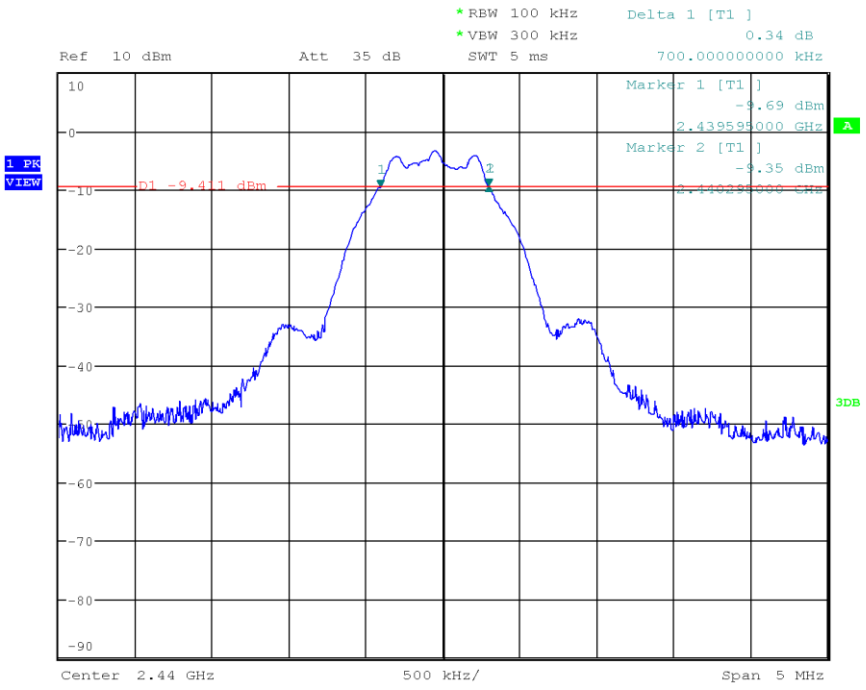
DTS (6 dB) Bandwidth

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:	29804
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	GFSK, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Florian Voigt
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-07-06
Lower Frequency [MHz]:	2401.590
Upper Frequency [MHz]:	2402.290
6 dB Bandwidth [kHz]:	700



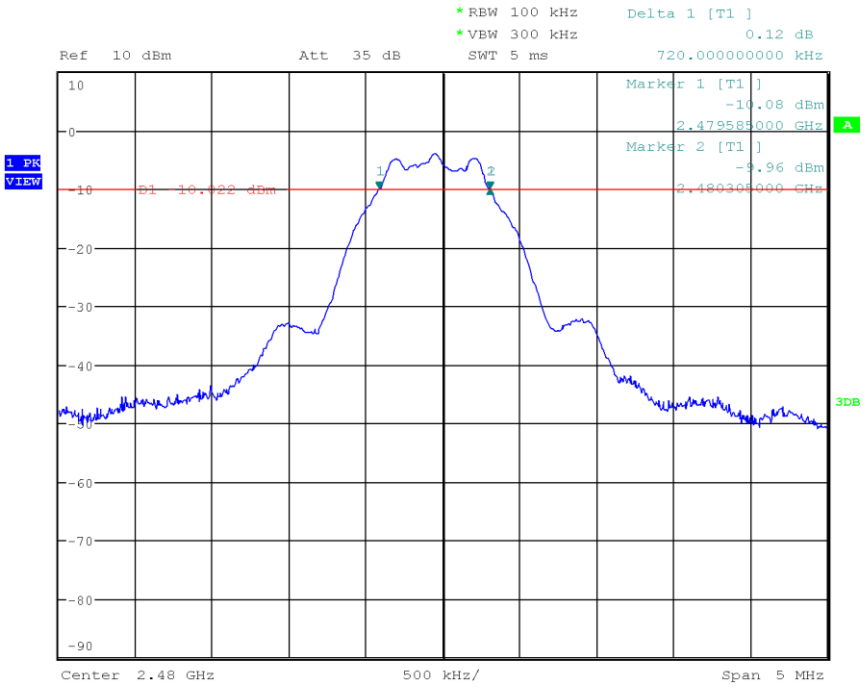
DTS (6 dB) Bandwidth

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:	29804
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	GFSK, Channel: 19, 2440 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Florian Voigt
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-07-06
Lower Frequency [MHz]:	2439.595
Upper Frequency [MHz]:	2440.295
6 dB Bandwidth [kHz]:	700



DTS (6 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:	29804
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	GFSK, Channel: 39, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Florian Voigt
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-07-06
Lower Frequency [MHz]:	2479.585
Upper Frequency [MHz]:	2480.305
6 dB Bandwidth [kHz]:	720



3.3 Test Conditions and Results - Maximum peak conducted output power

3.3.1 Information

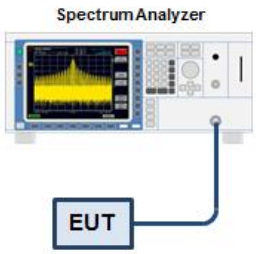
Test Information	
Reference	FCC § 15.247(b)(1); ISED RSS-247, Issue 2 (section 5.4)
Measurement Method	ANSI C63.10 11.9.1
Operator	Florian Voigt
Date	2020-07-06

3.3.2 Limits

Limits
1 W (30 dBm)
The conducted output power limit specified above is based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in the table, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.3.3 Setup

Test Setup



3.3.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSU 26	EF01407	2019-07	2020-07

3.3.5 Procedure

Test Procedure
1. EUT set to test mode (Communication tester is used if needed) 2. Analyzer resolution bandwidth is set ≥ DTS bandwidth 3. Detector set to peak and max hold 4. Sweep time is set to auto 5. After the trace has stabilized a marker is set to peak of envelope

3.3.6 Results

Test Results				
Channel [MHz]	Power [dBm]	Power [W]	Limit [W]	Verdict
2402	-1.714	0.0007	1.0	PASS
2440	-2.299	0.0006	1.0	PASS
2480	-2.927	0.0005	1.0	PASS

3.4 Test Conditions and Results - Power spectral density

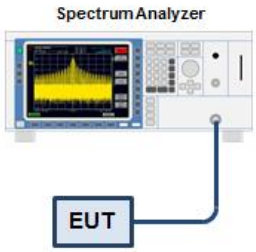
3.4.1 Information

Test Information	
Reference	FCC § 15.247(e); ISED RSS-247, Issue 2 (section 5.2)
Measurement Method	ANSI C63.10 11.10.2, 14.3.2
Operator	Florian Voigt
Date	2020-07-06

3.4.2 Limits

Limits
8 dBm / 3 kHz

3.4.3 Setup

Test Setup


3.4.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSU 26	EF01407	2019-07	2020-07

3.4.5 Procedure

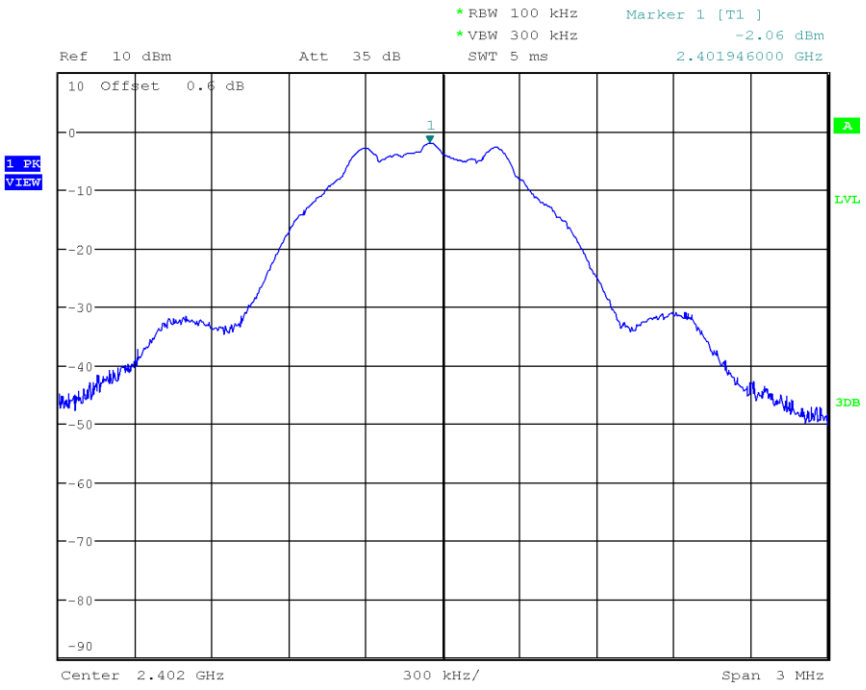
Test Procedure
1. EUT set to test mode 2. The analyzer is set to DTS channel center frequency with a span of 1.5 times the DTS bandwidth 3. The RBW is set to 100 kHz with VBW ≥ RBW and the detector is set to peak with max hold 4. After the trace has stabilized a marker is set to the envelope maximum 5. If the power spectral density is above the limit the RBW is reduced (not lower than 3 kHz) and the measurement is repeated 6. If the EUT has more than one transmit chain the procedure is repeated for each transmit chain

3.4.6 Results

Test Results			
Channel [MHz]	PSD [dBm/RBW]	Limit [dBm/3kHz]	Verdict
2402	-2.064	8.0	PASS
2440	-2.739	8.0	PASS
2480	-3.387	8.0	PASS
RBW = 100 kHz			

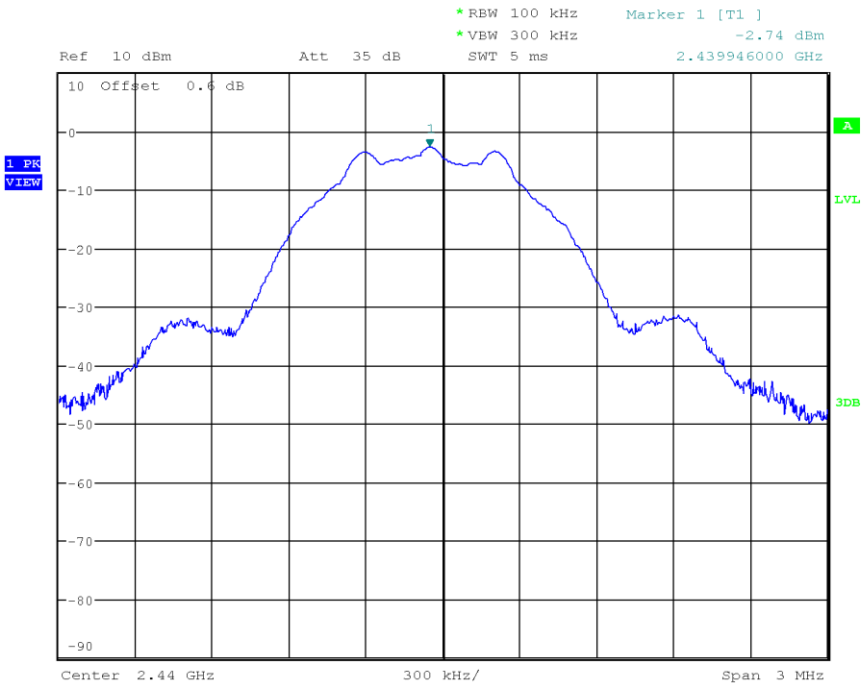
Peak Power Spectral Density

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:	29804
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.10.2
Operational Mode:	GFSK, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Florian Voigt
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-07-06
Peak Frequency [MHz]:	2401.946
Spectral Density [dBm/RBW]:	-2.064
Resolution Bandwidth [kHz]:	100 kHz



Peak Power Spectral Density

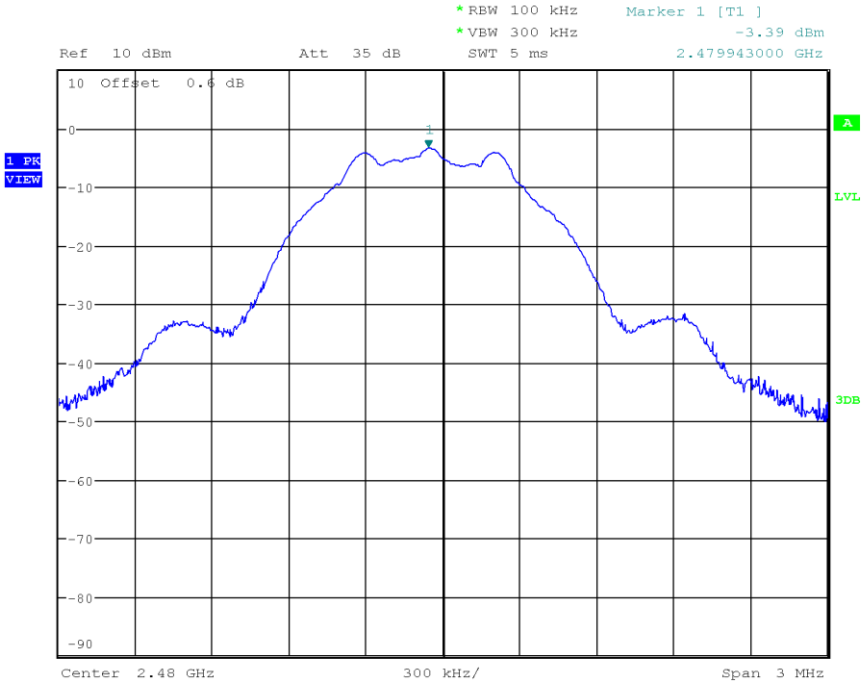
Project Number:	G0M-2006-9089
Applicant:	In-Circuit GmbH
Model Description:	radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000)
Model:	radino40 DW1000
Test Sample ID:	29804
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.10.2
Operational Mode:	GFSK, Channel: 19, 2440 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Florian Voigt
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-07-06
Peak Frequency [MHz]:	2439.946
Spectral Density [dBm/RBW]:	-2.739
Resolution Bandwidth [kHz]:	100 kHz



Date: 6.JUL.2020 14:36:00

Peak Power Spectral Density

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:	29804
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.10.2
Operational Mode:	GFSK, Channel: 39, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Florian Voigt
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-07-06
Peak Frequency [MHz]:	2479.943
Spectral Density [dBm/RBW]:	-3.387
Resolution Bandwidth [kHz]:	100 kHz



Date: 6.JUL.2020 14:37:04

3.5 Test Conditions and Results - AC powerline conducted emissions

3.5.1 Information

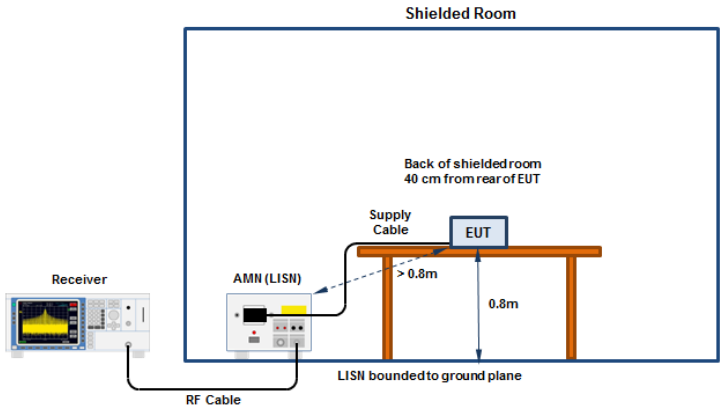
Test Information	
Reference	FCC § 15.207; ISED RSS-247, Issue 2 (section 3.1)
Measurement Method	ANSI C63.10 6.2
Operator	Florian Voigt
Date	2020-07-06

3.5.2 Limits

Limits		
Frequency [MHz]	Quasi-Peak [dBµV]	Average [dBµV]
0.15 - 0.5	66 - 56*	56 - 46*
0.5 - 5	56	46
5 - 30	60	50
* Limit decreases linearly with the logarithm of the frequency		

3.5.3 Setup

Test Setup



3.5.4 Equipment

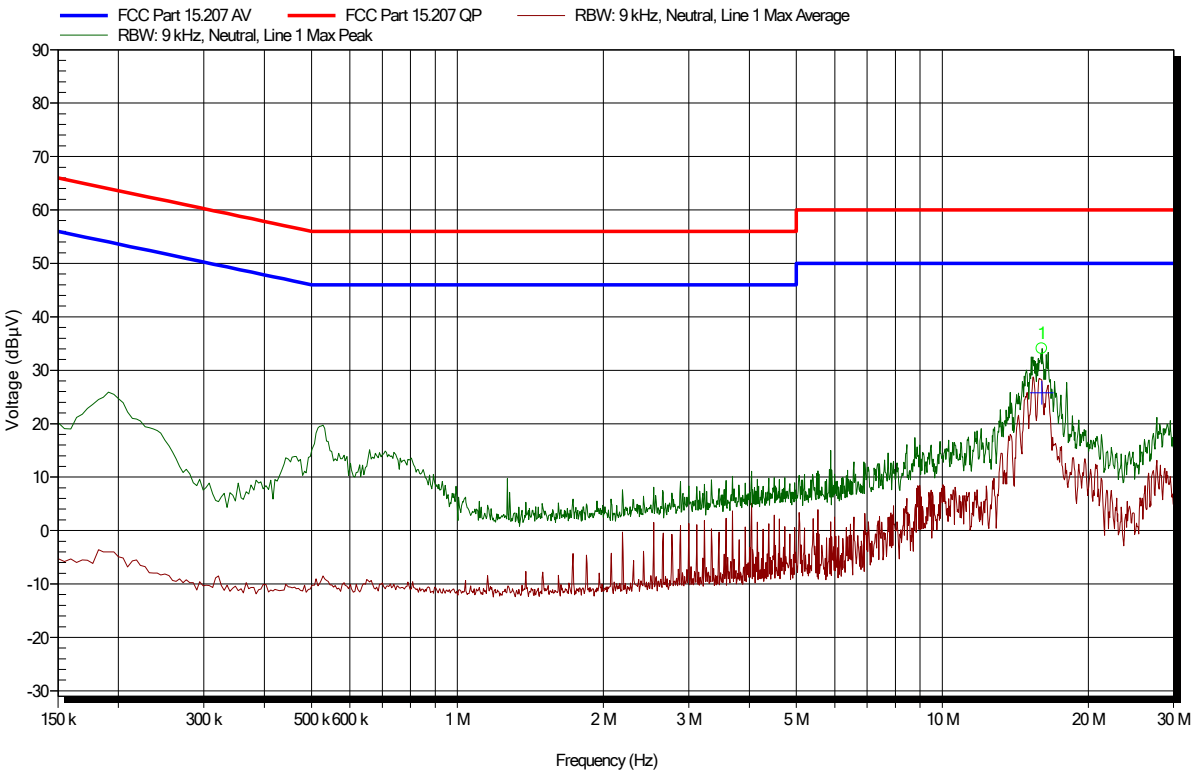
Test Software			
Description	Manufacturer	Name	Version
EMC Software	DARE Instruments	RadiMation	2016.1.10

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EMI Test Receiver	R&S	ESR7	EF00943	2019-10	2020-10
Pulse Limiter	R&S	ESH3-Z2	EF01222	2019-07	2020-07
LISN	Schwarzbeck	NSLK 8127 RC	EF01592	2019-10	2020-10

Conducted emissions at the mains power port according to FCC 47 e-CFR §15.207

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:	29805
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Voigt
Test Date:	2020-07-06
Operating Conditions:	ambient temperature: 23.8°C power input: 3.3 VDC
LISN:	Schwarzbeck NSLK 8127 RC L
Mode:	2440MHz, 2-GFSK, 37byte packetlength

Index 1



Peak Number	Frequency	Peak	LISN
1	16.044 MHz	34.08 dBµV	Neutral

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	16.044 MHz	25.81 dBµV	50 dBµV	-24.19 dB	Pass	Neutral

3.6 Test Conditions and Results - Band-edge compliance

3.6.1 Information

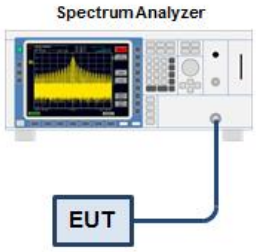
Test Information	
Reference	FCC § 15.247(d); ISED RSS-247, Issue 2 (section 5.5)
Measurement Method	ANSI C63.10 11.13
Operator	Florian Voigt
Date	2020-07-06

3.6.2 Limits

Limits	
Power Measurement	Out-of-band attenuation [dB]
Peak	20
RMS	30

3.6.3 Setup

Test Setup



3.6.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSU 26	EF01407	2019-07	2020-07

3.6.5 Procedure

Test Procedure

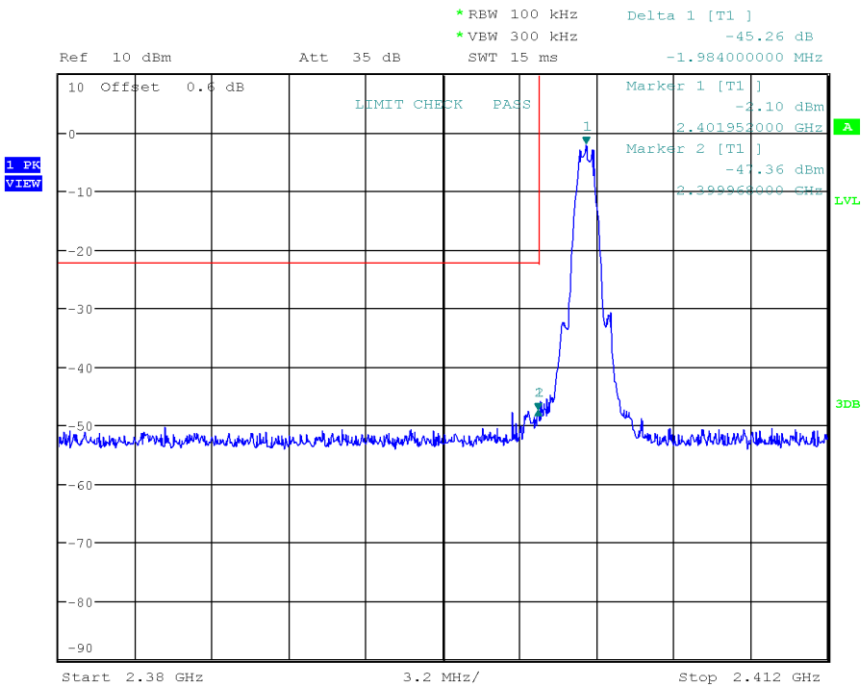
1. EUT set to test mode (Communication tester is used if needed)
2. Span set around lower band edge and detector is set to peak and max hold
3. Resolution bandwidth is set to 100 kHz
4. Markers are set to peak emission levels within frequency band and outside frequency band
5. Band edge attenuation is determined from level difference

3.6.6 Results

Test Results				
Mode	Channel [MHz]	Out-of-band Attenuation [dB]	Limit [dB]	Verdict
GFSK	2402	-45.26	-20	PASS
GFSK	2480	-45.65	-20	PASS

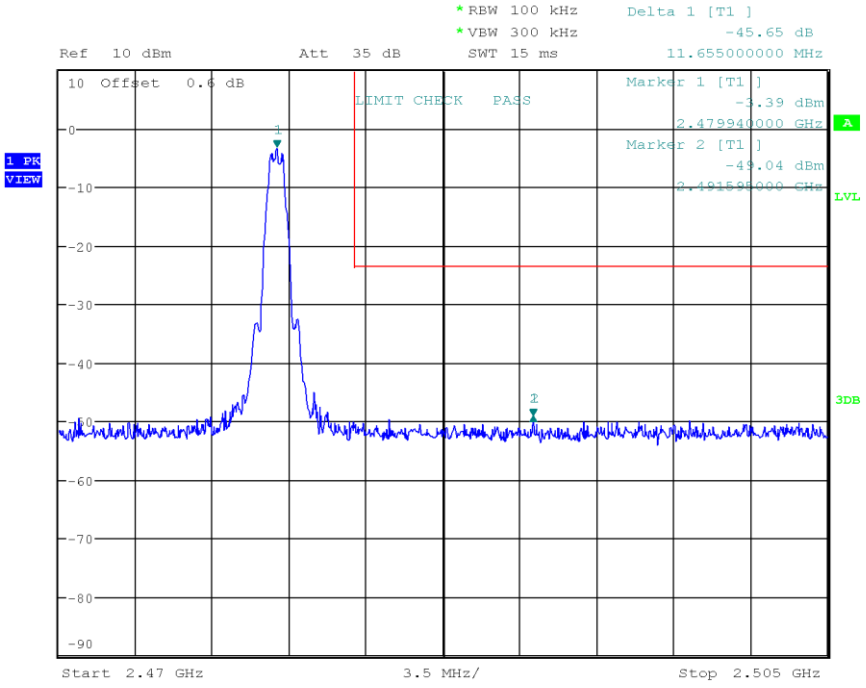
Emissions in nonrestricted frequency bands at the Band-edge

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:	29804
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 7.8.6, 6.10.4
Operating Conditions:	Tnom/Vnom
Operator:	Florian Voigt
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-07-06
Band-edge	Lower
In-band Frequency [MHz]:	2401.952
Max. in-band Level [dBm/100 kHz]:	-2.1
Out-of-band Frequency [MHz]:	2399.968
Max. out-of-band Level [dBm/100 kHz]:	-47.356
Attenuation [dB]:	-45.26



Emissions in nonrestricted frequency bands at the Band-edge

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:	29804
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 7.8.6, 6.10.4
Operating Conditions:	Tnom/Vnom
Operator:	Florian Voigt
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-07-06
Band-edge	Upper
In-band Frequency [MHz]:	2479.94
Max. in-band Level [dBm/100 kHz]:	-3.389
Out-of-band Frequency [MHz]:	2491.595
Max. out-of-band Level [dBm/100 kHz]:	-49.036
Attenuation [dB]:	-45.65



3.7 Test Conditions and Results - Conducted spurious emissions

3.7.1 Information

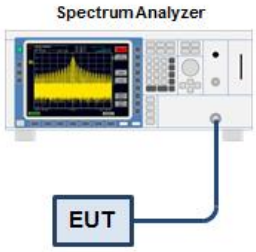
Test Information	
Reference	FCC § 15.247(d); ISED RSS-247, Issue 2 (section 5.5)
Measurement Method	ANSI C63.10 11.11
Operator	Florian Voigt
Date	2020-07-06

3.7.2 Limits

Limits	
Power Measurement	Out-of-band attenuation [dB]
Peak	20
RMS	30

3.7.3 Setup

Test Setup



3.7.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSU 26	EF01407	2019-07	2020-07

3.7.5 Procedure

Test Procedure

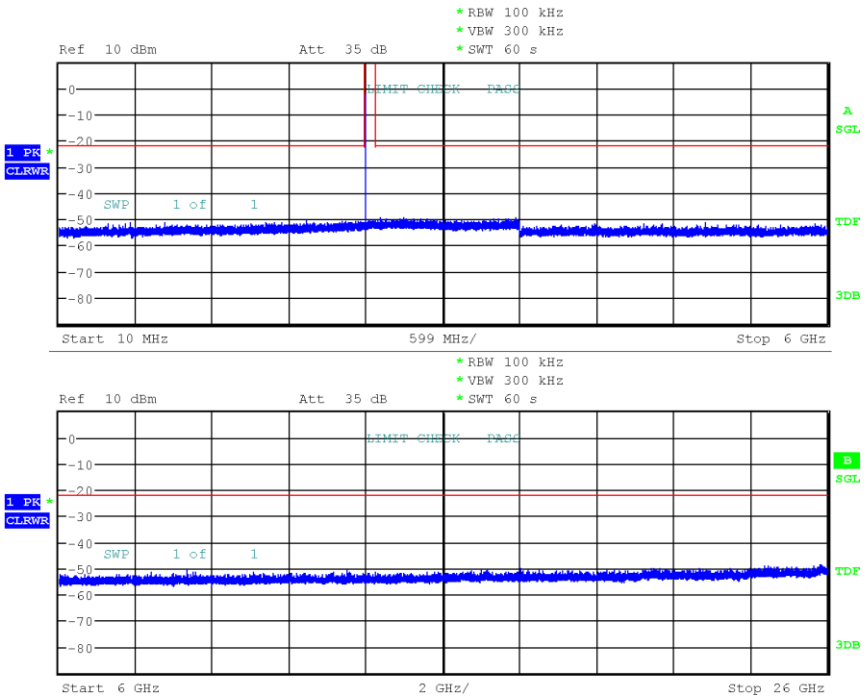
1. EUT set to test mode (Communication tester is used if needed)
2. Span set around lower band edge and detector is set to peak and max hold
3. Resolution bandwidth is set to 100 kHz
4. Markers are set to peak emission levels within frequency band and outside frequency band
5. Band edge attenuation is determined from level difference

3.7.6 Results

Test Results		
Mode	Channel [MHz]	Verdict
GFSK	2402	PASS
GFSK	2440	PASS
GFSK	2480	PASS

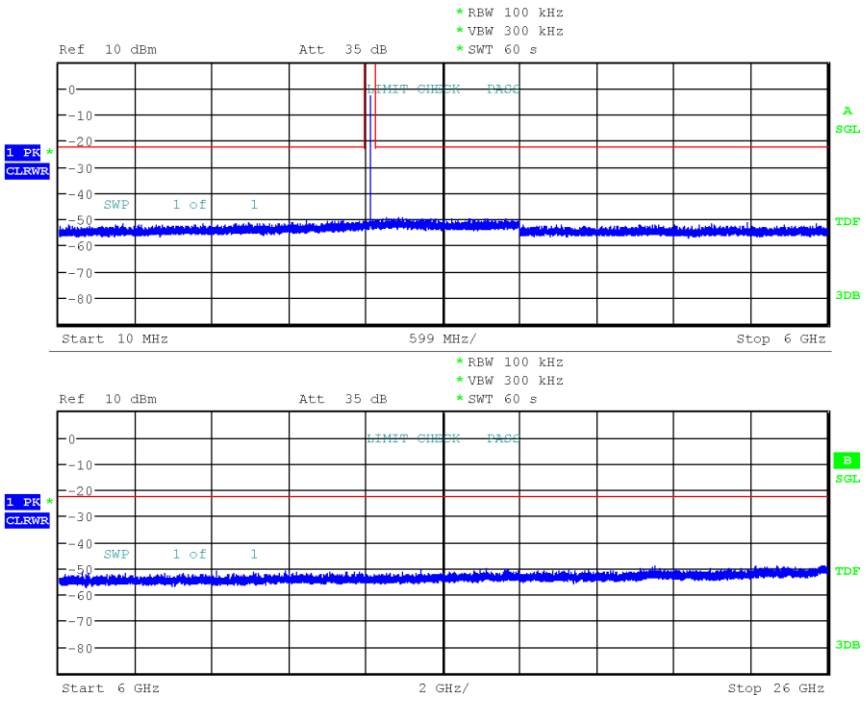
Conducted Spurious Emissions

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:	29804
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.11
Operational Mode:	GFSK, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Florian Voigt
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-07-06
Max. in-band Frequency [MHz]:	2401.9
Max. in-band Level [dBm/100 kHz]:	-2.1
Out-of-band Limit [dBm/100 kHz]:	-22.1



Conducted Spurious Emissions

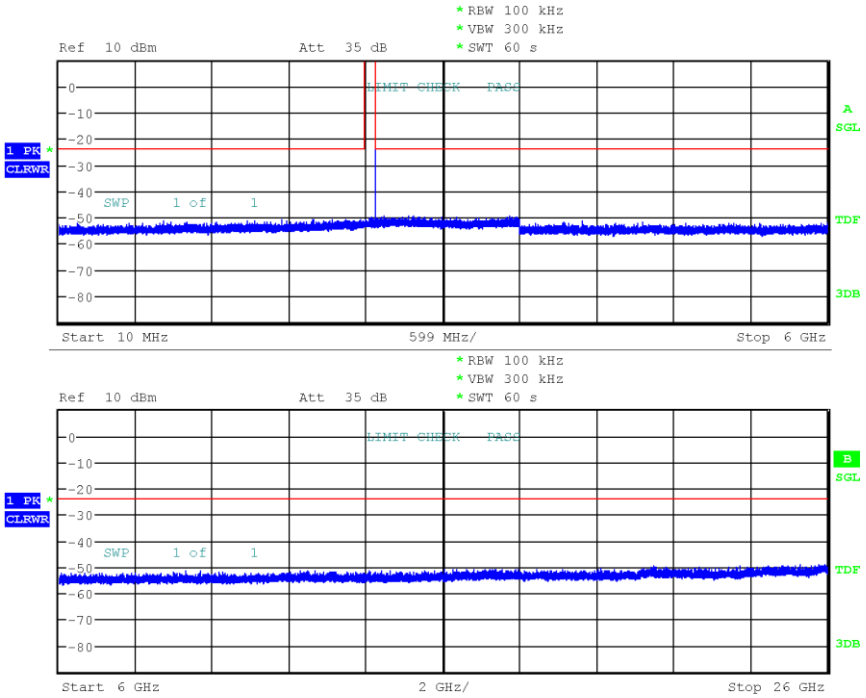
Project Number:	G0M-2006-9089
Applicant:	In-Circuit GmbH
Model Description:	radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000)
Model:	radino40 DW1000
Test Sample ID:	29804
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.11
Operational Mode:	GFSK, Channel: 19, 2440 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Florian Voigt
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-07-06
Max. in-band Frequency [MHz]:	2439.9
Max. in-band Level [dBm/100 kHz]:	-2.7
Out-of-band Limit [dBm/100 kHz]:	-22.7



Date: 6.JUL.2020 15:04:07

Conducted Spurious Emissions

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:	29804
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.11
Operational Mode:	GFSK, Channel: 39, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Florian Voigt
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-07-06
Max. in-band Frequency [MHz]:	2479.9
Max. in-band Level [dBm/100 kHz]:	-3.4
Out-of-band Limit [dBm/100 kHz]:	-23.4



Date: 6.JUL.2020 15:09:36

3.8 Test Conditions and Results - Transmitter radiated emissions

3.8.1 Information

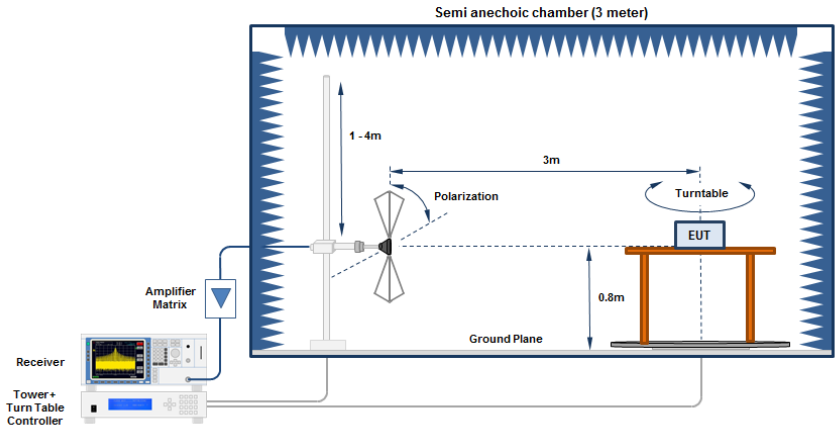
Test Information	
Reference	FCC § 15.247(d); FCC § 15.209; ISED RSS-Gen, Issue 5 (section 6.13)
Measurement Method	ANSI C63.10 6.4, 6.5, 6.6, 11.12
Operator	Florian Voigt
Date	2020-07-03 + 2020-07-06 + 2020-07-17

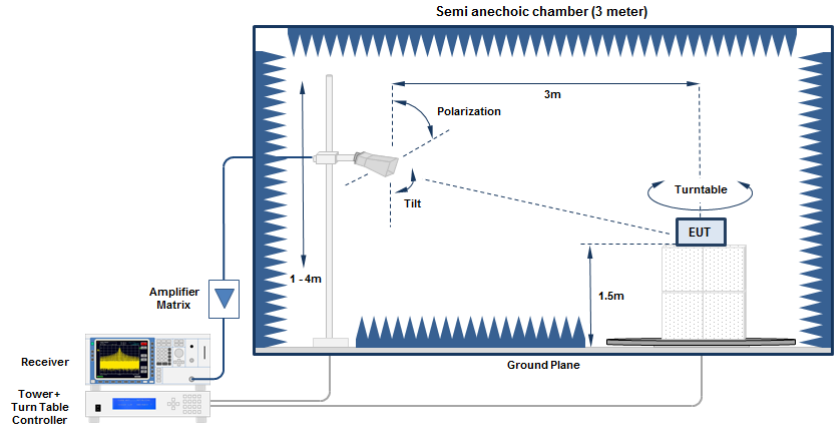
3.8.2 Limits

Limits			
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
960 - 1000	Quasi-Peak	500	3
>1000	Average	500	3

3.8.3 Setup

Test Setup 30 - 1000 MHz



Test Setup > 1 GHz


3.8.4 Equipment

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

Test Equipment 30 - 1000 MHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF00062	2018-07	2021-07
Spectrum analyzer	R&S	FSU26	EF01003	2019-07	2020-07
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
Spectrum analyzer	R&S	FSU26	EF01003	2019-07	2020-07
Antenna	Schwarzbeck	BBHA 9120D	EF00018	2019-10	2022-10
Antenna	Amplifier Research	AT4560	EF00302	2019-05	2021-05
Antenna	Flann Microwave Ltd	22240-25 Amp. CBL26402075	EF00301	2019-12	2022-12

3.8.5 Procedure

Test Procedure < 30 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 EUT is rotated through 360°
4. The emissions are measured with peak detector and max hold
5. All significant emissions are measured again using the corresponding final detector

Test Procedure 30 - 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

3.8.6 Results

Test Results						
Channel [MHz]	Emission [MHz]	Level [dBµV/m]	Det.	Pol.	Limit [dBµV/m]	Margin [dB]
2402	2372.9	50.63	pk	hor	74.00	-23.37
2402	4801	37.84	pk	hor	74.00	-36.16
2402	4801	37.56	pk	ver	74.00	-36.44
2440	4878	39.36	pk	hor	74.00	-34.64
2440	4878	38.53	pk	ver	74.00	-35.47
2480	2483.5	50.92	pk	ver	74.00	-23.08
2480	4962	39.25	pk	hor	74.00	-34.75
2480	4962	39.75	pk	ver	74.00	-34.25

3.9 Test Conditions and Results - Receiver radiated emissions

3.9.1 Information

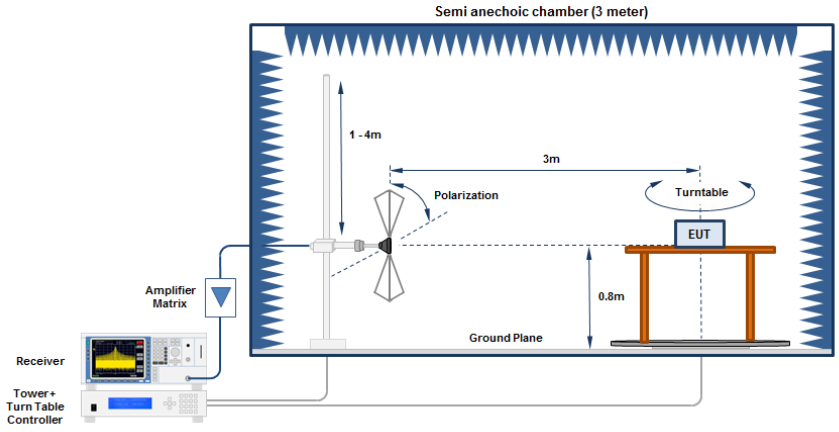
Test Information	
Reference	ISED RSS-247, Issue 2 (section 3.1)
Measurement Method	ANSI C63.10 6.5, 6.6, 11.12
Operator	Florian Voigt
Date	2020-07-03 + 2020-07-06 + 2020-07-17

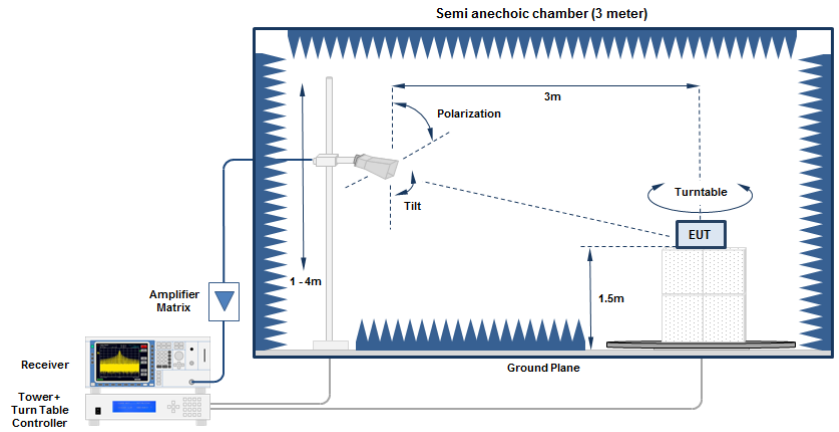
3.9.2 Limits

Limits			
Frequency [MHz]	Detector	Field strength [µV/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

3.9.3 Setup

Test Setup 30 - 1000 MHz



Test Setup > 1 GHz


3.9.4 Equipment

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

Test Equipment 30 - 1000 MHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF00062	2018-07	2021-07
Spectrum analyzer	R&S	FSU26	EF01003	2019-07	2020-07
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
Spectrum analyzer	R&S	FSU26	EF01003	2019-07	2020-07
Antenna	Schwarzbeck	BBHA 9120D	EF00018	2019-10	2022-10
Antenna	Amplifier Research	AT4560	EF00302	2019-05	2021-05
Antenna	Flann Microwave Ltd	22240-25 Amp. CBL26402075	EF00301	2019-12	2022-12

3.9.5 Procedure

Test Procedure 30 - 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

3.9.6 Results

Test Results						
Channel [MHz]	Emission [MHz]	Level [dBµV/m]	Det.	Pol.	Limit [dBµV/m]	Margin [dB]
2440	38.41	30.80	qpk	ver	40.00	-09.20
2440	5237	35.29	pk	hor	53.98	-18.69

ANNEX A Transmitter spurious emissions

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	TX; 2402MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-06
Note:	

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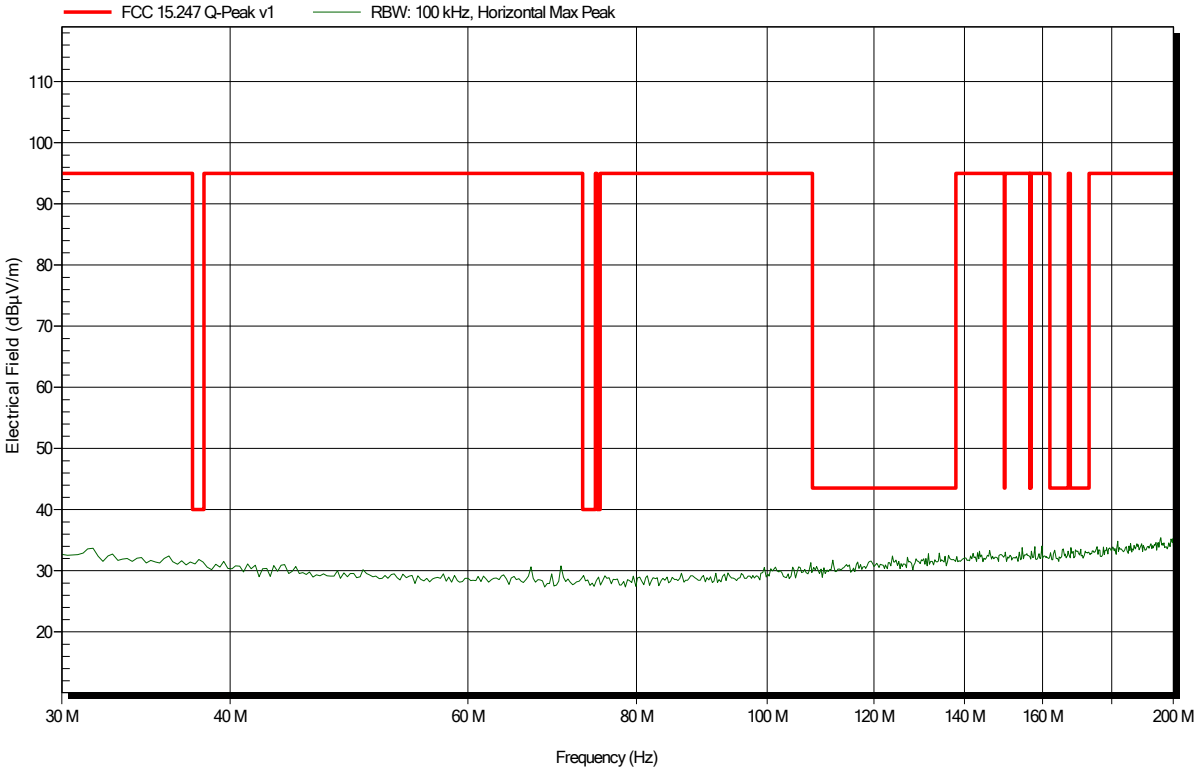

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	TX; 2402MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-06
Note:	

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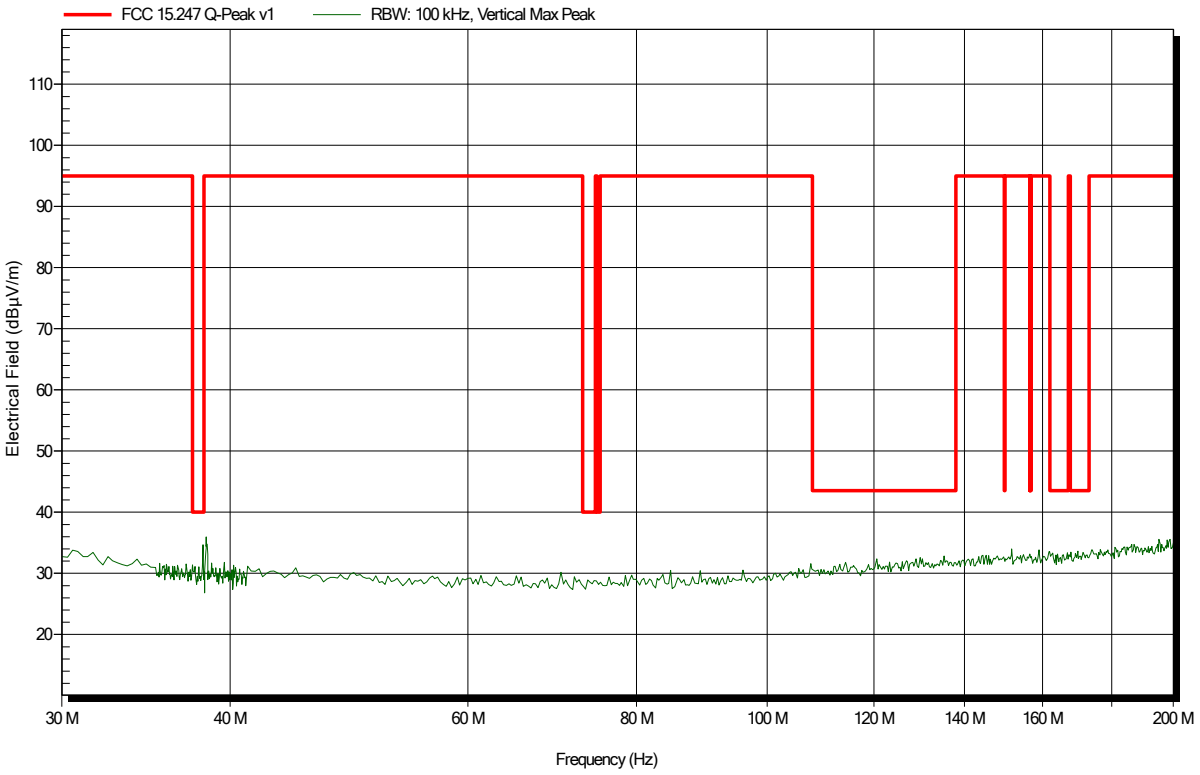

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	TX; 2402MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-06
Note:	

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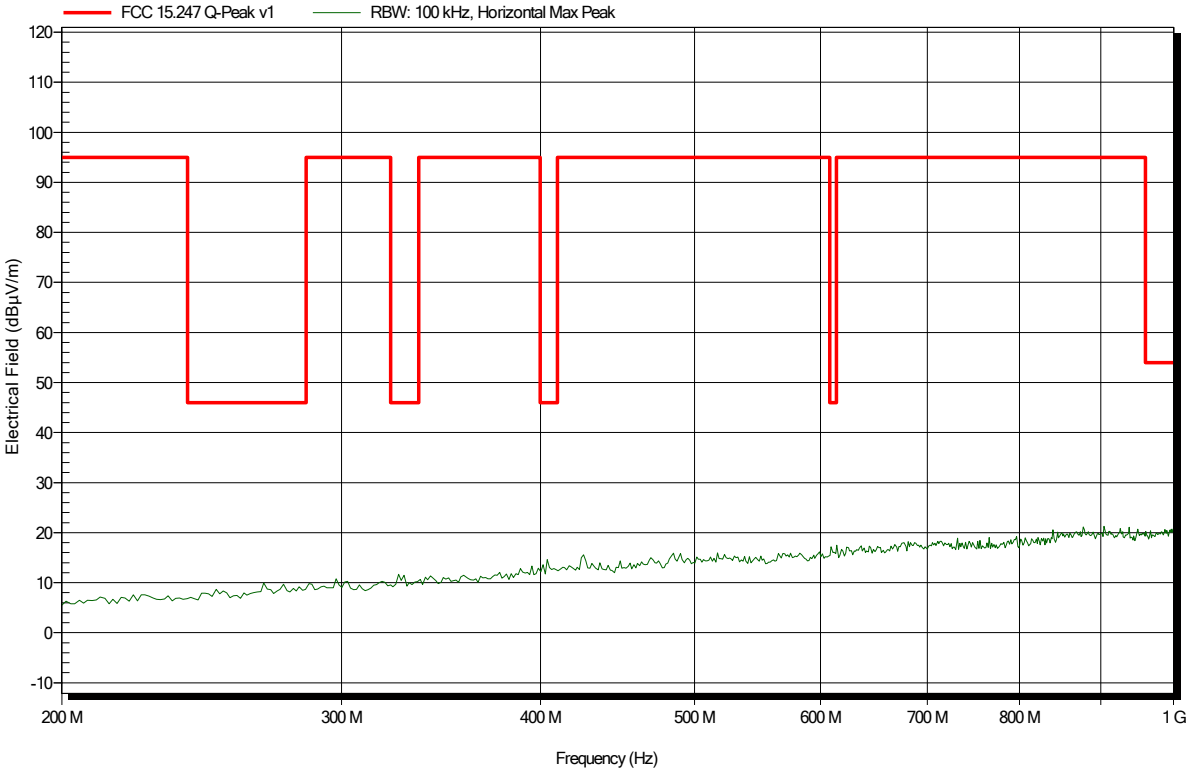

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	TX; 2402MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-06
Note:	

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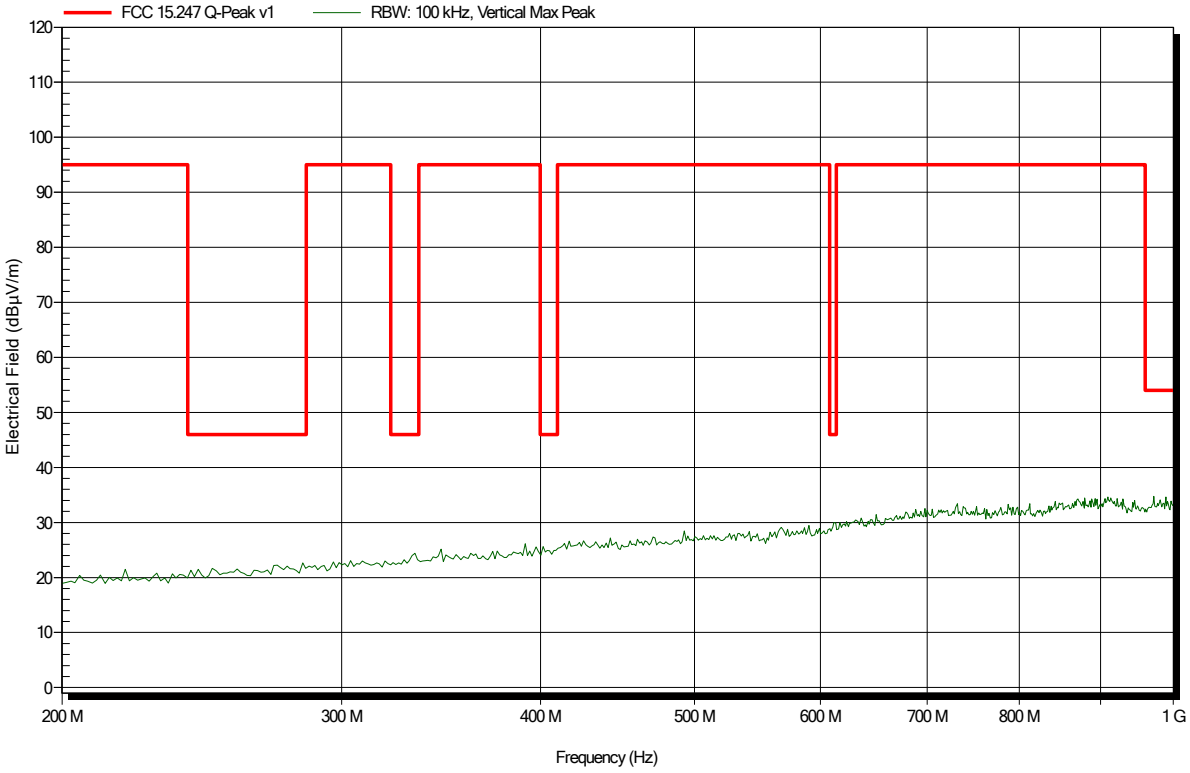

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; 2402MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-03
Note:	

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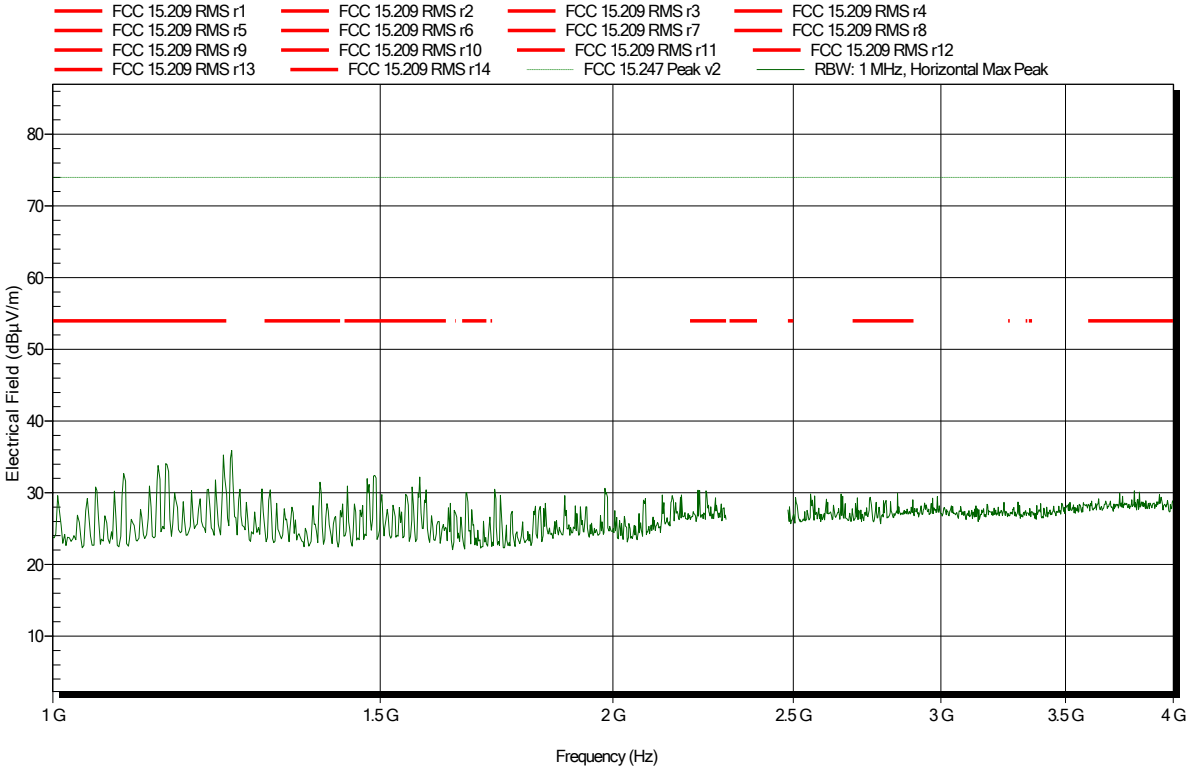

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; 2402MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-03
Note:	

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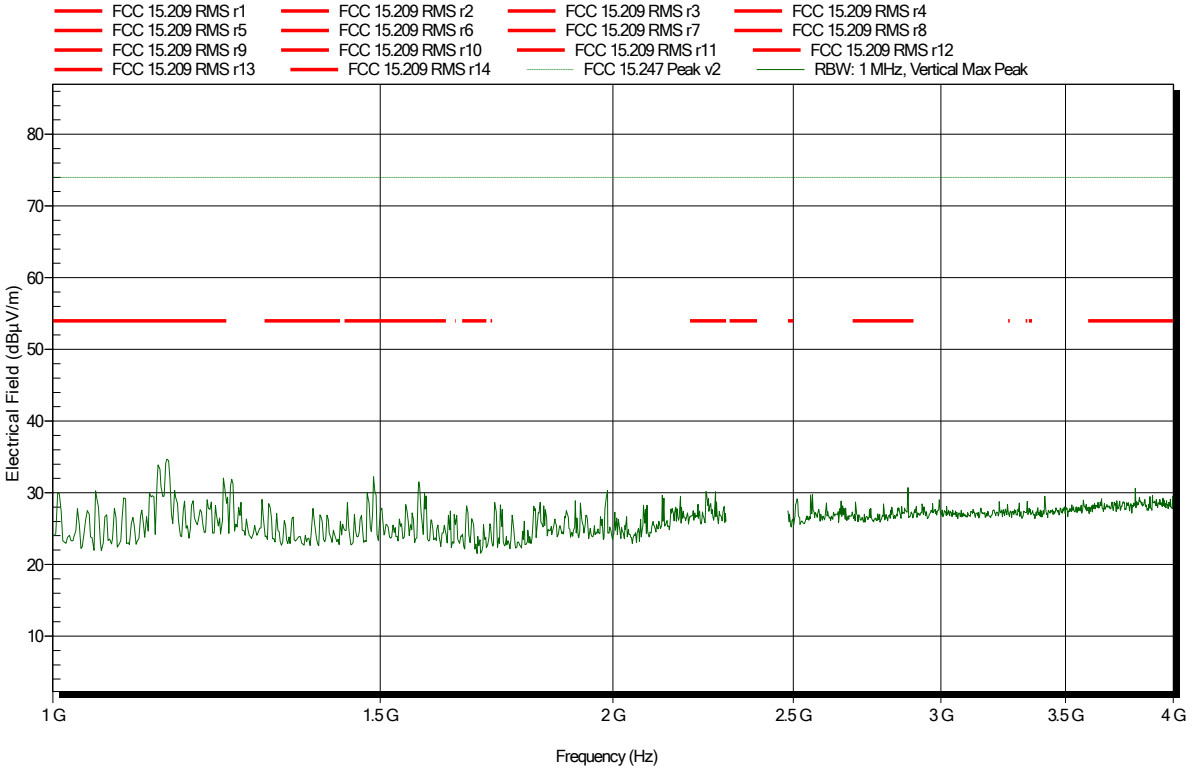

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; 2402MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-03
Note:	lower bandedge

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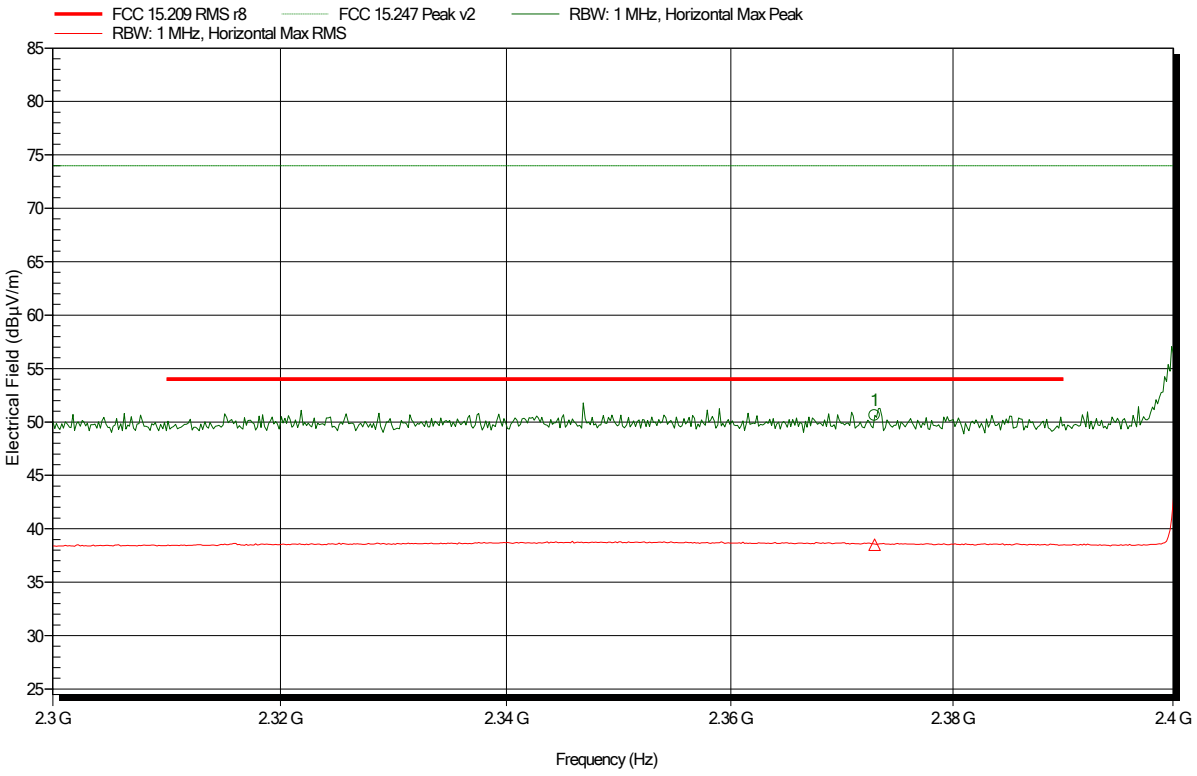

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.3729 GHz	50.63 dBµV/m	74 dBµV/m	-23.37 dB	Pass

Frequency	RMS	RMS Limit	RMS Difference	RMS Status
2.3729 GHz	38.52 dBµV/m	54 dBµV/m	-15.48 dB	Pass

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; 2402MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-03
Note:	lower bandedge

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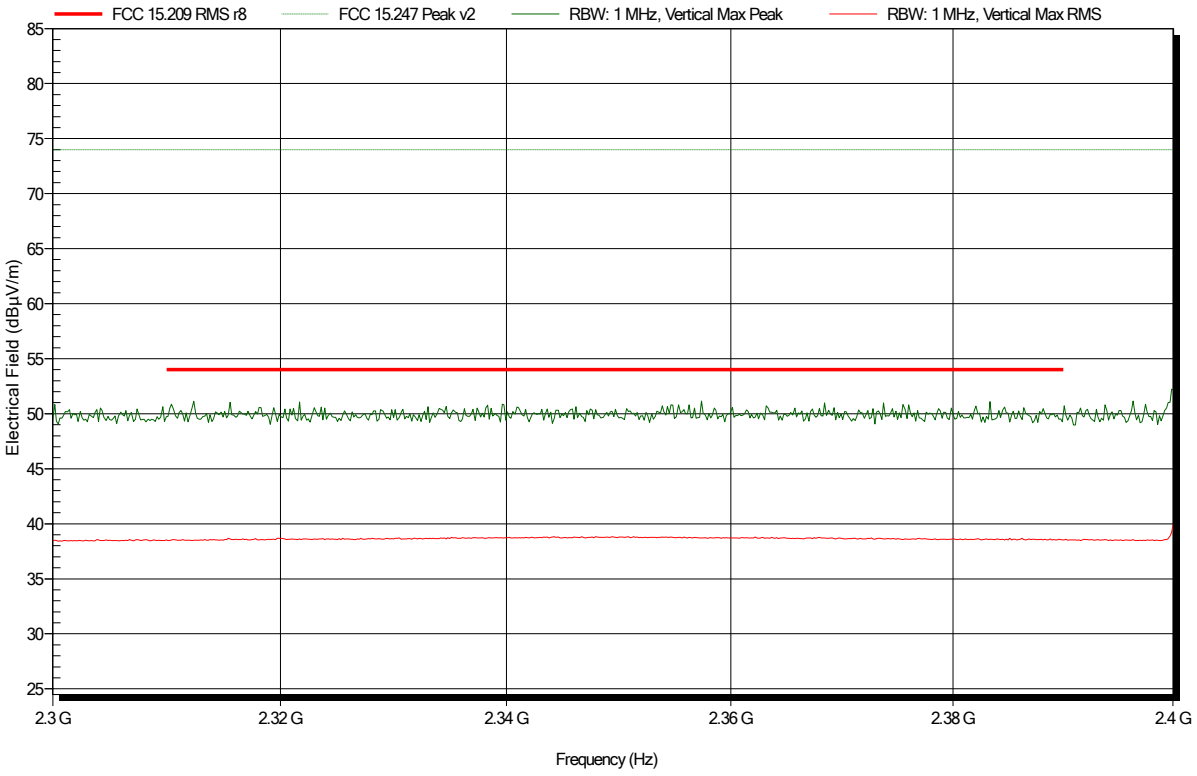

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; 2402MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-03
Note:	

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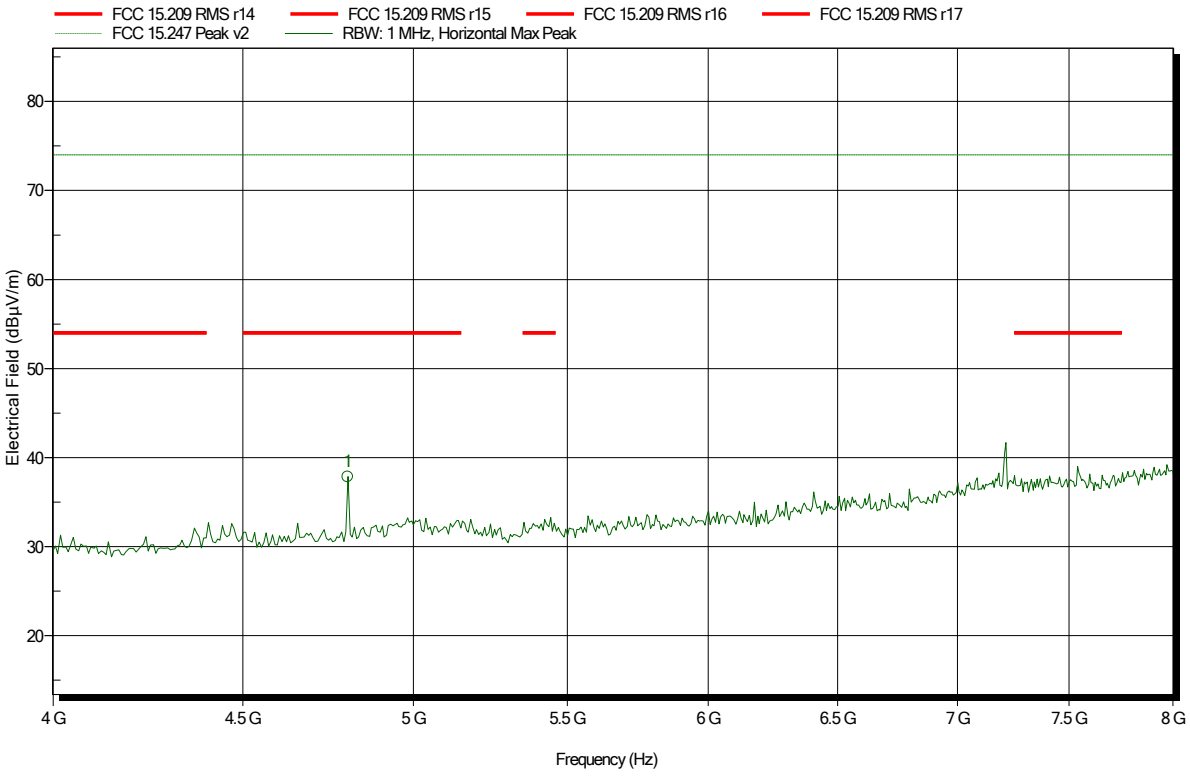

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
4.801 GHz	37.84 dBµV/m	74 dBµV/m	-36.16 dB	Pass

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; 2402MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-03
Note:	

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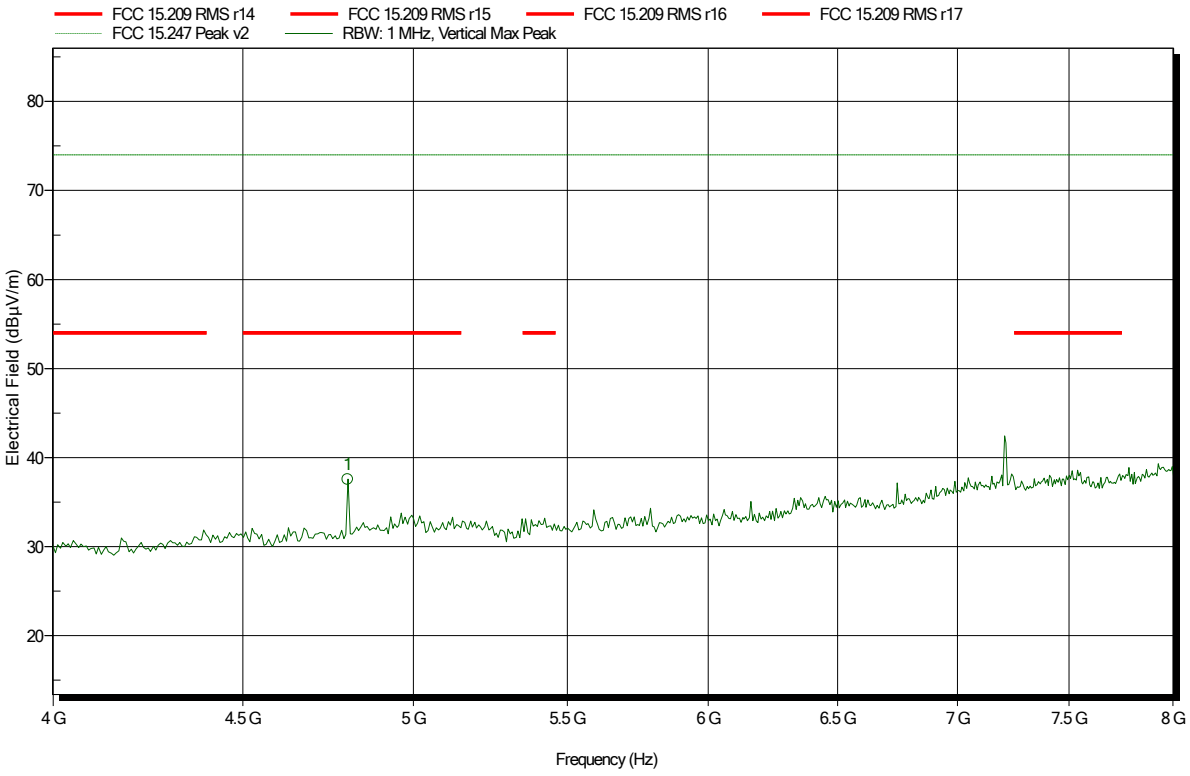

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
4.801 GHz	37.56 dBµV/m	74 dBµV/m	-36.44 dB	Pass

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; 2402MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-03
Note:	

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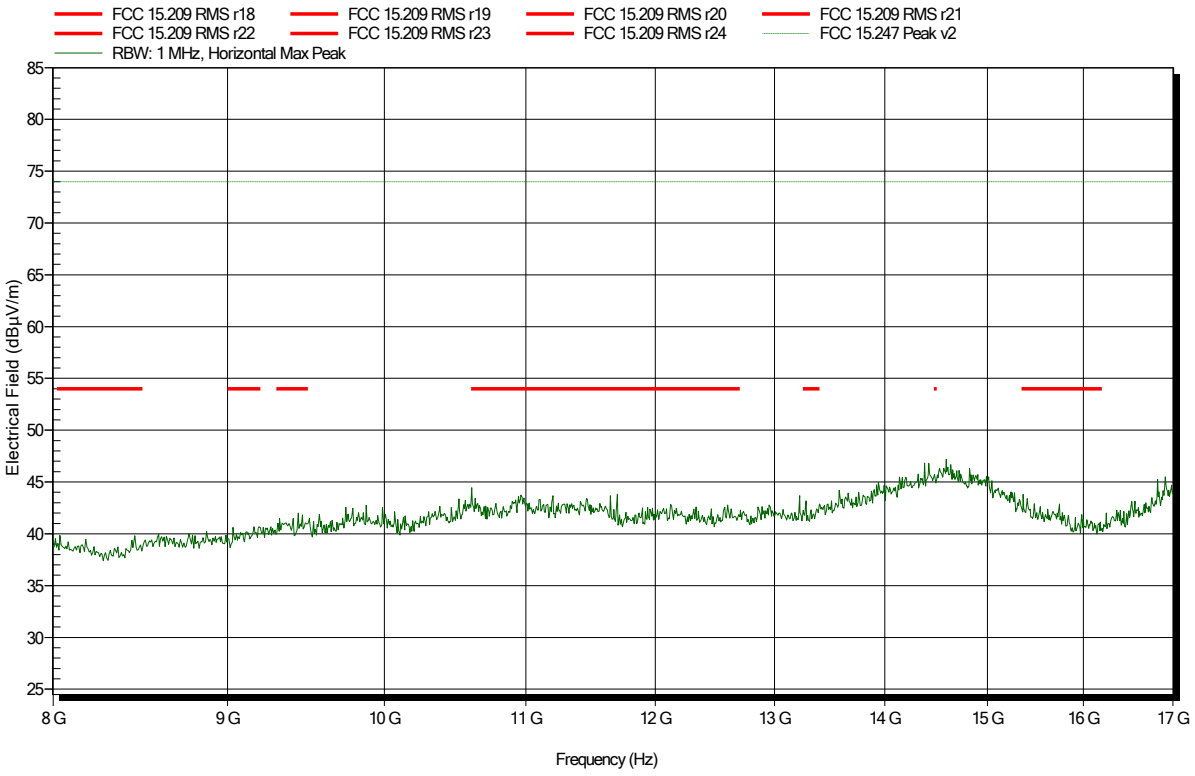

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; 2402MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-03
Note:	

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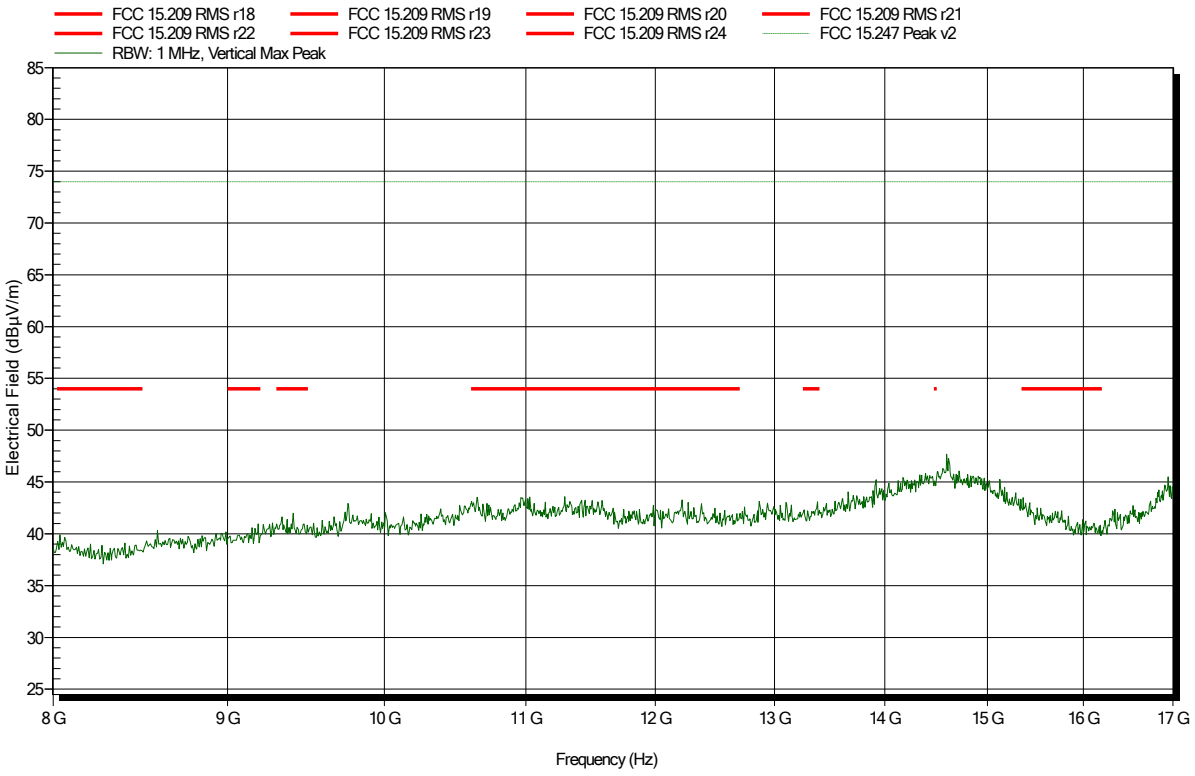

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Amplifier Research AT4560, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; 2402MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-03
Note:	

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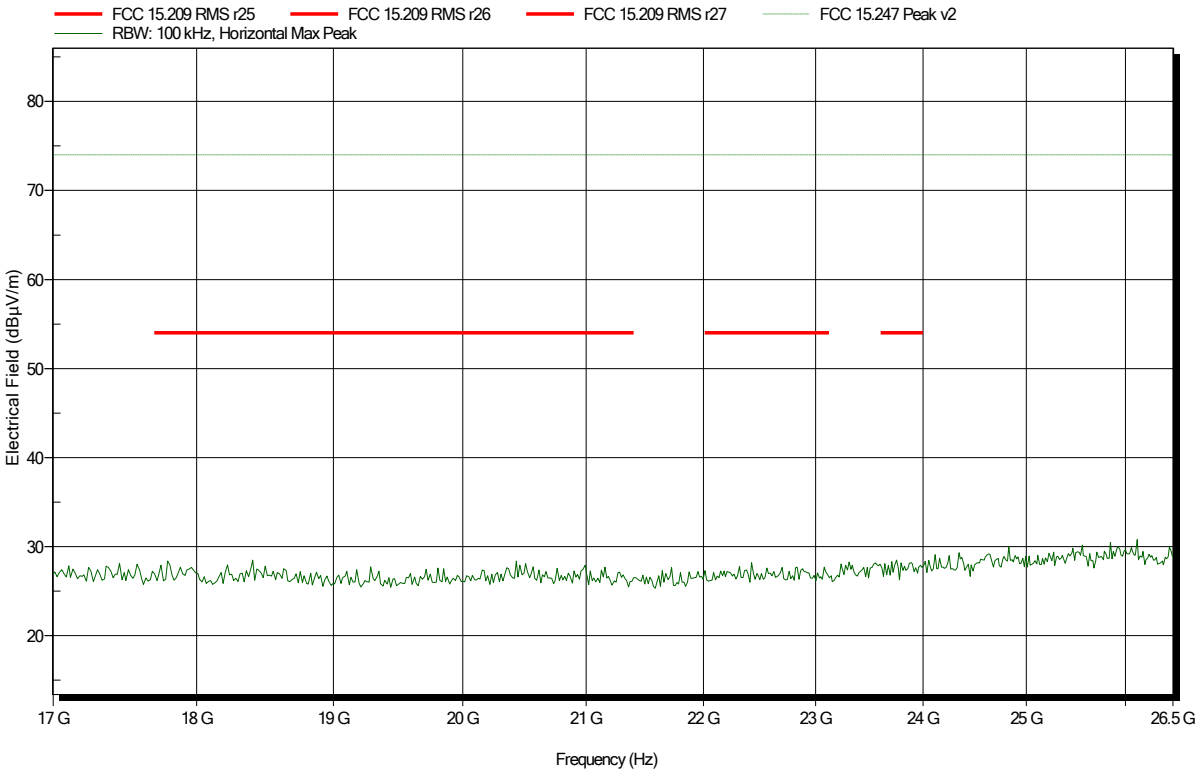

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Amplifier Research AT4560, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; 2402MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-03
Note:	

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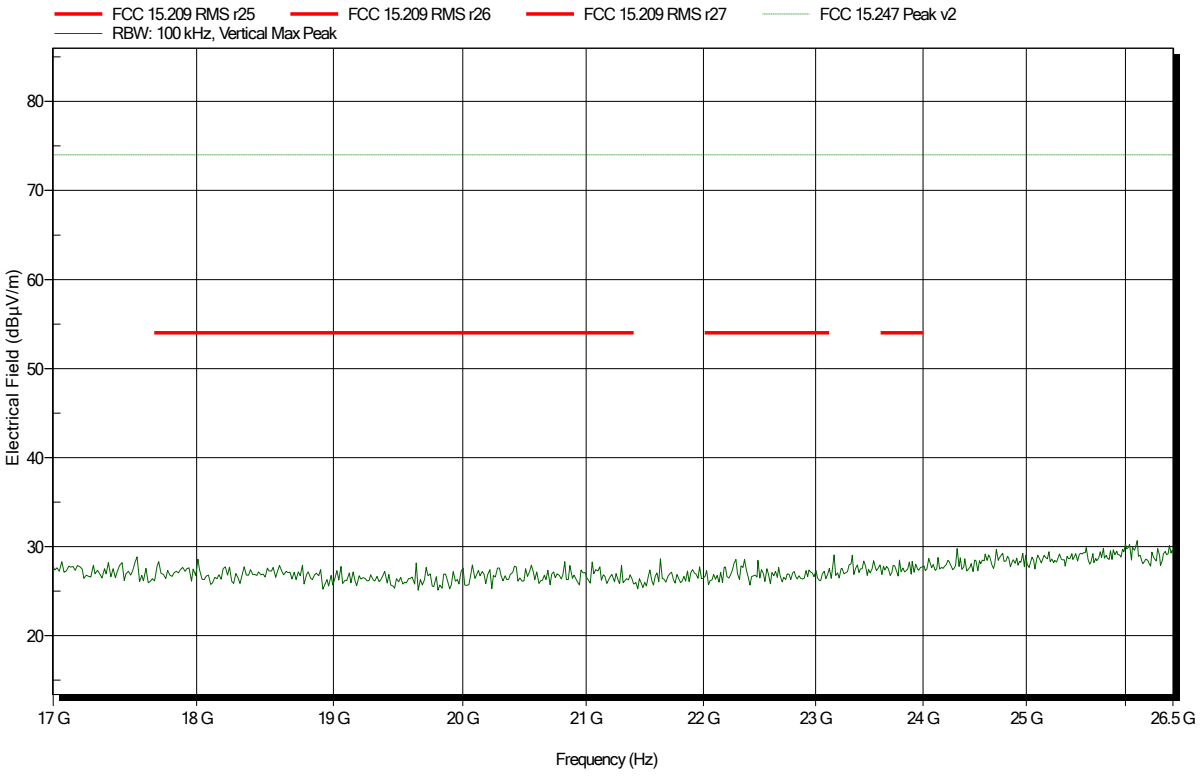

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	TX; 2440MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-06
Note:	

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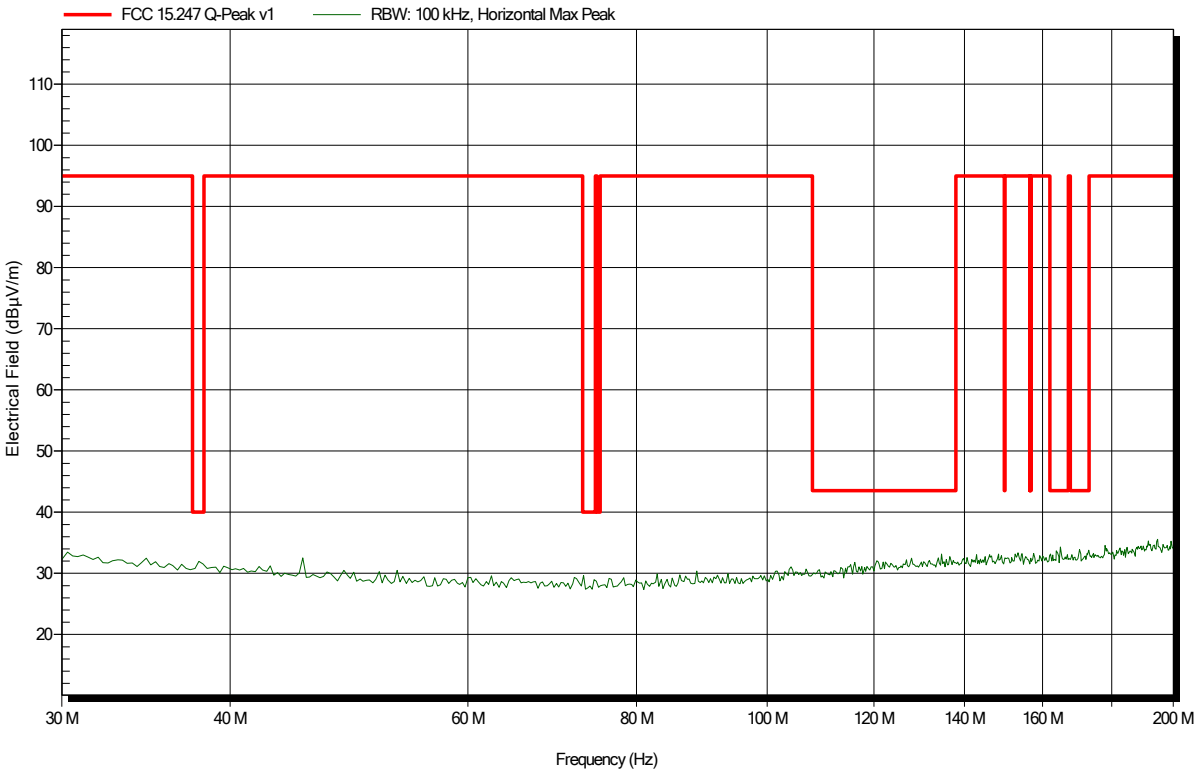

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	TX; 2440MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-06
Note:	

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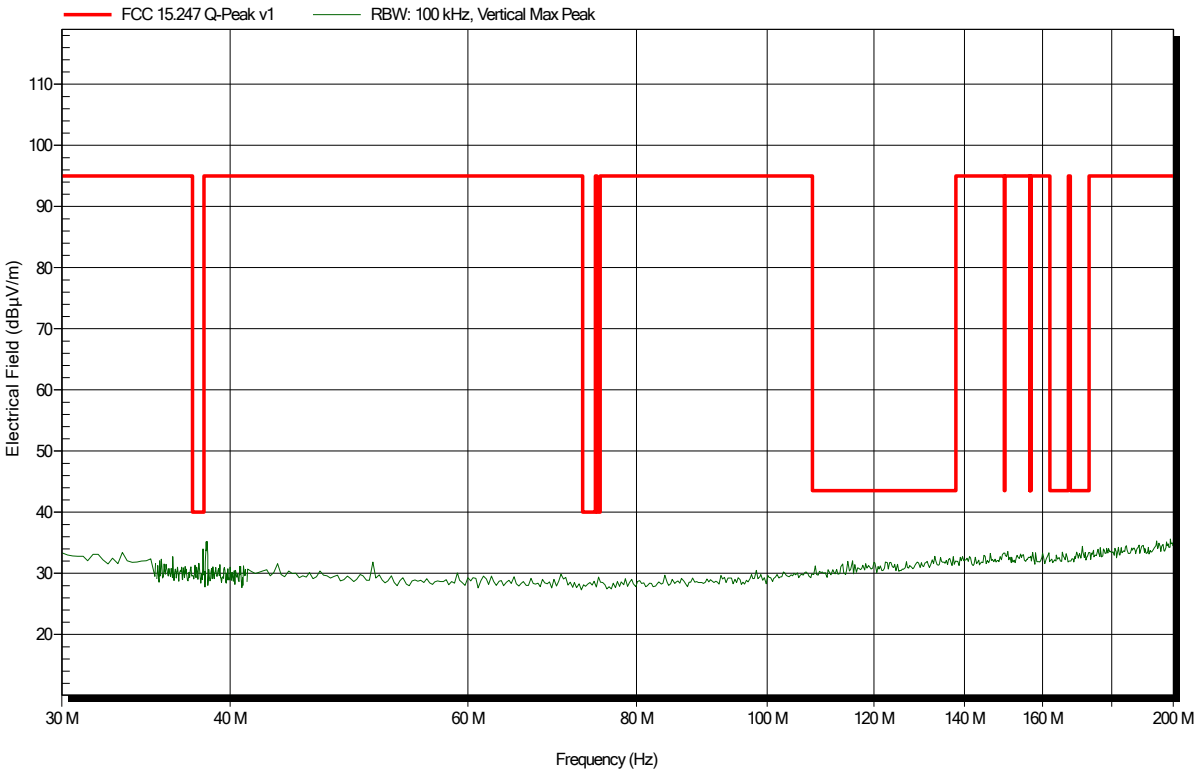

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	TX; 2440MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-06
Note:	

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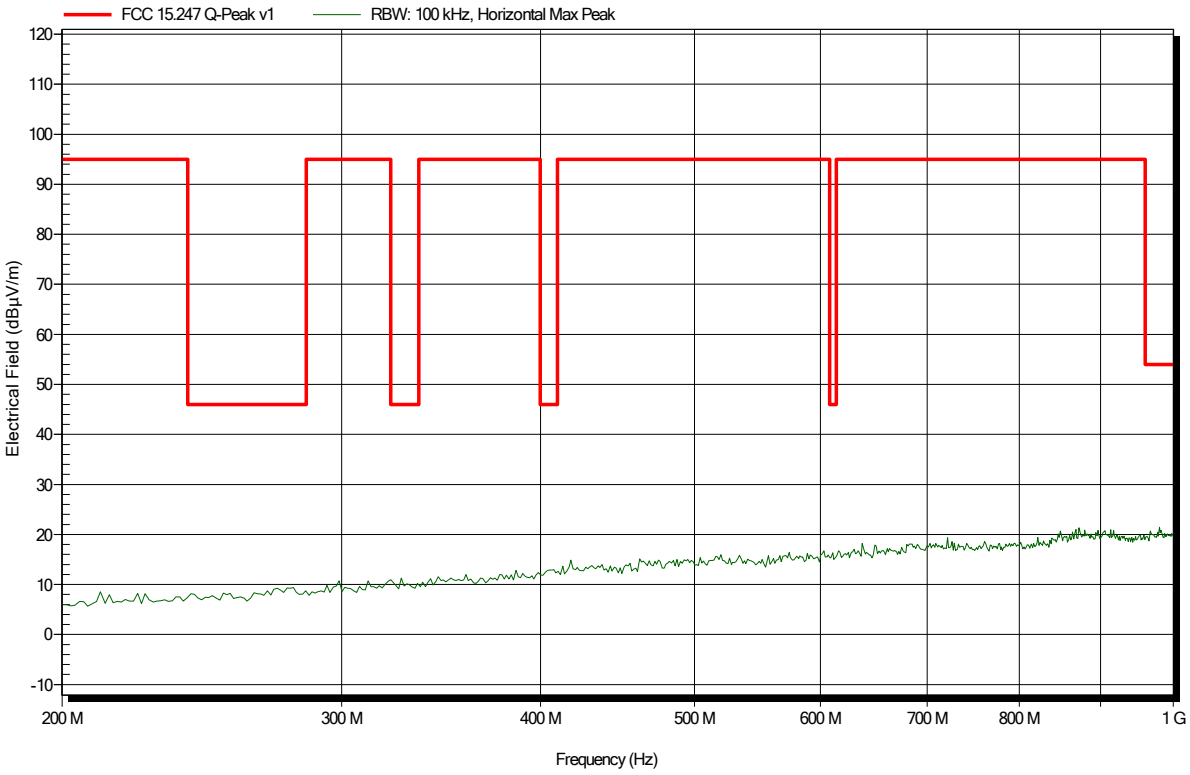

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	TX; 2440MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-06
Note:	

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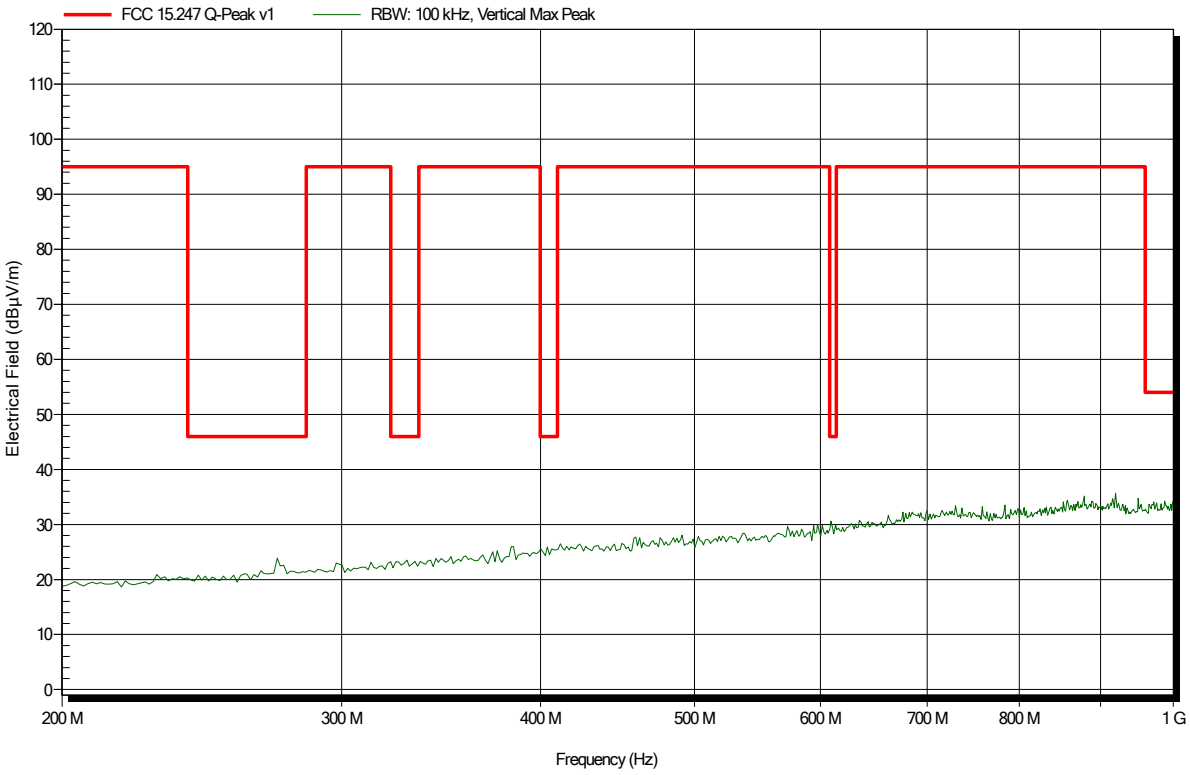

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; 2440MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-03
Note:	

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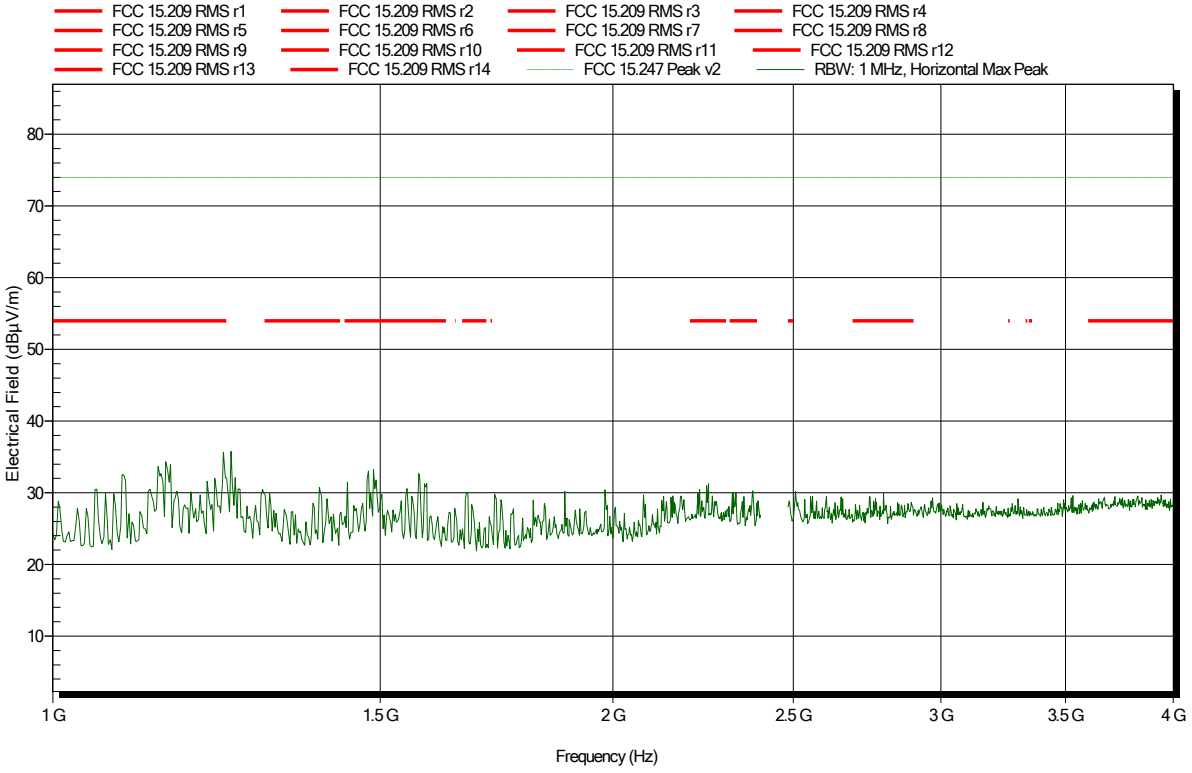

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; 2440MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-03
Note:	

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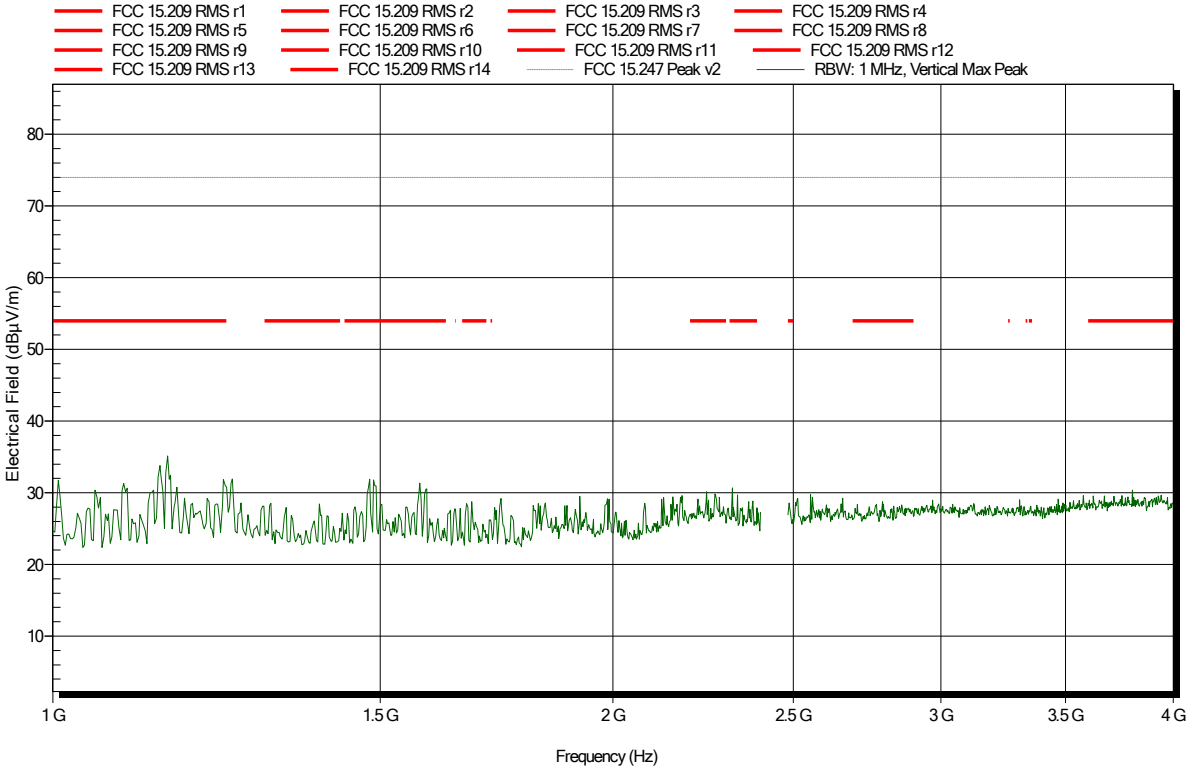

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; 2440MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-03
Note:	

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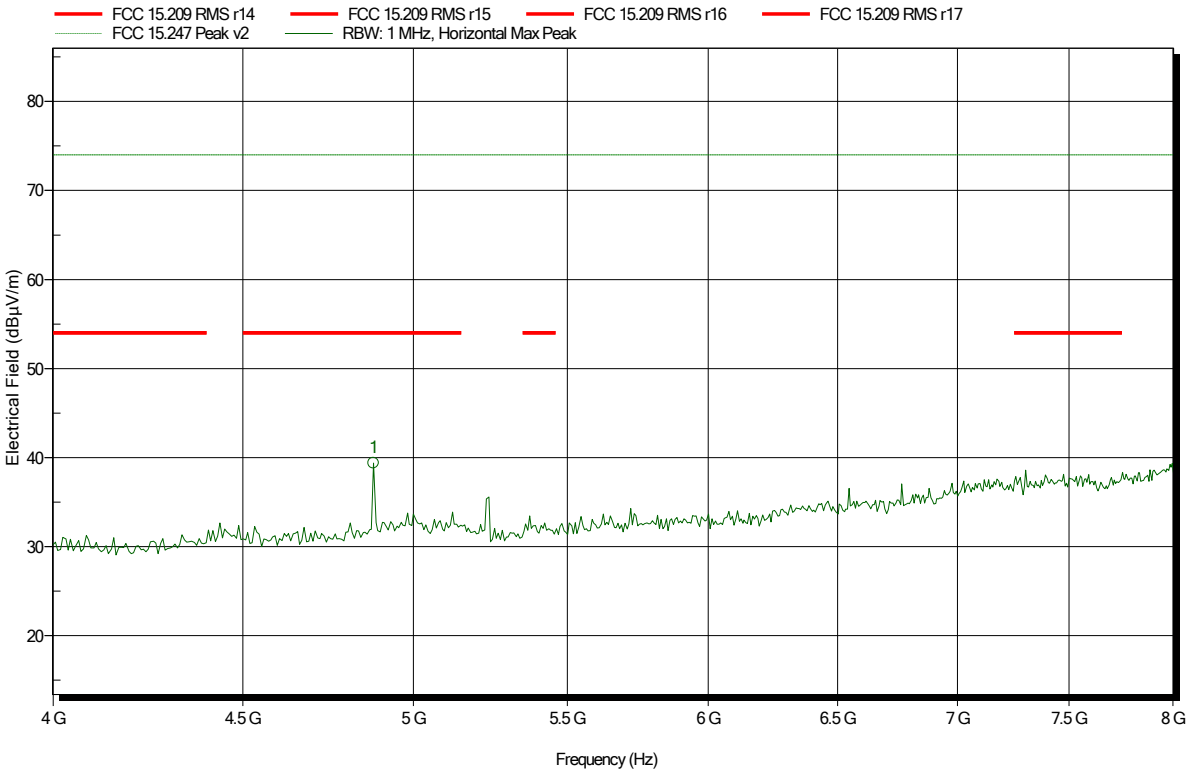

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
4.878 GHz	39.36 dBµV/m	74 dBµV/m	-34.64 dB	Pass

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; 2440MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-03
Note:	

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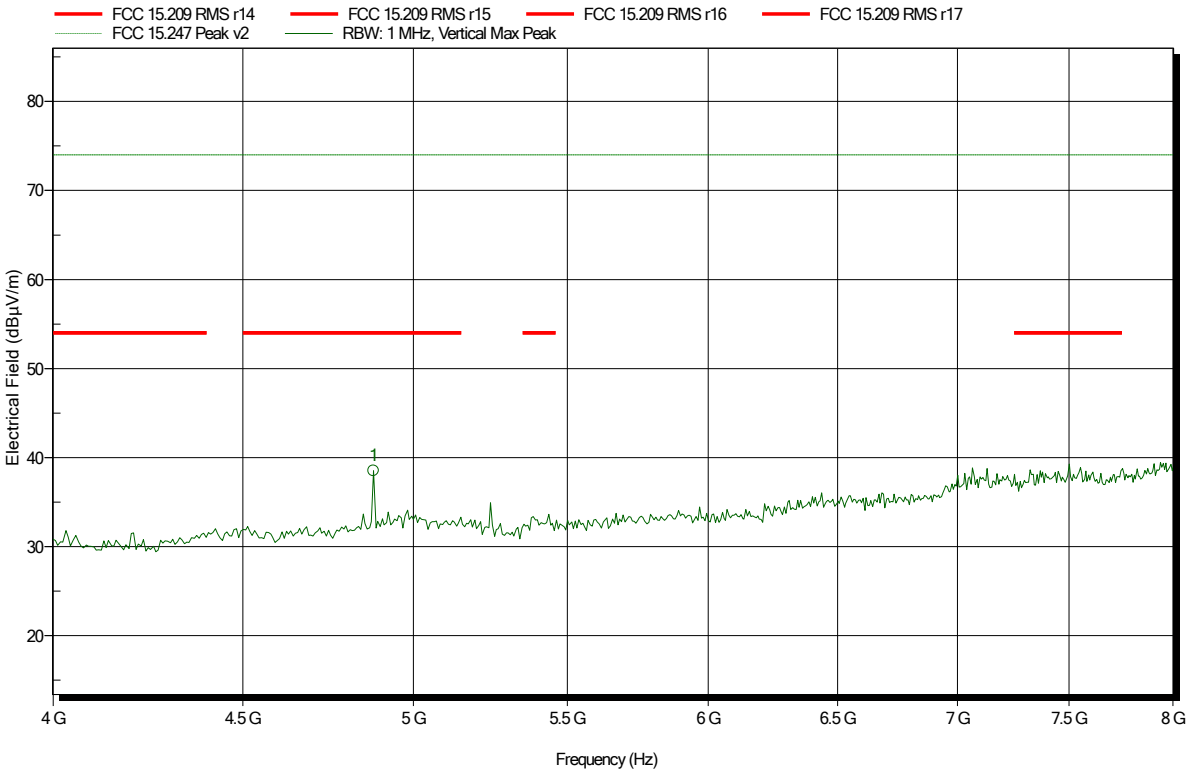

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
4.878 GHz	38.53 dBµV/m	74 dBµV/m	-35.47 dB	Pass

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; 2440MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-03
Note:	

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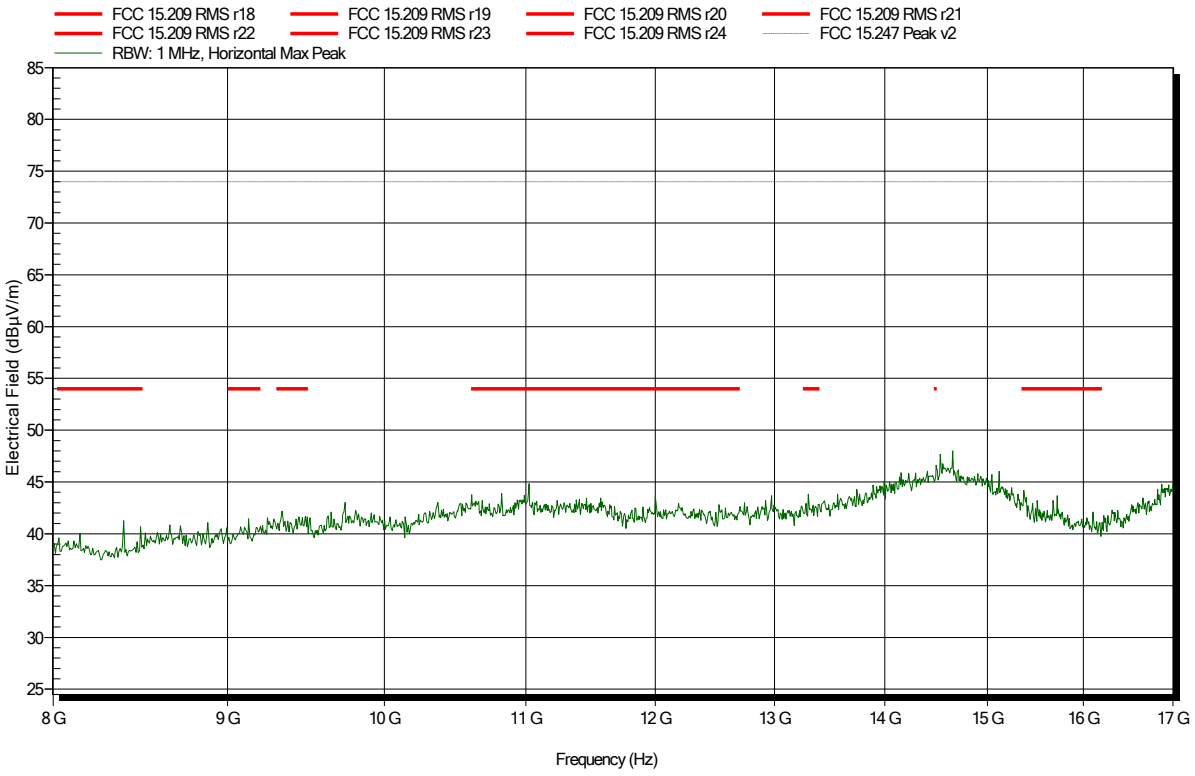

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; 2440MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-03
Note:	

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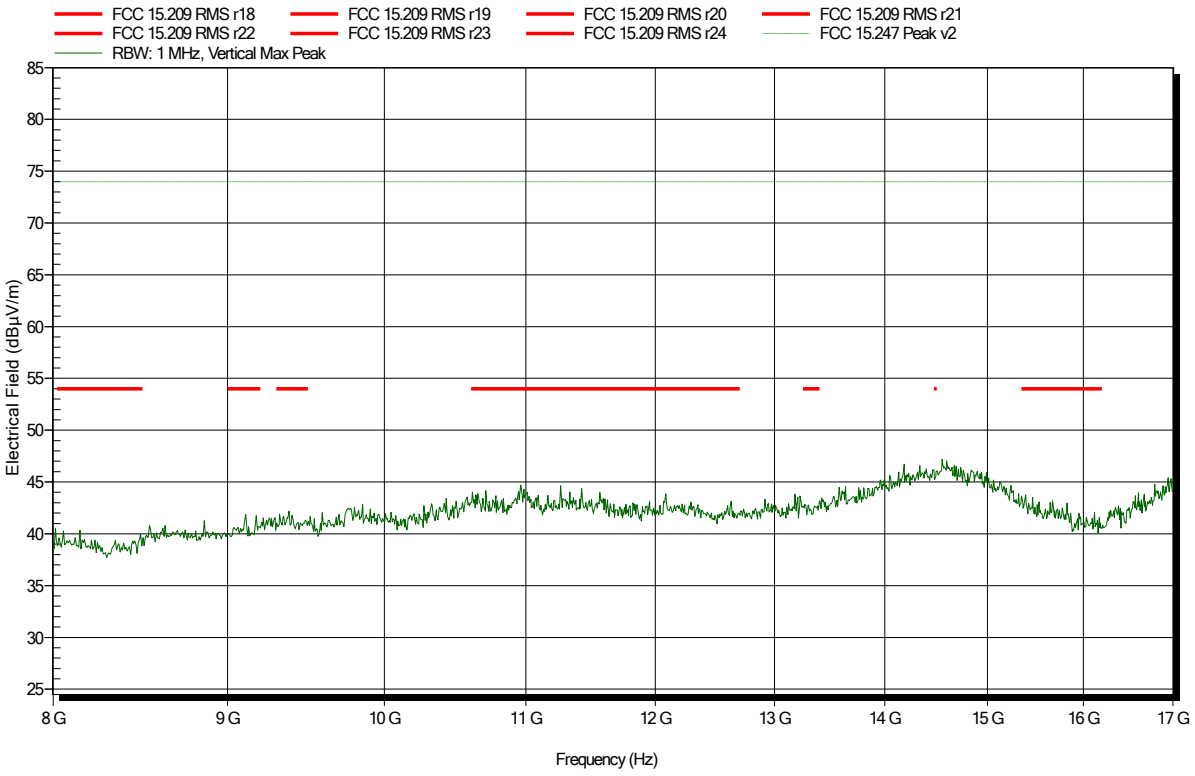

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Amplifier Research AT4560, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; 2440MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-03
Note:	

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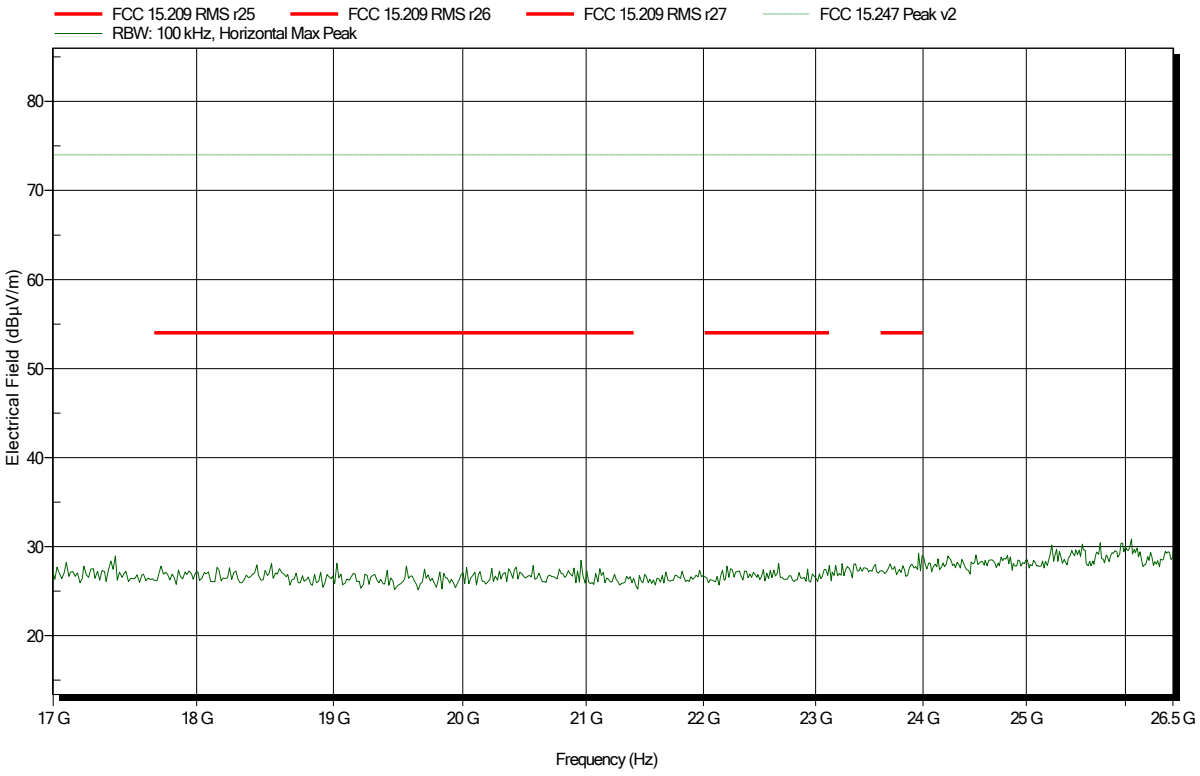

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Amplifier Research AT4560, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; 2440MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-03
Note:	

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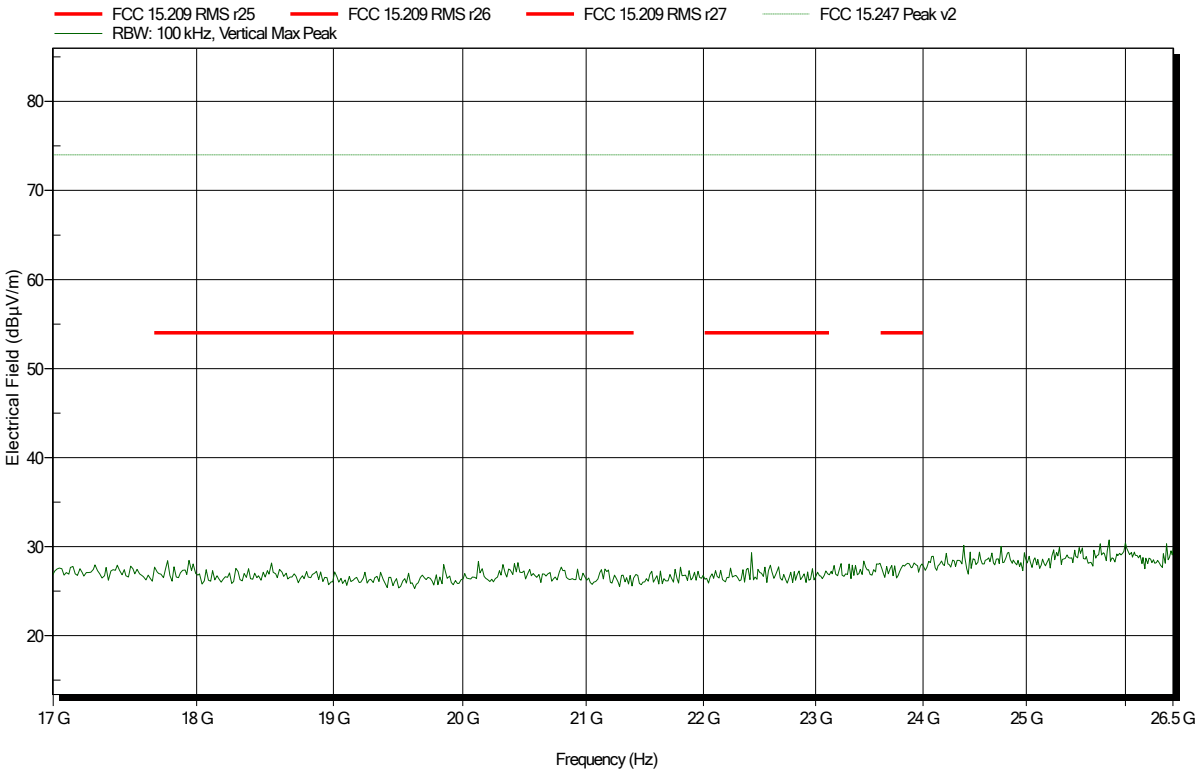

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	TX; 2480MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-06
Note:	

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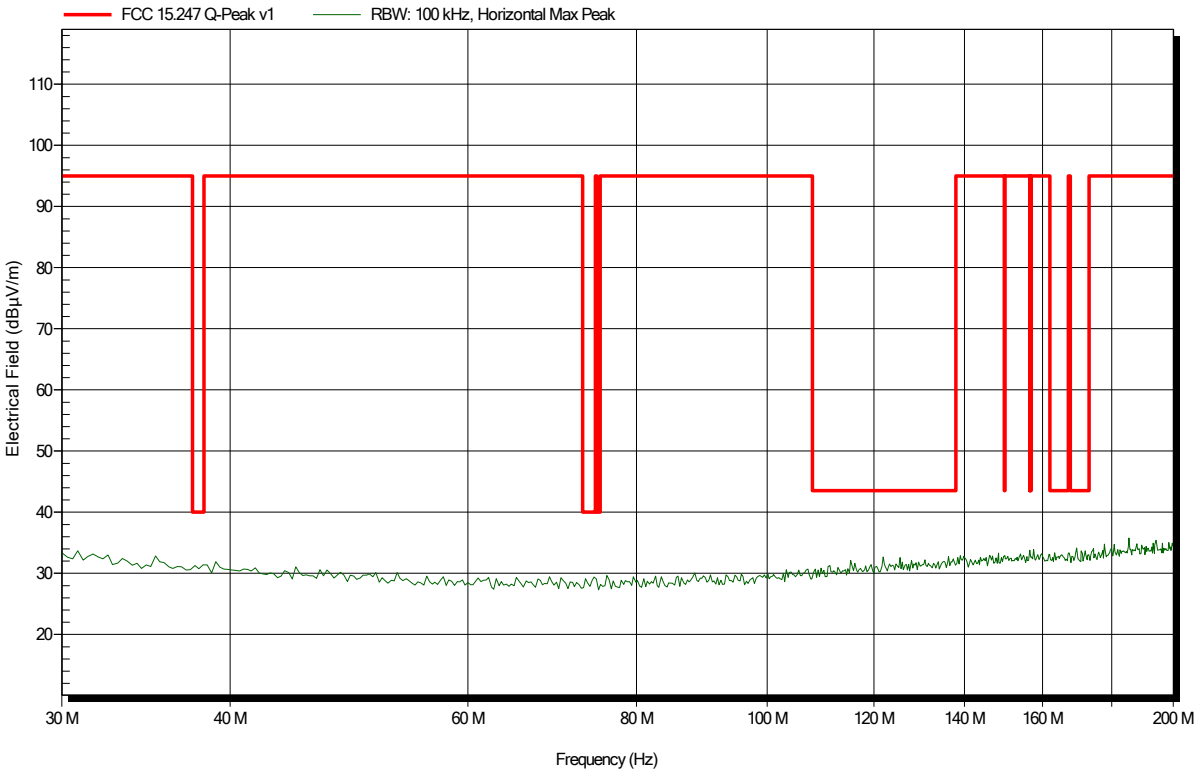

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	TX; 2480MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-06
Note:	

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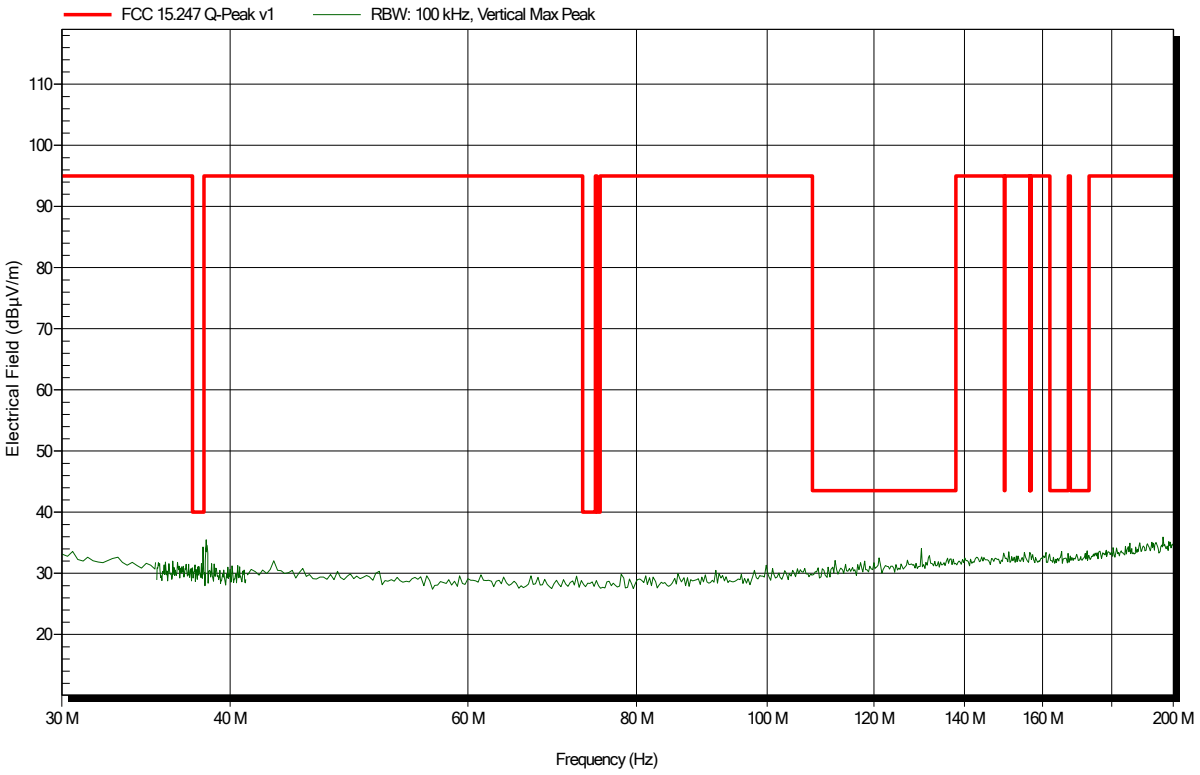

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	TX; 2480MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-06
Note:	

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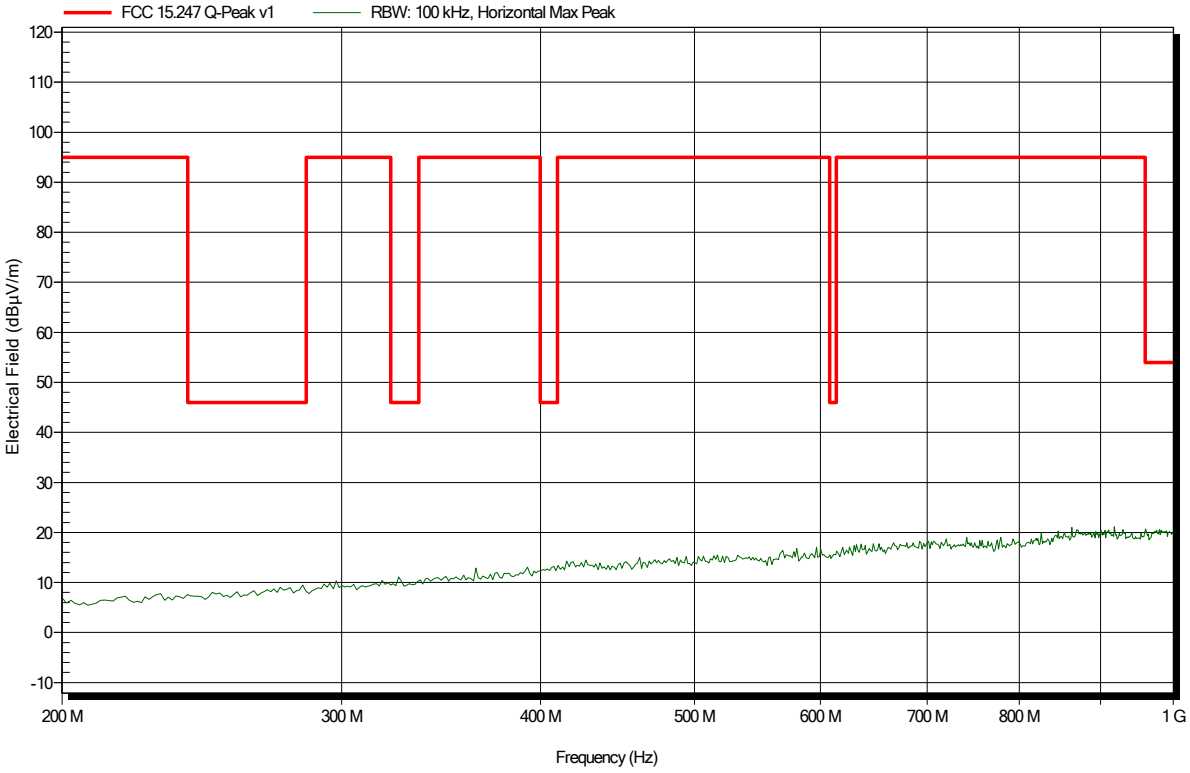

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	TX; 2480MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-06
Note:	

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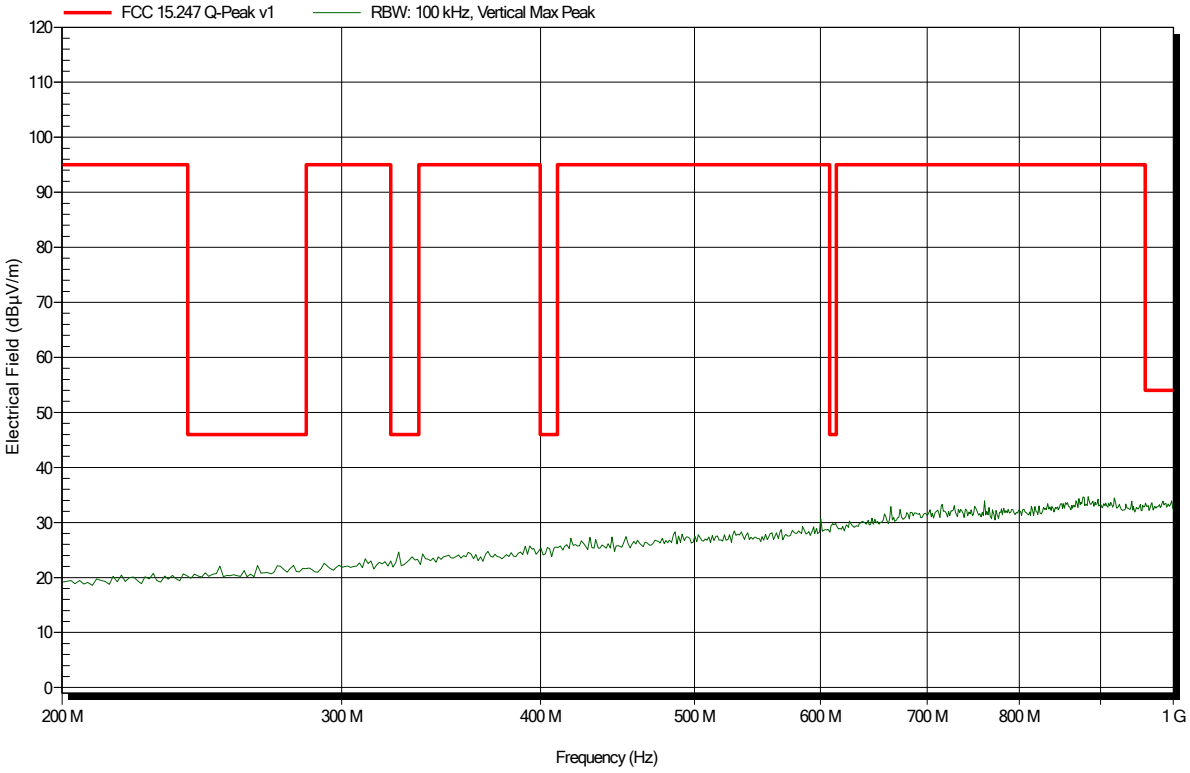

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; 2480MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-03
Note:	

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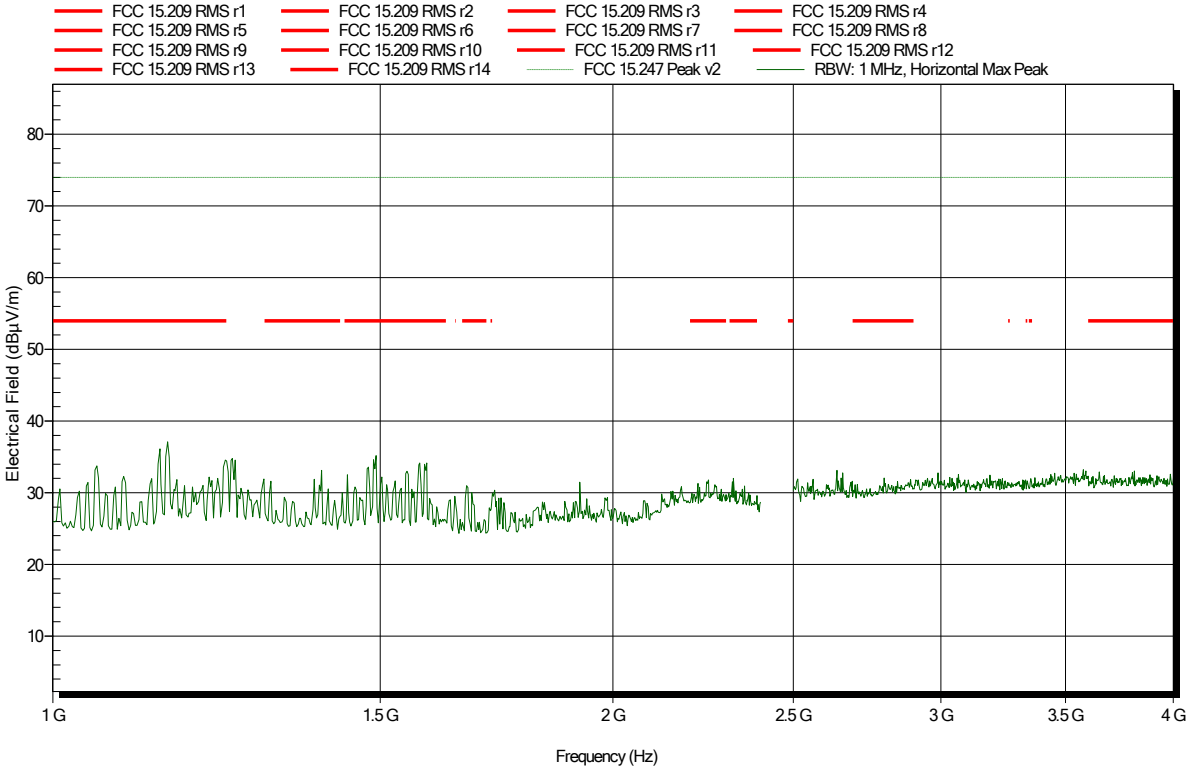

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; 2480MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-03
Note:	

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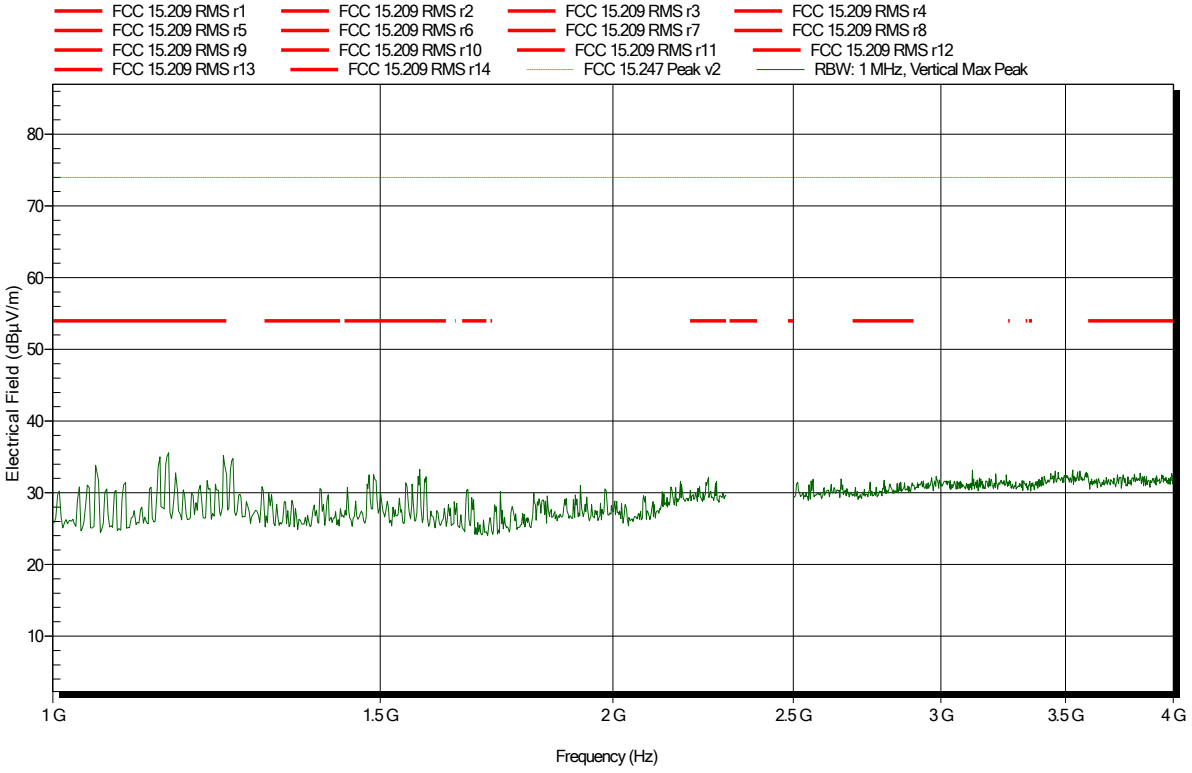

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; 2480MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-03
Note:	upper bandedge

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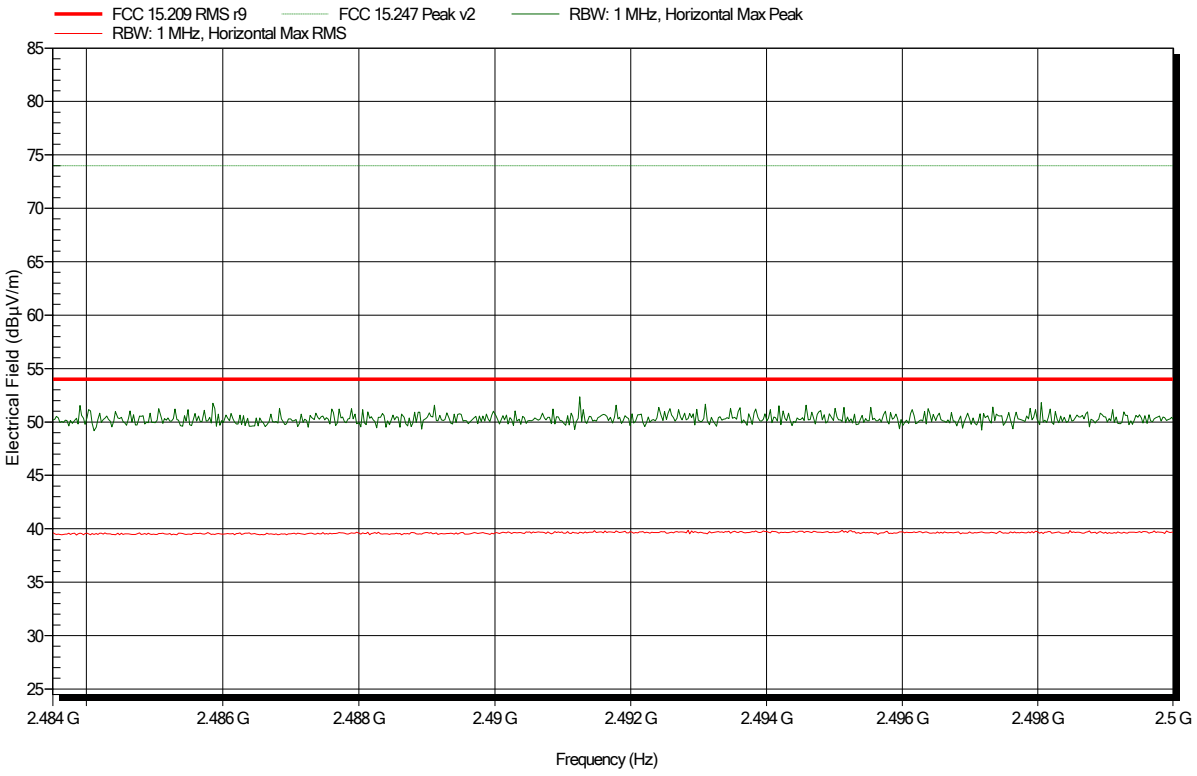

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; 2480MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-03
Note:	upper bandedge

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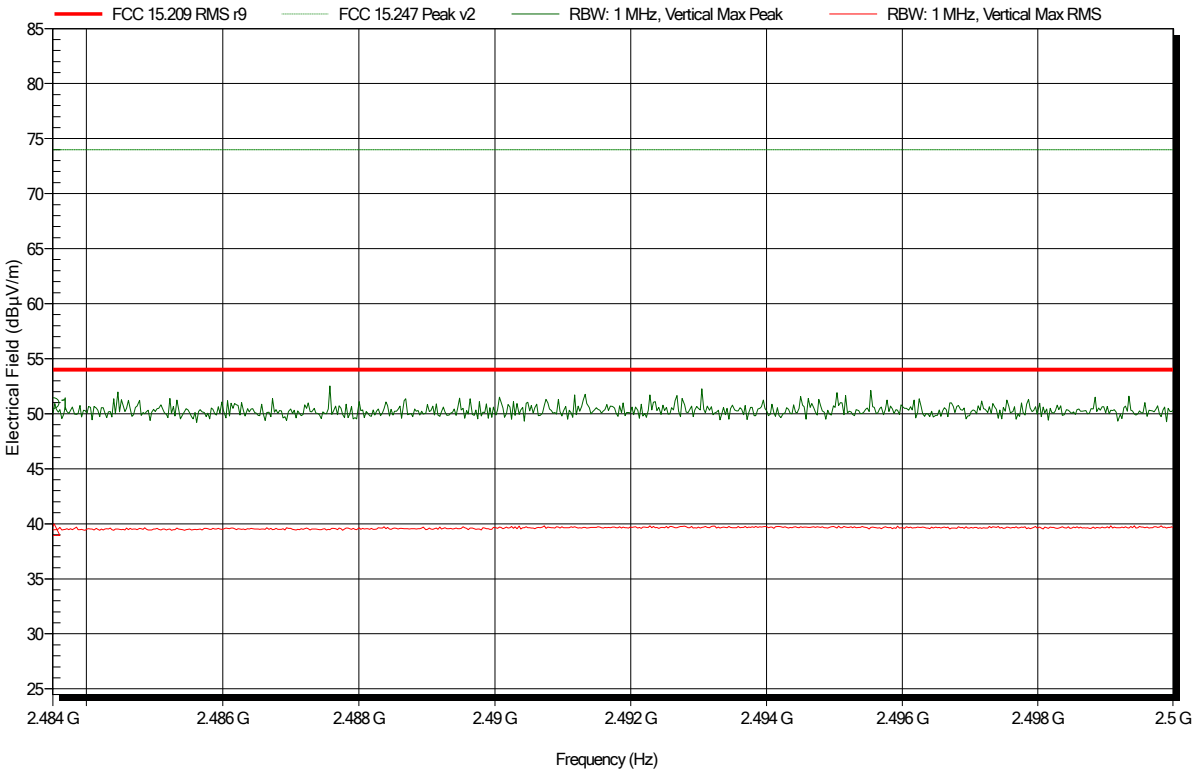

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.4835 GHz	50.92 dBµV/m	74 dBµV/m	-23.08 dB	Pass

Frequency	RMS	RMS Limit	RMS Difference	RMS Status
2.4835 GHz	39.46 dBµV/m	54 dBµV/m	-14.54 dB	Pass

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; 2480MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-03
Note:	

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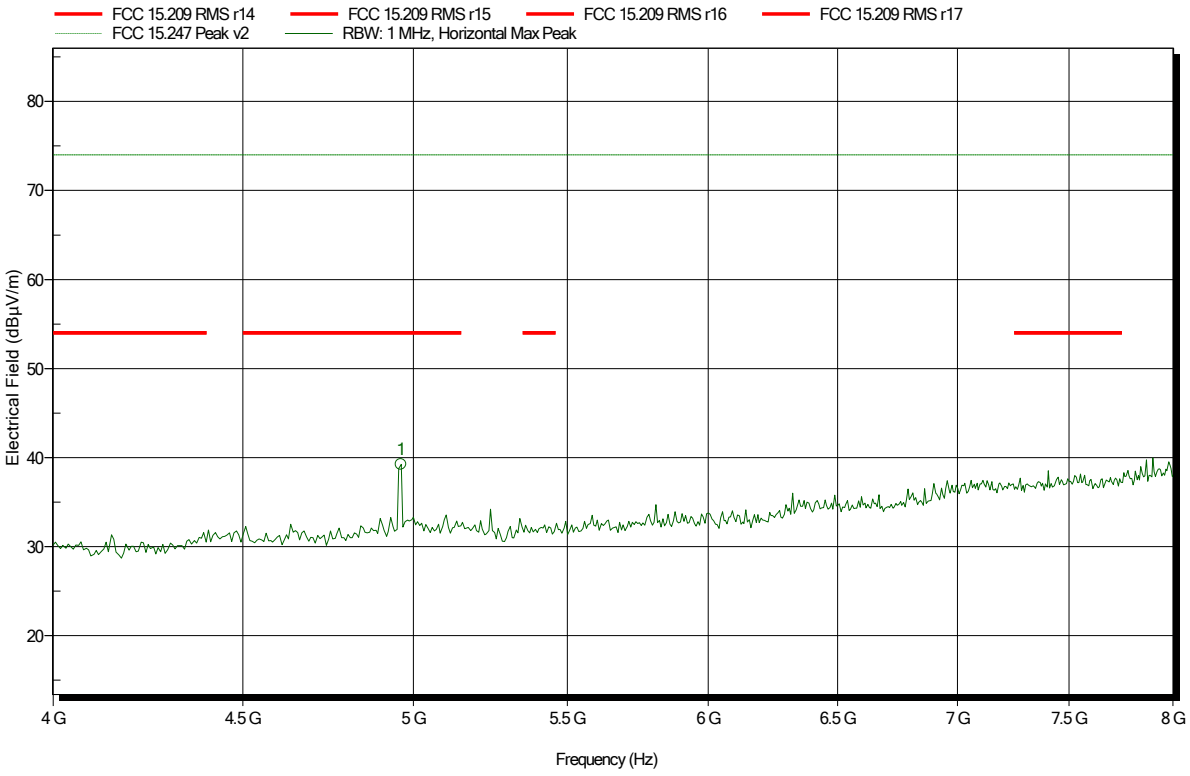

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
4.962 GHz	39.25 dBµV/m	74 dBµV/m	-34.75 dB	Pass

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; 2480MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-03
Note:	

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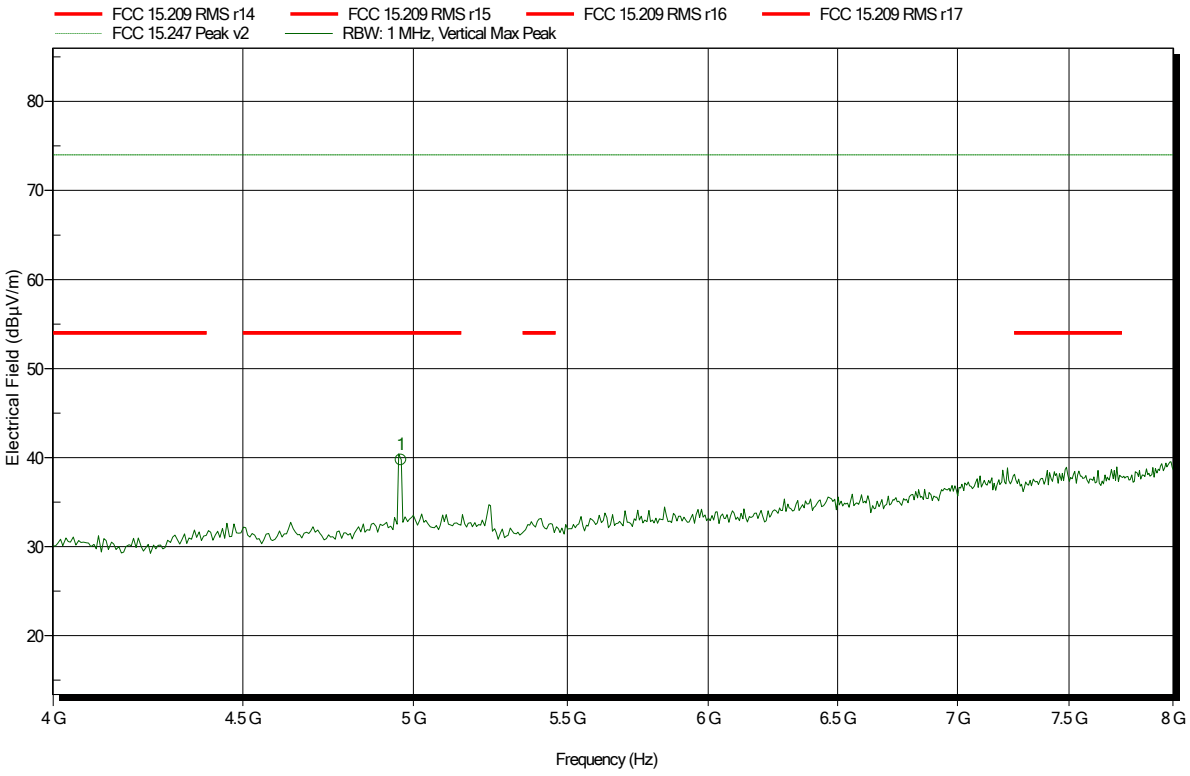

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
4.962 GHz	39.75 dBµV/m	74 dBµV/m	-34.25 dB	Pass

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; 2480MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-03
Note:	

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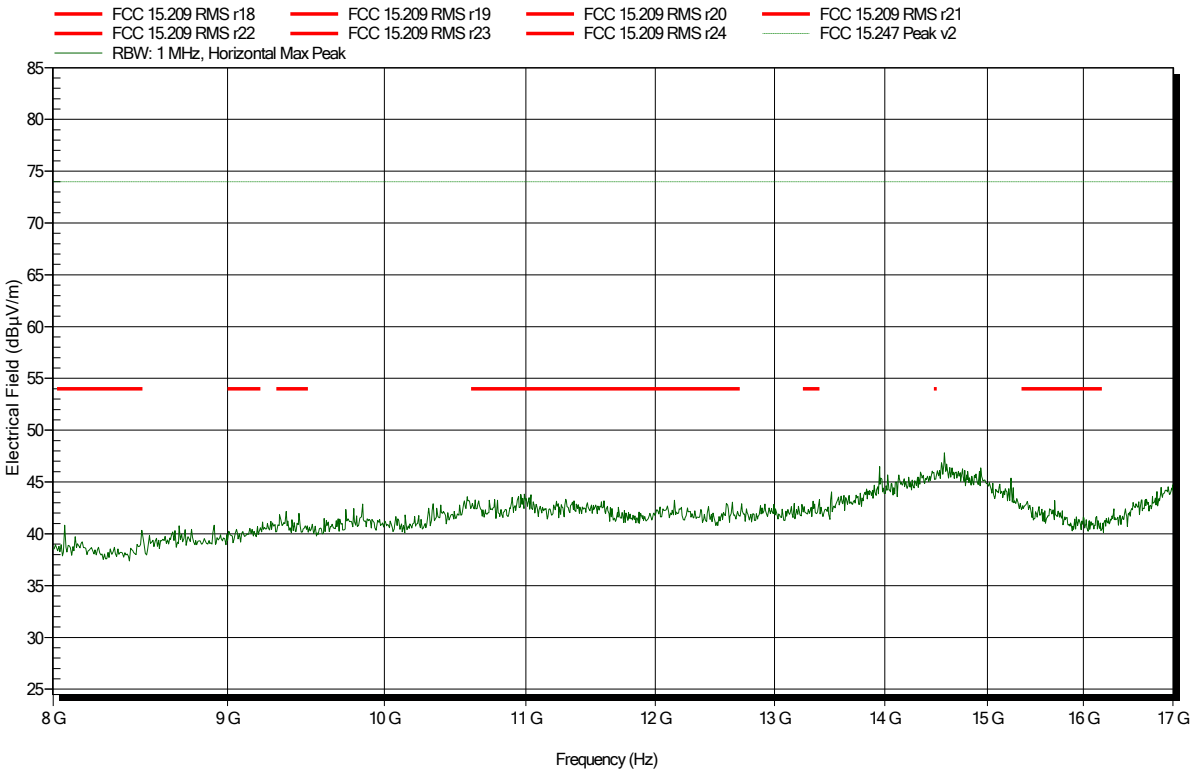

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; 2480MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-03
Note:	

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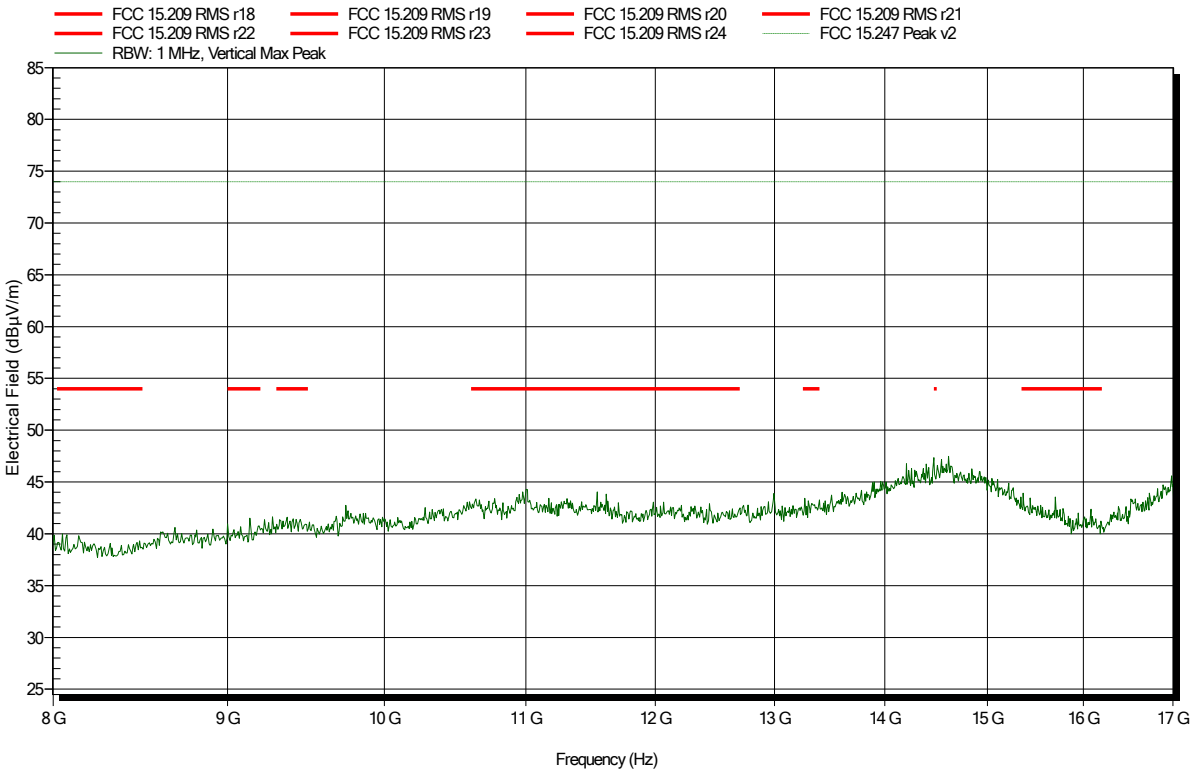

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Amplifier Research AT4560, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; 2480MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-03
Note:	

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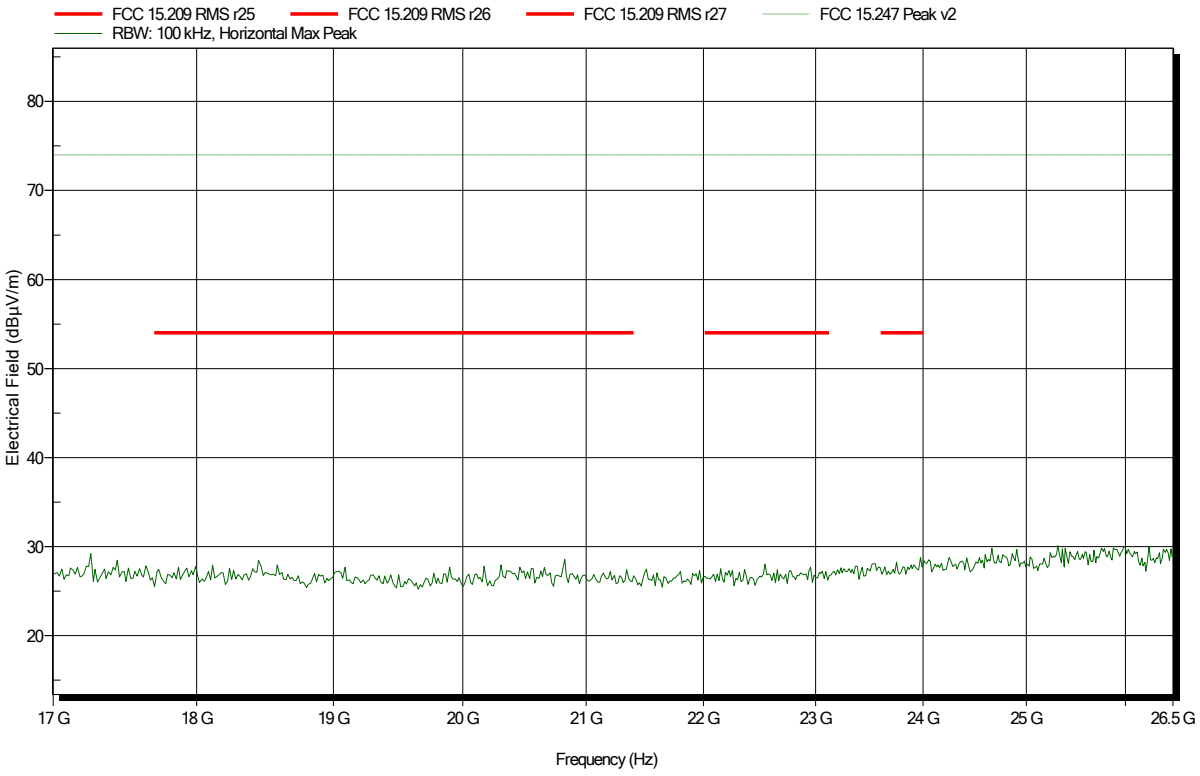

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Florian Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Amplifier Research AT4560, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; 2480MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-03
Note:	

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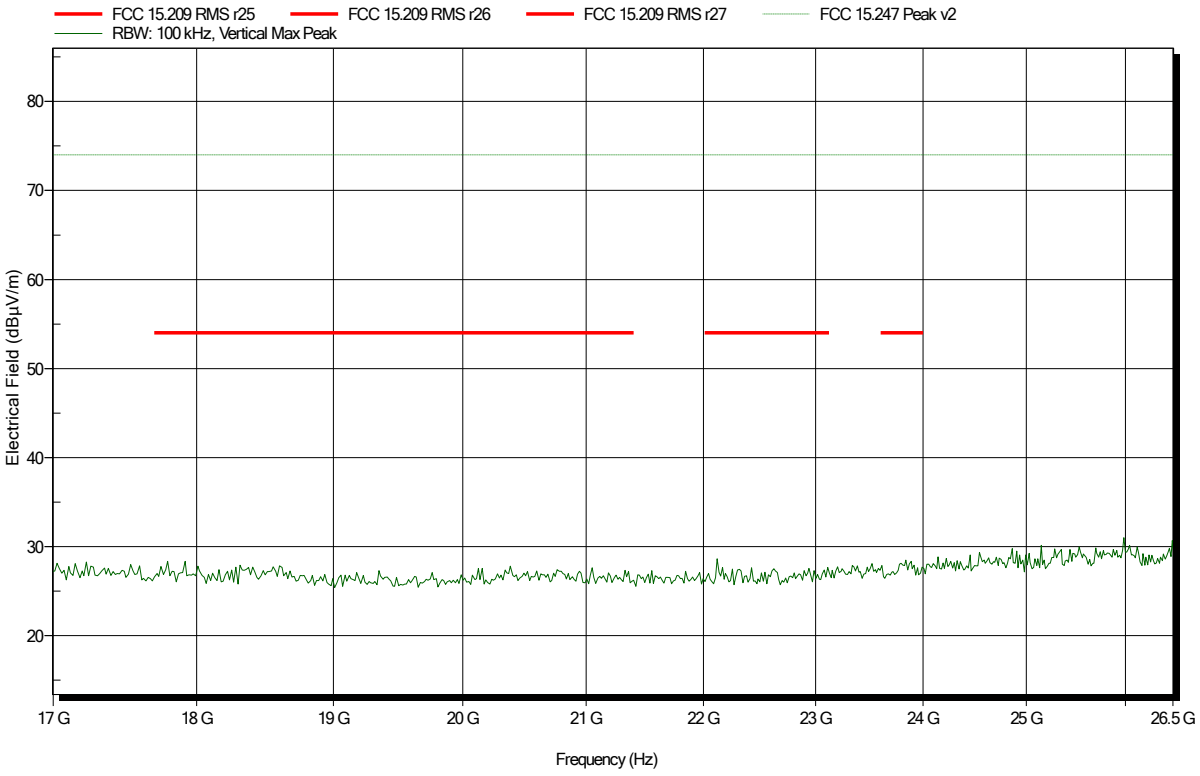

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Mr. Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Flann 22240-25, Horizontal
Measurement distance:	3 m
Mode:	TX; 2402MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-17
Note:	

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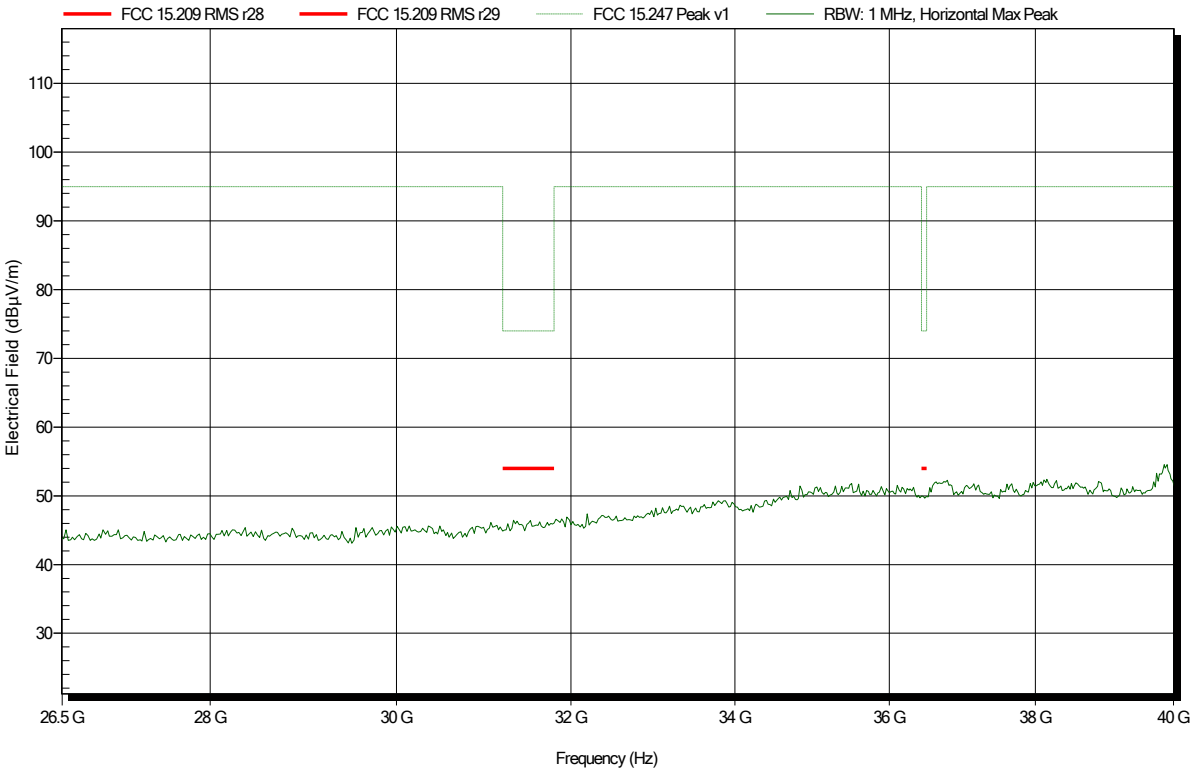

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Mr. Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Flann 22240-25, Vertical
Measurement distance:	3 m
Mode:	TX; 2402MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-17
Note:	

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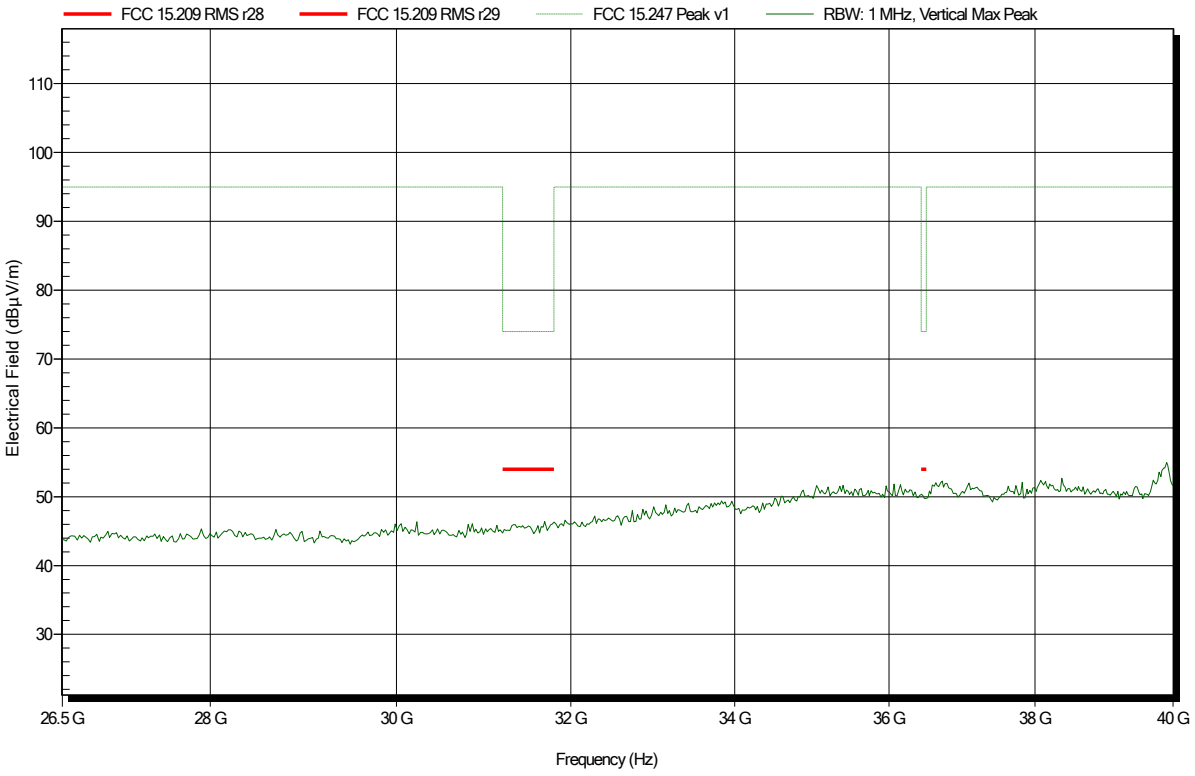

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Mr. Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Flann 22240-25, Horizontal
Measurement distance:	3 m
Mode:	TX; 2440MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-17
Note:	

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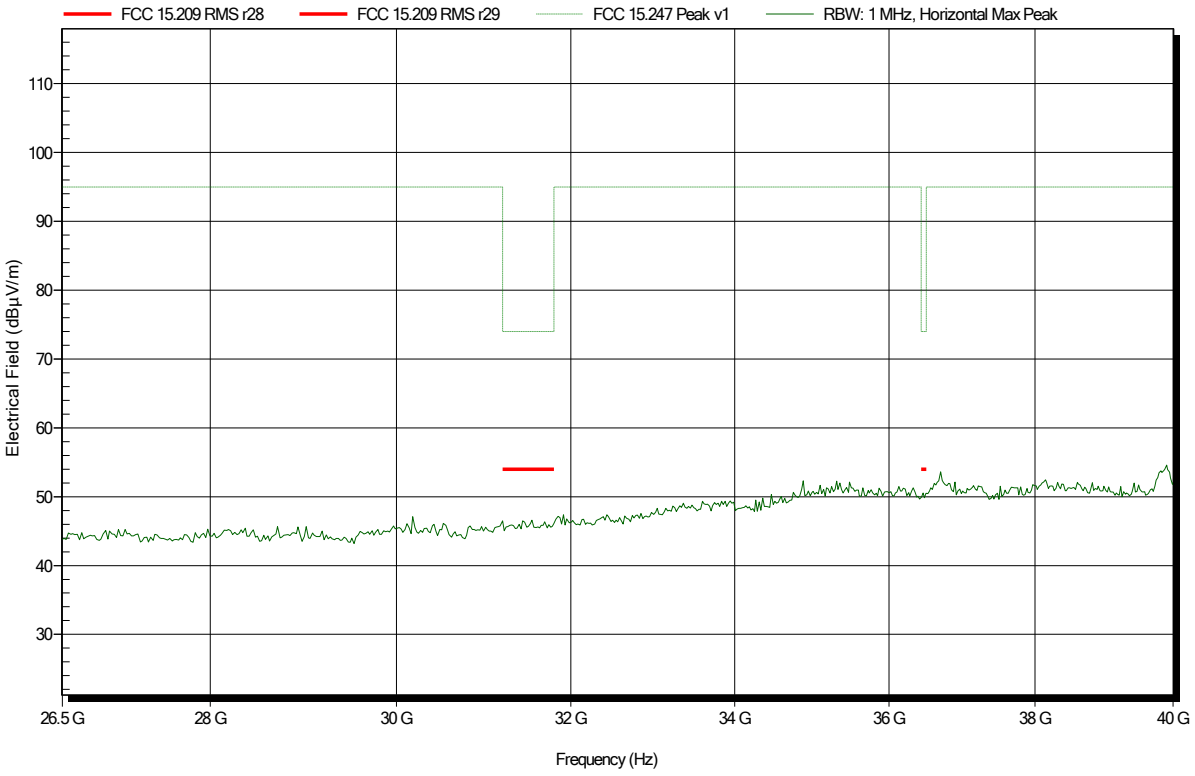

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Mr. Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Flann 22240-25, Vertical
Measurement distance:	3 m
Mode:	TX; 2440MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-17
Note:	

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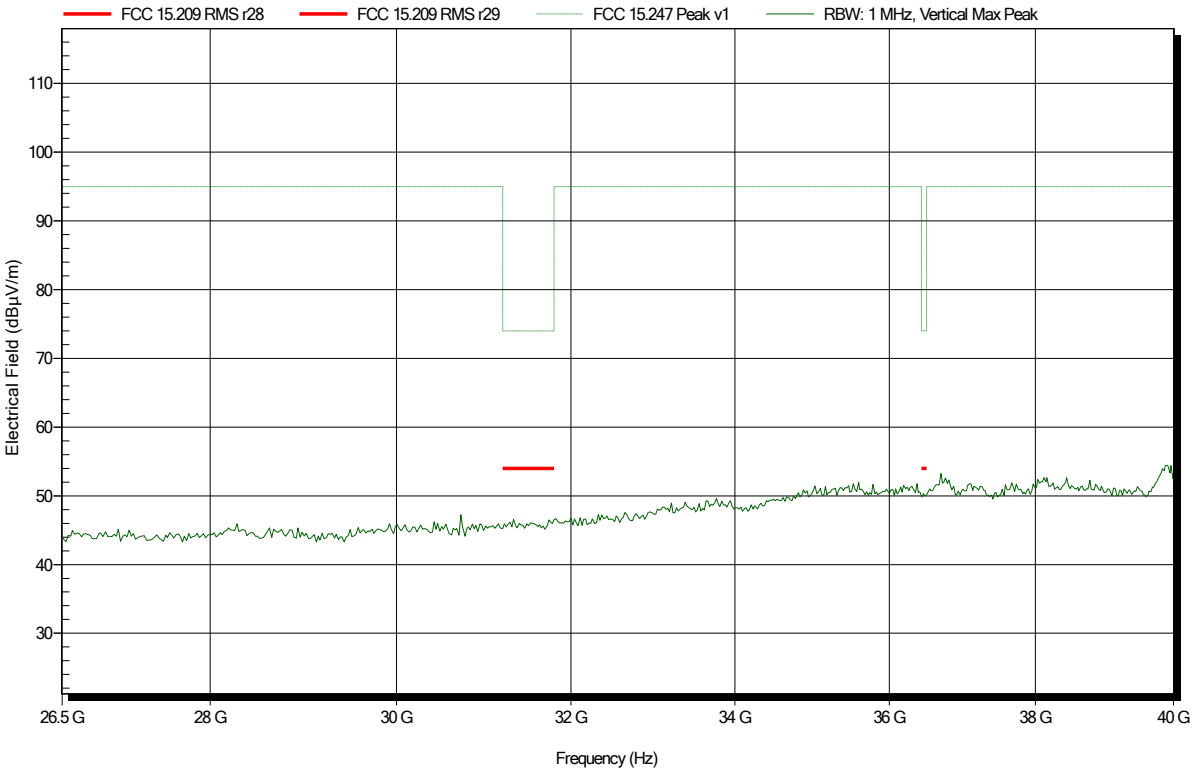

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Mr. Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Flann 22240-25, Horizontal
Measurement distance:	3 m
Mode:	TX; 2480MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-17
Note:	

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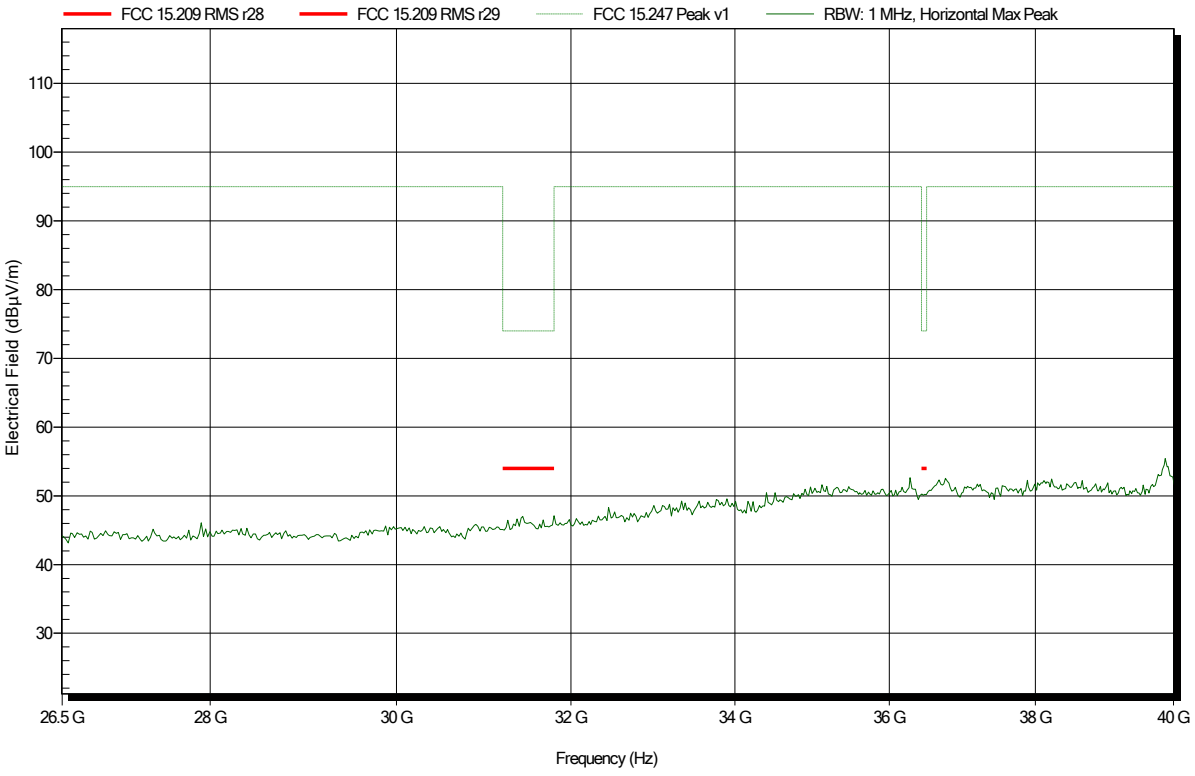

Spurious emissions according to FCC 47 e-CFR §15.247

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:	Mr. Voigt
Test Conditions:	Tnom: 24.3°C, Vnom: 3.3 VDC
Antenna:	Flann 22240-25, Vertical
Measurement distance:	3 m
Mode:	TX; 2480MHz, 2-GFSK, 37byte packetlength
Test Date:	2020-07-17
Note:	

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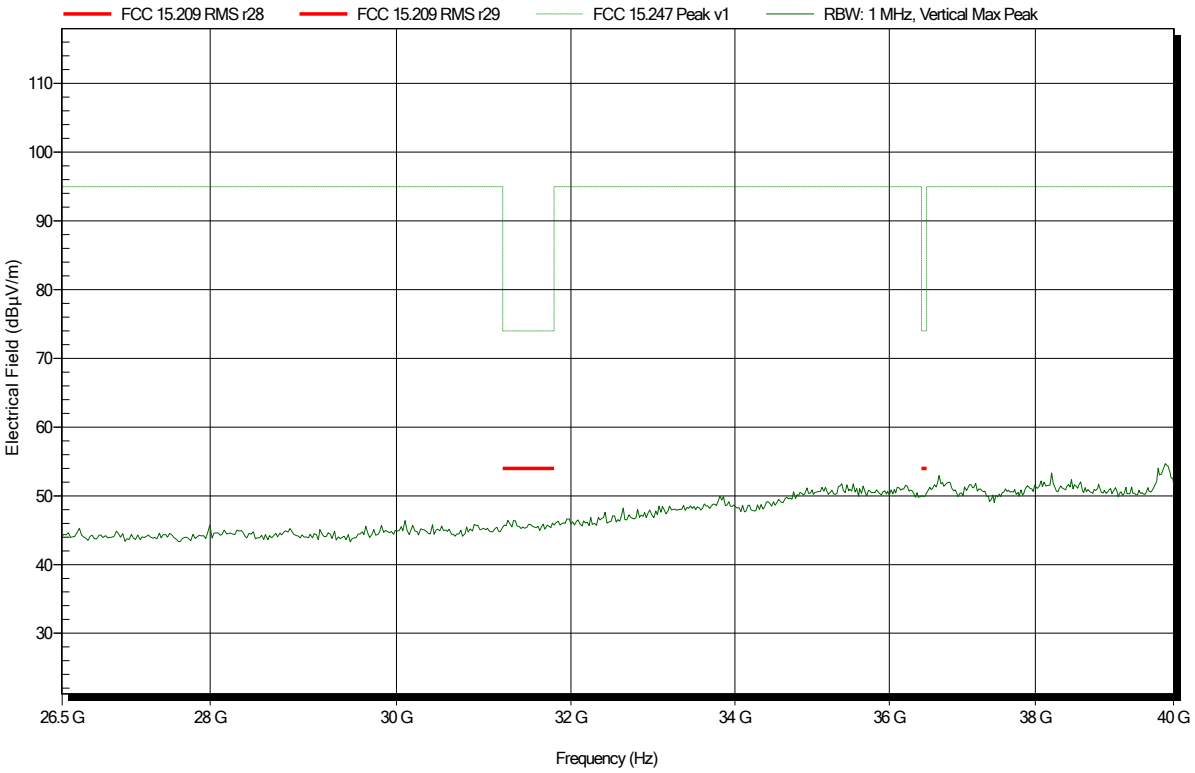

ANNEX B Receiver spurious emissions

Spurious emissions according to ISED RSS-247 Issue 2 (February 2017)

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:	Florian Voigt
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 24.9°C, Vnom: 3.3 VDC
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	RX; 2440MHz
Test Date:	2020-07-06
Note:	

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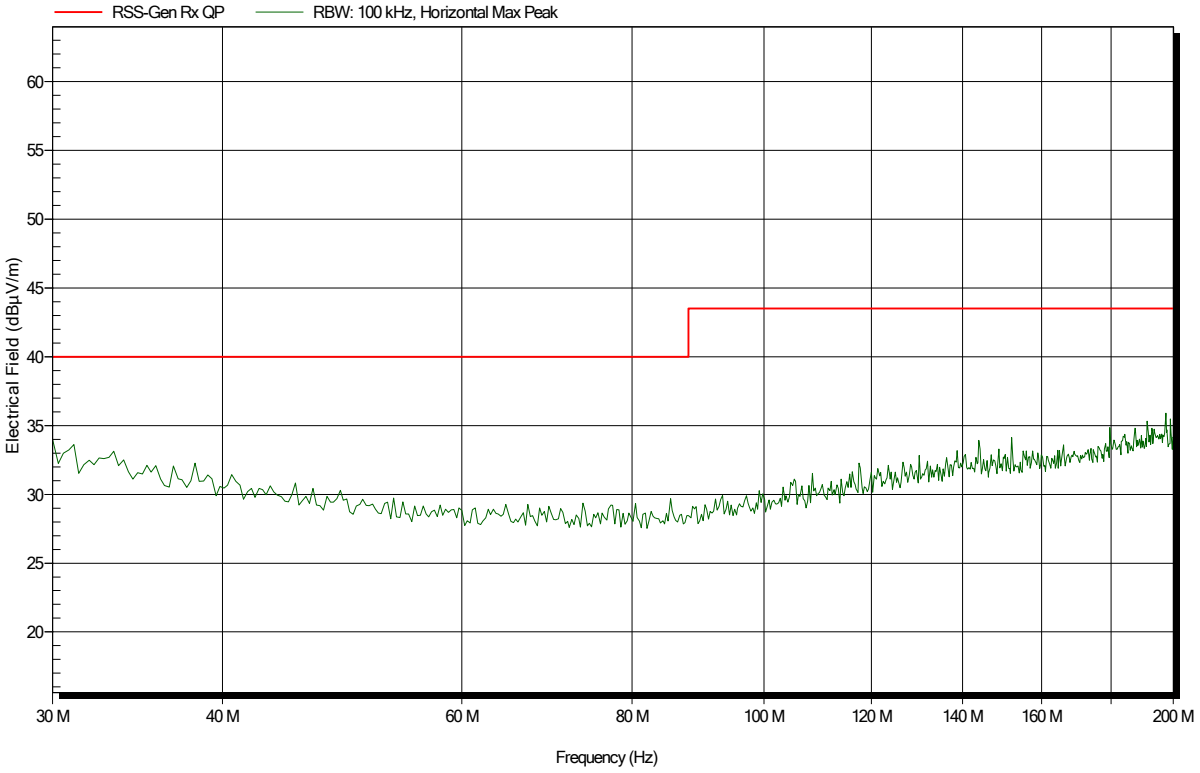

Spurious emissions according to ISED RSS-247 Issue 2 (February 2017)

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:	Florian Voigt
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 24.9°C, Vnom: 3.3 VDC
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	RX; 2440MHz
Test Date:	2020-07-06
Note:	

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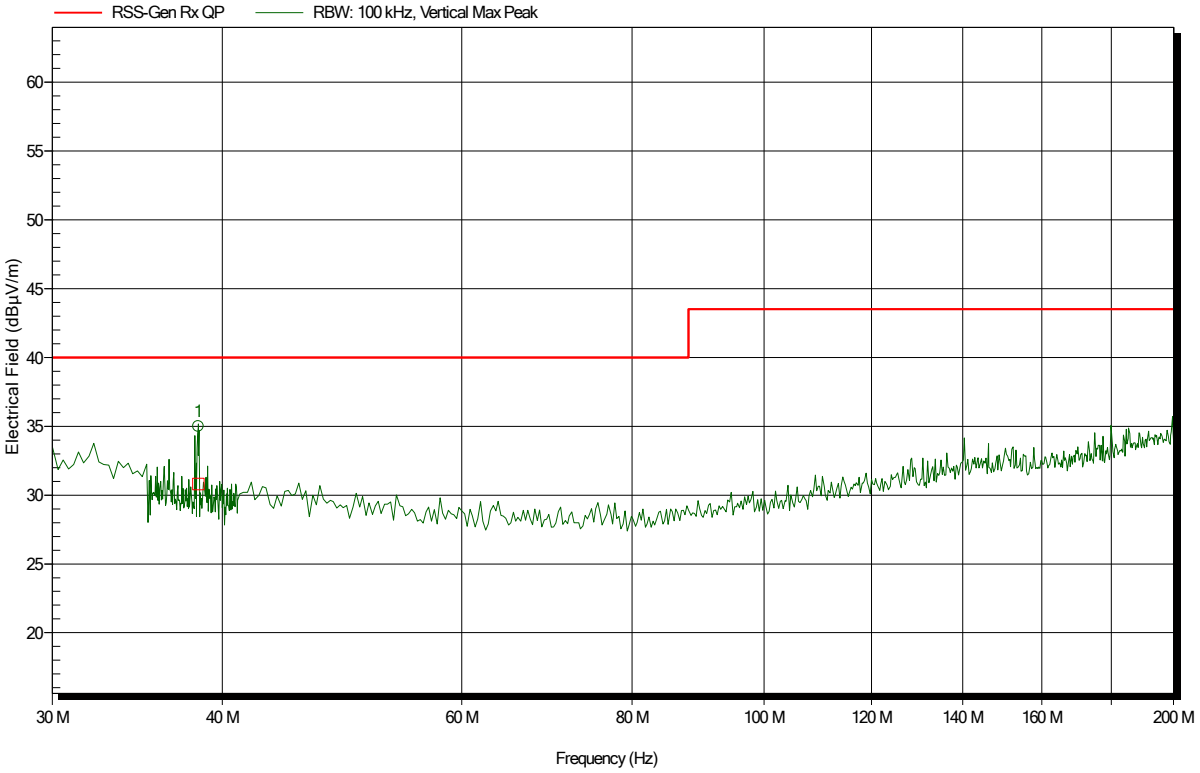

Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
38.41 MHz	30.8 dBµV/m	40 dBµV/m	-9.2 dB	Pass

Spurious emissions according to ISED RSS-247 Issue 2 (February 2017)

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:	Florian Voigt
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 24.9°C, Vnom: 3.3 VDC
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	RX; 2440MHz
Test Date:	2020-07-06
Note:	

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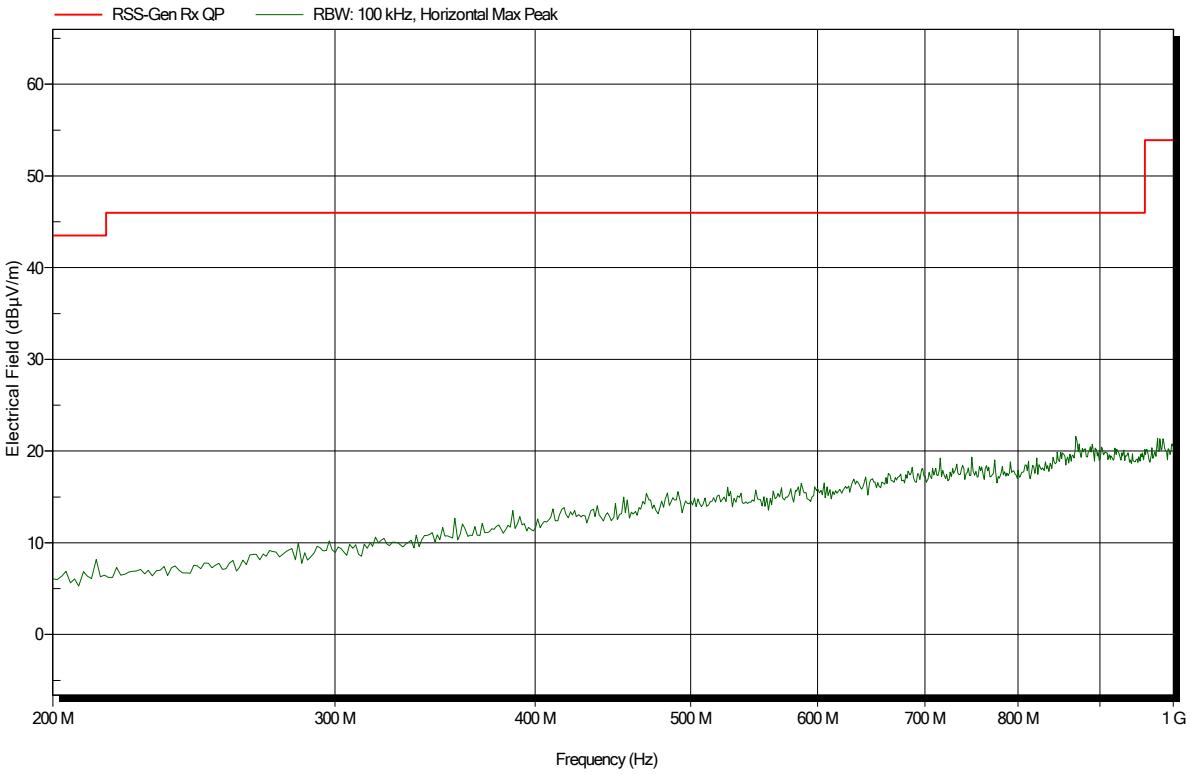

Spurious emissions according to ISED RSS-247 Issue 2 (February 2017)

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:	Florian Voigt
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 24.9°C, Vnom: 3.3 VDC
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	RX; 2440MHz
Test Date:	2020-07-06
Note:	

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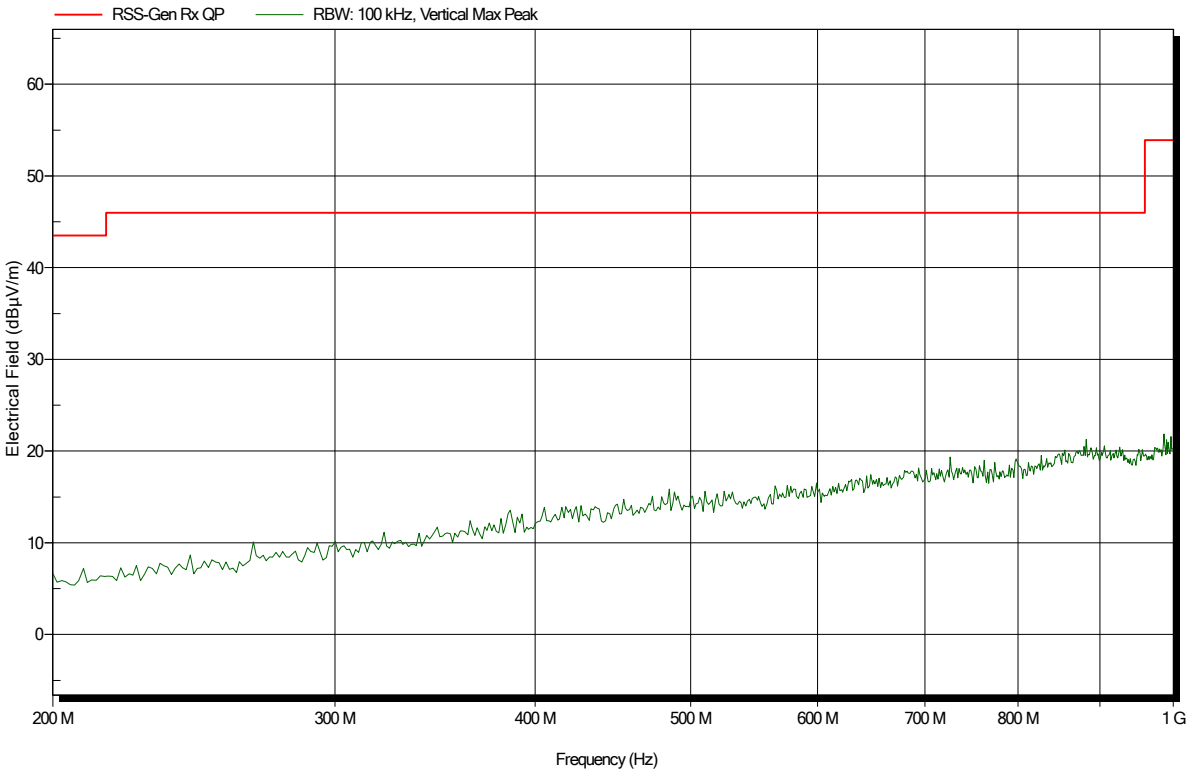

Spurious emissions according to ISED RSS-247 Issue 2 (February 2017)

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:	Florian Voigt
Test Conditions:	Tnom: 24.9°C, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	RX; 2440MHz
Test Date:	2020-07-03
Note:	

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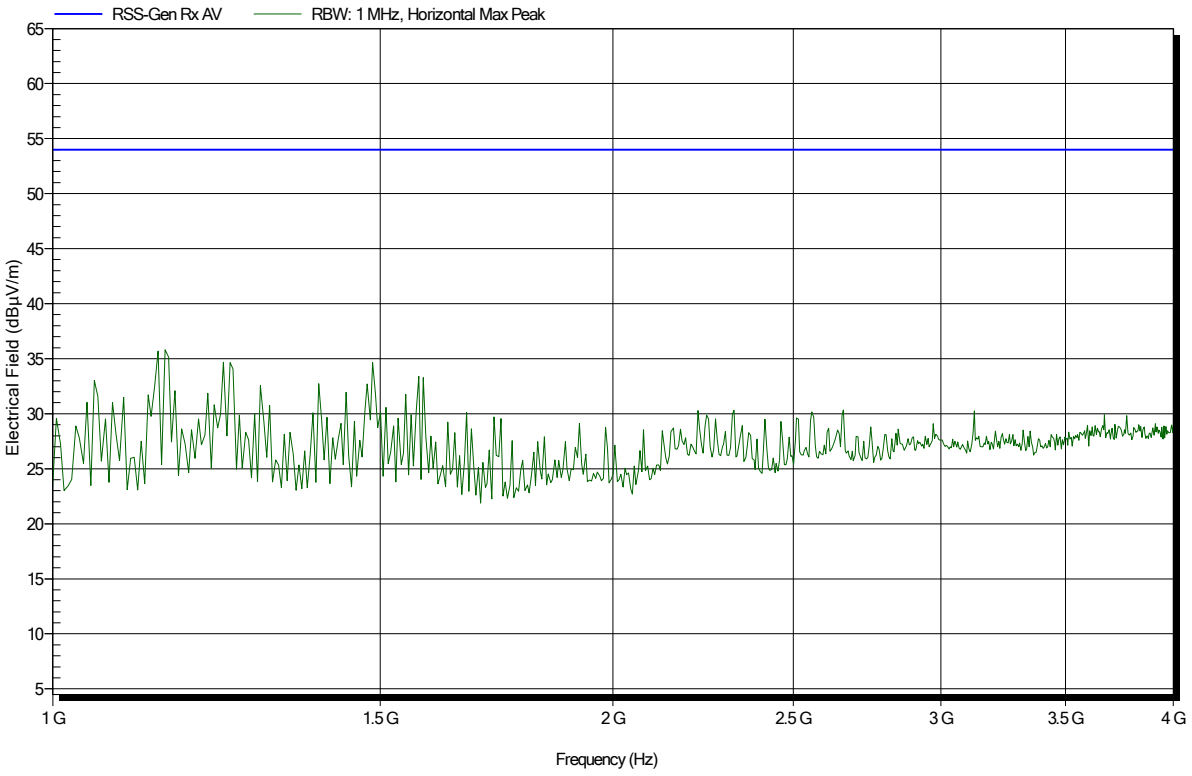

Spurious emissions according to ISED RSS-247 Issue 2 (February 2017)

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:	Florian Voigt
Test Conditions:	Tnom: 24.9°C, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	RX; 2440MHz
Test Date:	2020-07-03
Note:	

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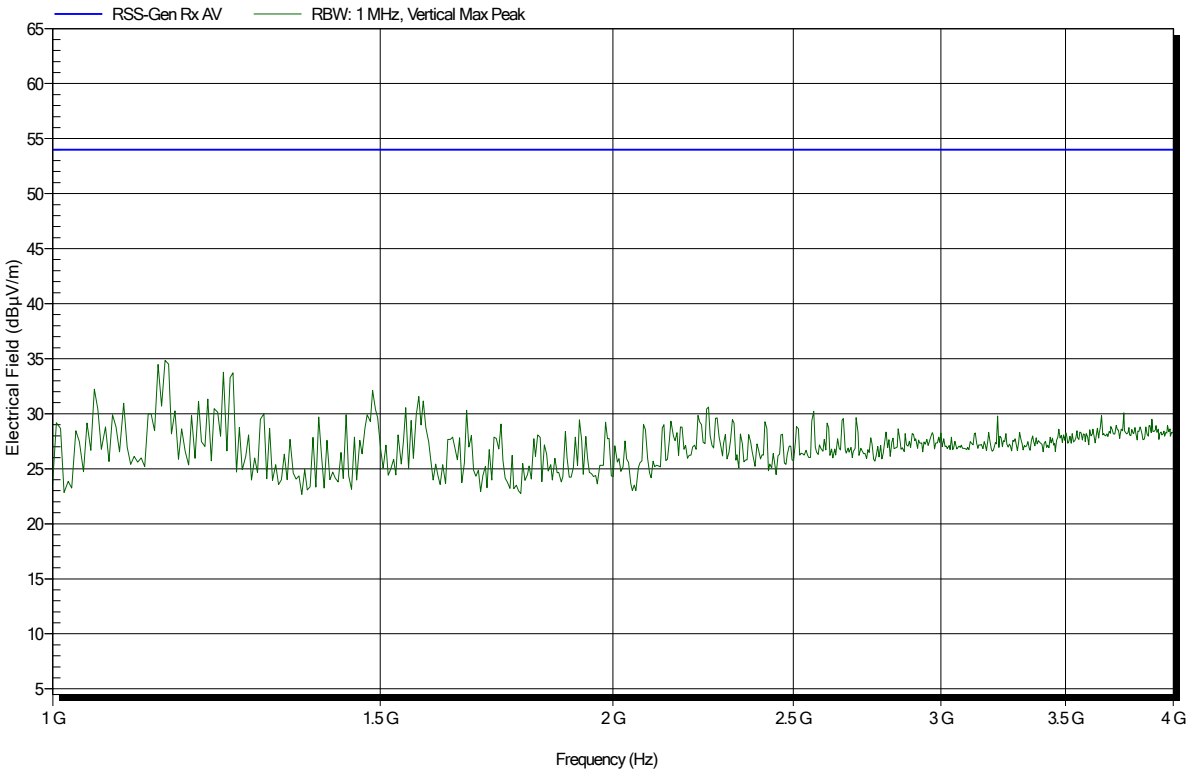

Spurious emissions according to ISED RSS-247 Issue 2 (February 2017)

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Applicant:	In-Circuit GmbH
EUT Name:	radio module with integrated microcontroller (nRF52840), BLE and UWB interface (DW1000)
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Operator:	Florian Voigt
Test Conditions:	Tnom: 24.9°C, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	RX; 2440MHz
Test Date:	2020-07-03
Note:	

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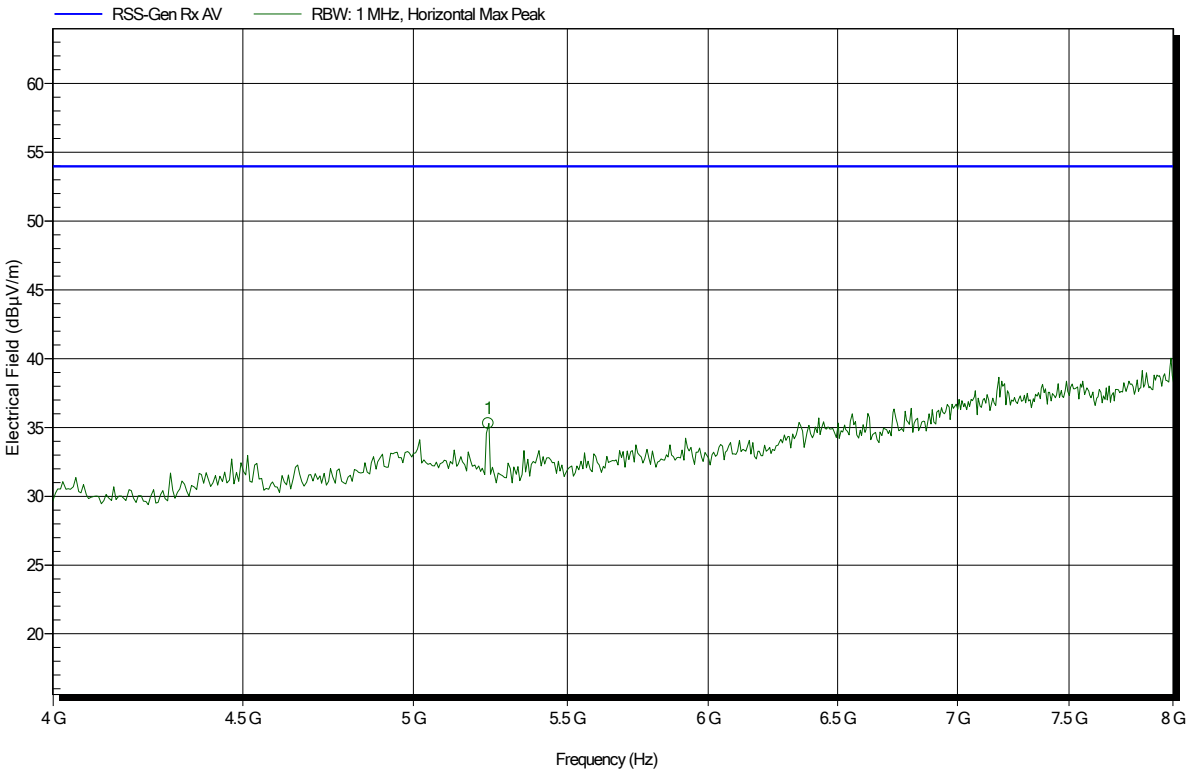

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
5.237 GHz	35.29 dBµV/m	53.98 dBµV/m	-18.69 dB	Pass

Spurious emissions according to ISED RSS-247 Issue 2 (February 2017)

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Applicant:	In-Circuit GmbH
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Model:	radino40 DW1000
Test Site:	Eurofins Product Service GmbH
Operator:	Florian Voigt
Test Conditions:	Tnom: 24.9°C, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	RX; 2440MHz
Test Date:	2020-07-03
Note:	

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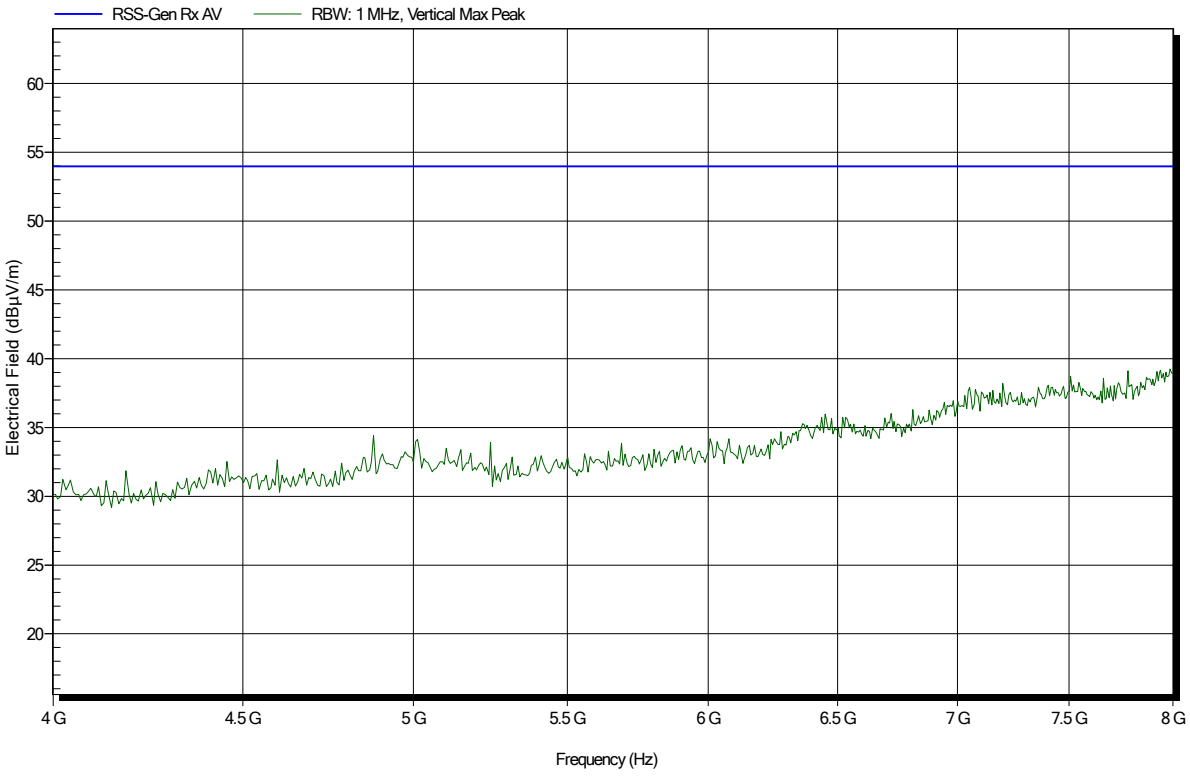

Spurious emissions according to ISED RSS-247 Issue 2 (February 2017)

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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:	Florian Voigt
Test Conditions:	Tnom: 24.9°C, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	RX; 2440MHz
Test Date:	2020-07-03
Note:	

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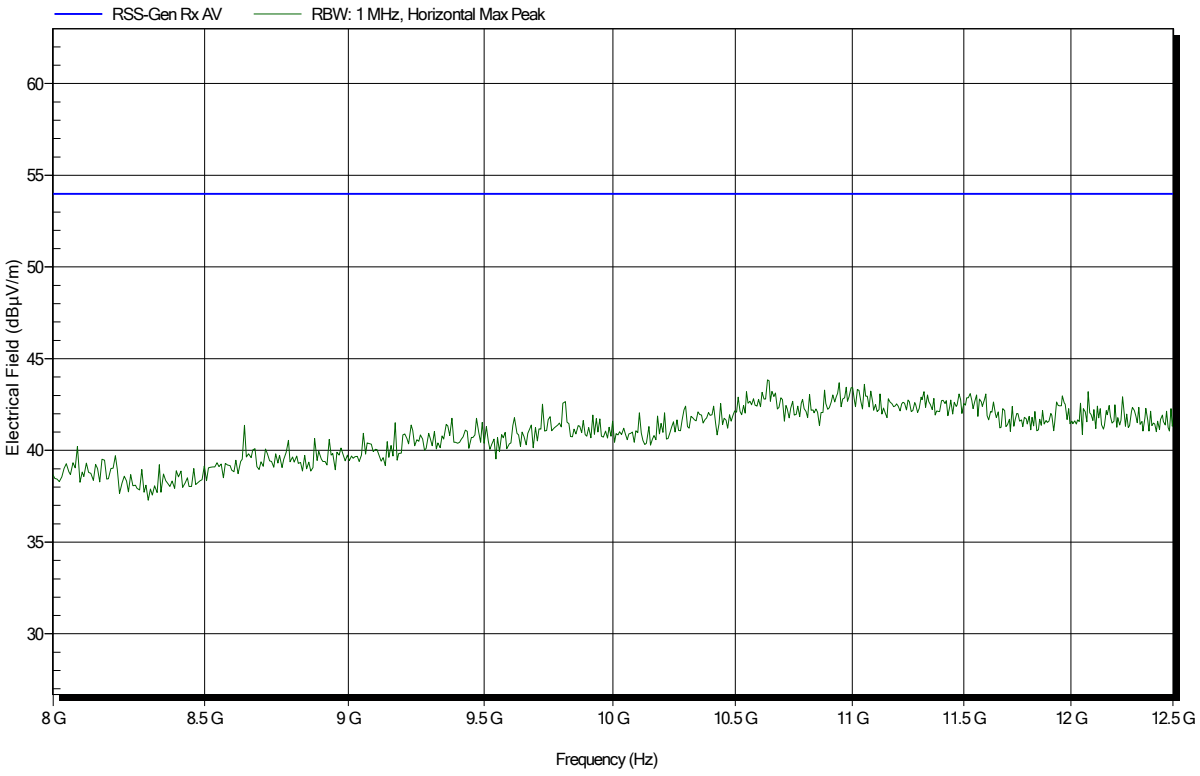

Spurious emissions according to ISED RSS-247 Issue 2 (February 2017)

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:	Florian Voigt
Test Conditions:	Tnom: 24.9°C, Vnom: 3.3 VDC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	RX; 2440MHz
Test Date:	2020-07-03
Note:	

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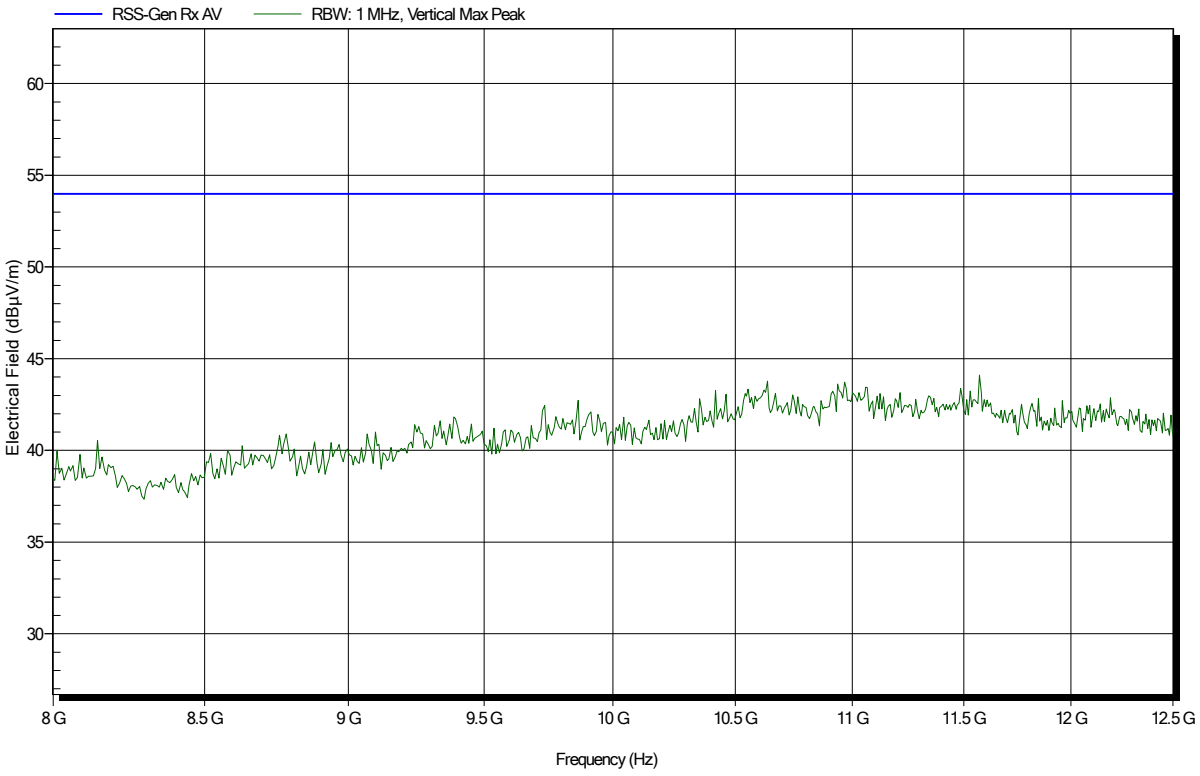

Spurious emissions according to ISED RSS-247 Issue 2 (February 2017)

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:	Mr. Voigt
Test Conditions:	Tnom: 24.9°C, Vnom: 3.3 VDC
Antenna:	BBHA 9120D, Horizontal
Measurement distance:	3 m
Mode:	RX; 2440MHz
Test Date:	2020-07-17
Note:	

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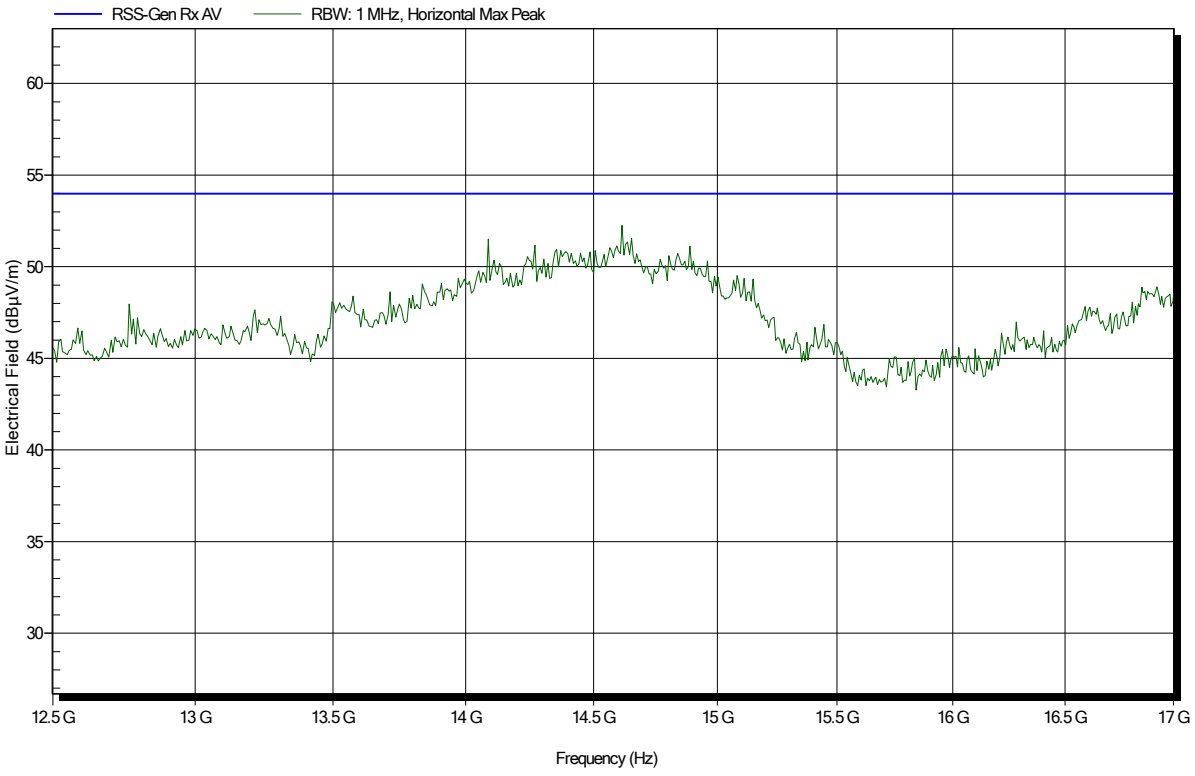

Spurious emissions according to ISED RSS-247 Issue 2 (February 2017)

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:	Mr. Voigt
Test Conditions:	Tnom: 24.9°C, Vnom: 3.3 VDC
Antenna:	BBHA 9120D, Vertical
Measurement distance:	3 m
Mode:	RX; 2440MHz
Test Date:	2020-07-17
Note:	

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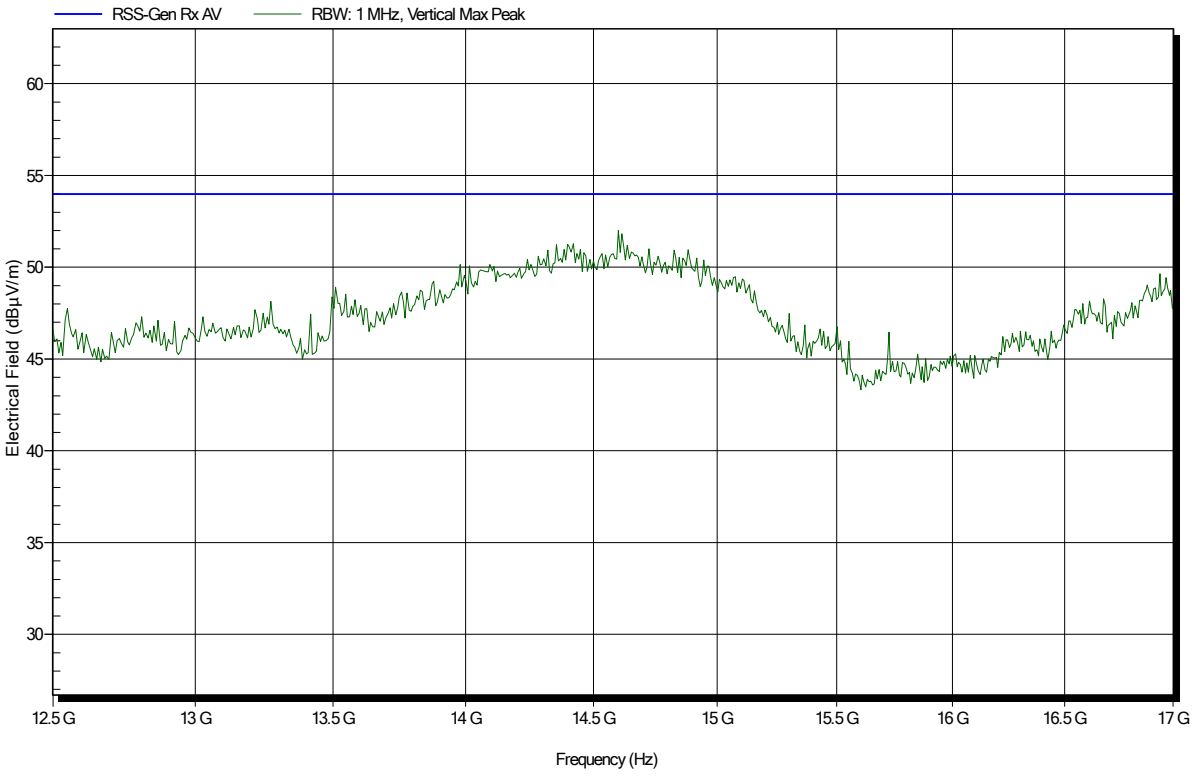

Spurious emissions according to ISED RSS-247 Issue 2 (February 2017)

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:	Mr. Voigt
Test Conditions:	Tnom: 24.9°C, Vnom: 3.3 VDC
Antenna:	Amplifier Research AT4560, Horizontal
Measurement distance:	3 m
Mode:	RX; 2440MHz
Test Date:	2020-07-17
Note:	

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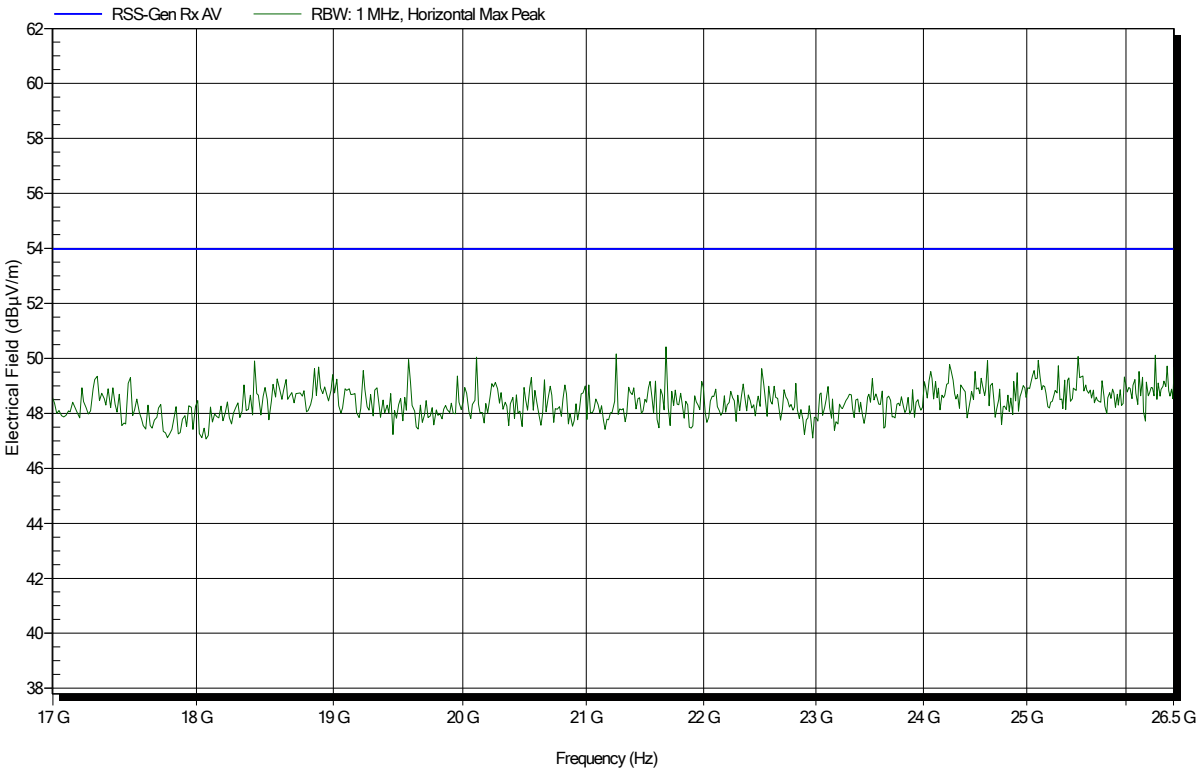

Spurious emissions according to ISED RSS-247 Issue 2 (February 2017)

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:	Mr. Voigt
Test Conditions:	Tnom: 24.9°C, Vnom: 3.3 VDC
Antenna:	Amplifier Research AT4560, Vertical
Measurement distance:	3 m
Mode:	RX; 2440MHz
Test Date:	2020-07-17
Note:	

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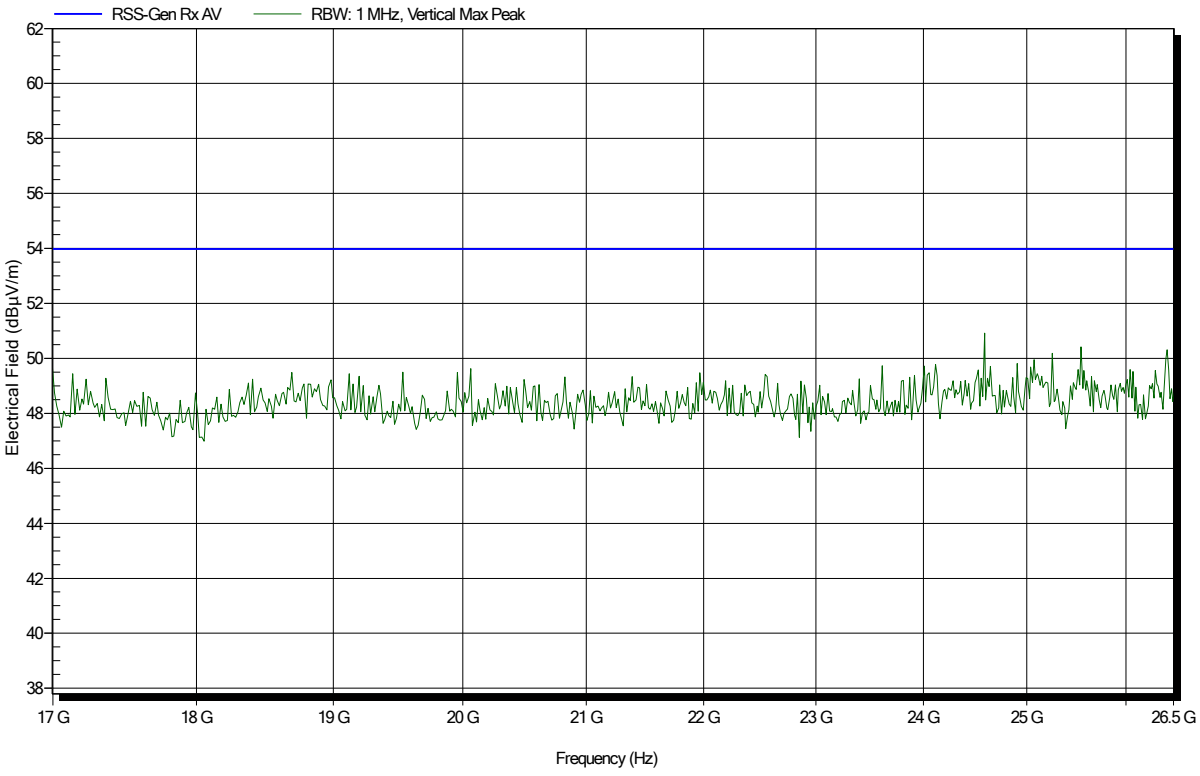

Spurious emissions according to ISED RSS-247 Issue 2 (February 2017)

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:	Mr. Voigt
Test Conditions:	Tnom: 24.9°C, Vnom: 3.3 VDC
Antenna:	Flann 22240-25, Horizontal
Measurement distance:	3 m
Mode:	RX; 2440MHz
Test Date:	2020-07-17
Note:	

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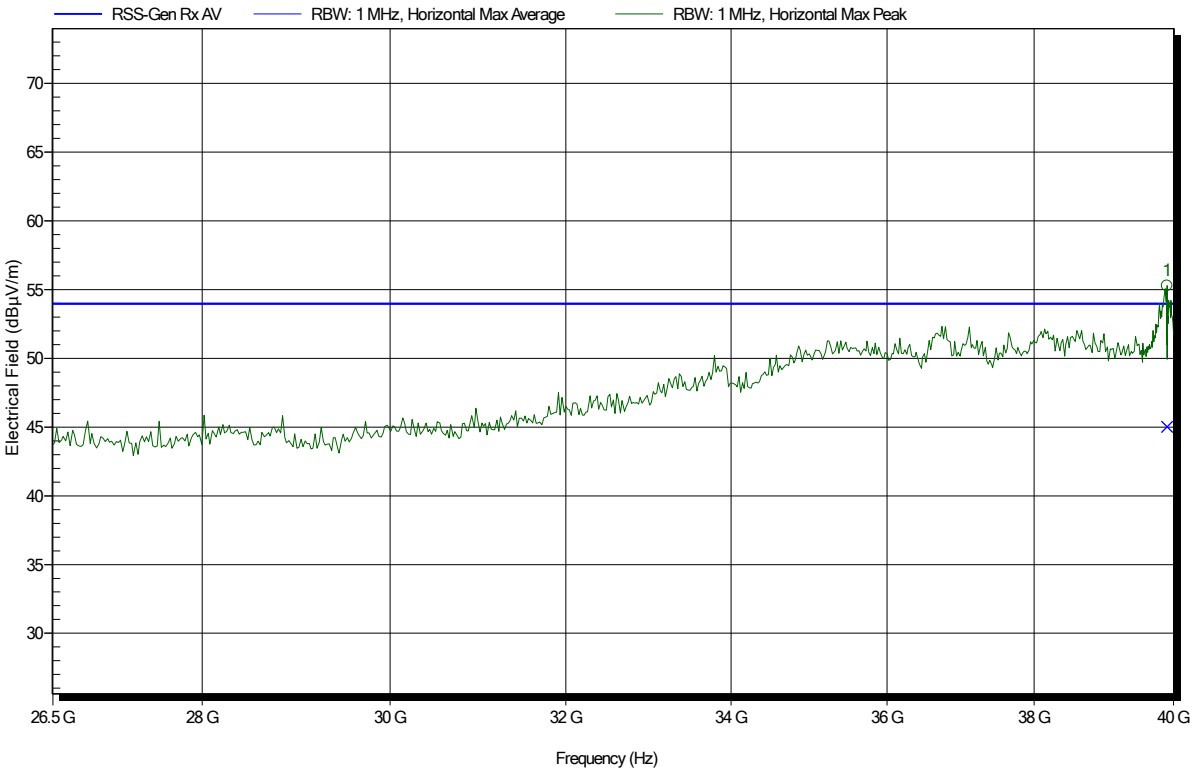

Frequency	Average	Average Limit	Average Difference	Average Status
39.899 GHz	45.01 dBµV/m	53.98 dBµV/m	-8.97 dB	Pass

Spurious emissions according to ISED RSS-247 Issue 2 (February 2017)

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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:	Mr. Voigt
Test Conditions:	Tnom: 24.9°C, Vnom: 3.3 VDC
Antenna:	Flann 22240-25, Vertical
Measurement distance:	3 m
Mode:	RX; 2440MHz
Test Date:	2020-07-17
Note:	

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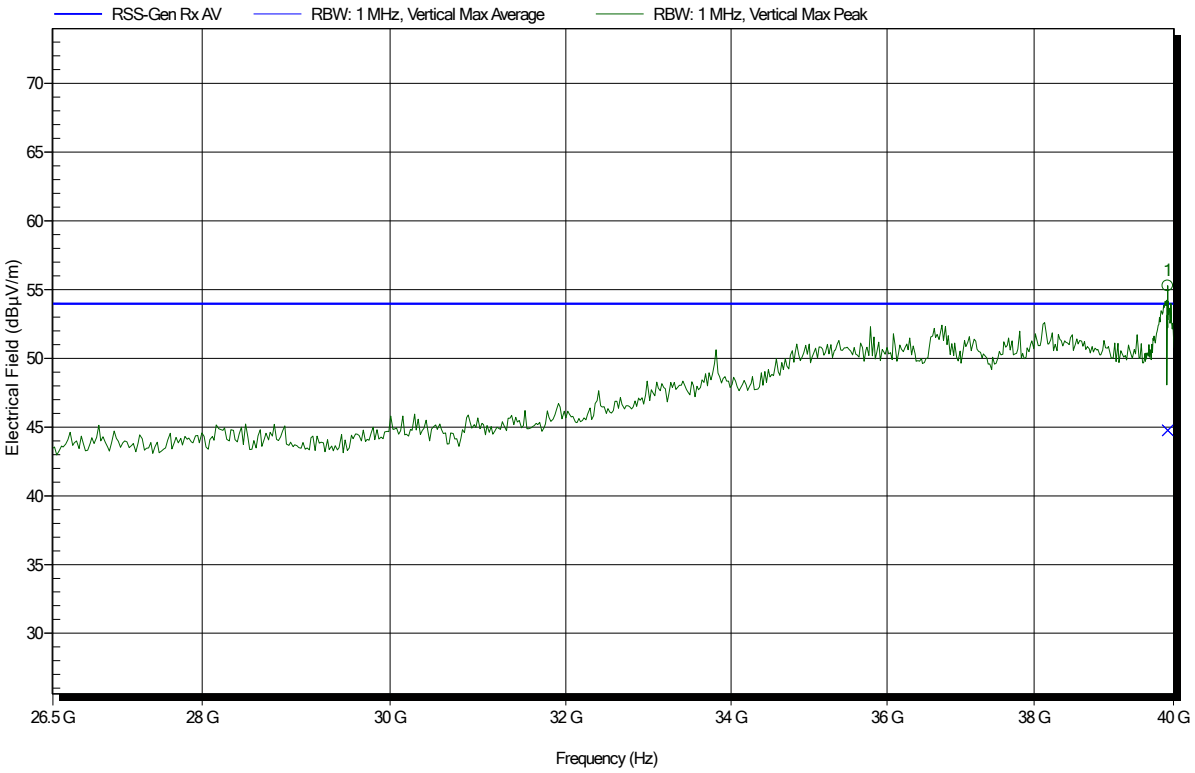

Frequency	Average	Average Limit	Average Difference	Average Status
39.908 GHz	44.76 dBµV/m	53.98 dBµV/m	-9.22 dB	Pass