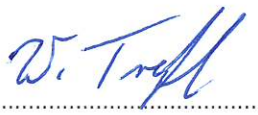
RADIO REPORT

FCC 47 CFR Part 15C
ISED Canada RSS-247

Digital transmission systems operating within the 2400.0 MHz - 2483.5 MHz band

Report Reference No	G0M-2008-9229-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	Hempel A/S
Address	Lundtoftegaardsvej 91 2800 Kgs. Lyngby Denmark
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	Temperature and humidity logger with BLE and LoRa communication
Model(s)	915 MHz
Additional Model(s)	None
Brand Name(s)	None
Hardware Version(s)	1.3.0
Software Version(s)	BLE v1.0.0, LoRa v1.4.0
FCC ID	2AXRV-HT915
IC	-/-
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 - 30 °C
Test Lab Humidity	25 % - 55 %
Date of receipt of test item	2020-12-07 Test Sample ID 32410 Test Sample ID 32411

Report:		
Compiled by	Wilfried Treffke	
Tested by (+ signature) (Responsible for Test)	Wilfried Treffke	
Approved by (+ signature) (Deputy Head of Lab)	Toralf Jahn	
Date of Issue	2020-12-21	
Total number of pages	87	

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:

N/C

VERSION HISTORY

Version History			
Version	Issue Date	Remarks	Revised By
01	2020-12-21	Initial Release	

ABBREVIATIONS AND ACRONYMS

Acronyms	
Acronym	Description
EUT	Equipment Under Test
FCC	Federal Communications Commission
ISED	Innovation, Science and Economic Development Canada
N/A	Not applicable
N/C	No comment
N/S	Notspecified
RBW	Resolution bandwidth
RMS	Root mean square
T_{NOM}	Nominal temperature
VBW	Video bandwidth
V_{NOM}	Nominal supply voltage

REPORT INDEX

1 Equipment (Test Item) Under Test

Description	Temperature and humidity logger with BLE and LoRa communication		
Model	915 MHz		
Additional Model(s)	None		
Brand Name(s)	None		
Serial Number(s)	None	Test Sample ID 32410 (conducted sample) Test Sample ID 32411 (radiated sample)	
Hardware Version(s)	1.3.0		
Software Version(s)	v1.0.0		
PMN	-/-		
HVIN	-/-		
FVIN	-/-		
HMN	-/-		
FCC ID	2AXRV-HT915		
IC	-/-		
Equipment type	End Product		
Radio type	Transceiver		
Assigned frequency bands	2400.0 MHz - 2483.5 MHz		
Radio technology	Bluetooth LE 5.0		
Bluetooth Specification	LE 1M PHY		Yes
	LE 2M PHY		No
	LE Coded PHY S=8 (125 kbit)		No
	LE Coded PHY S=2 (500 kbit)		No
	Stable Modulation Index - Transmitter		No
	Stable Modulation Index - Receiver		No
Modulation	GFSK		
Number of antenna ports	1		
Antenna	Type	Integrated antenna	
	Model	N/S	
	Manufacturer	GRINN	
	Gain	0.0 dBi (declared by applicant)	
Supply Voltage	V_{NOM}	3.6 VDC (removable lithium battery, Li-$SoCl_2$)	
Operating Temperature	T_{NOM}	25 °C	
AC/DC-Adaptor	Model	N/A	
	Vendor	N/A	
	Input	N/A	
	Output	N/A	
Manufacturer	Hempel A/S Lundtoftegaardsvej 91 2800 Kgs. Lyngby Denmark		

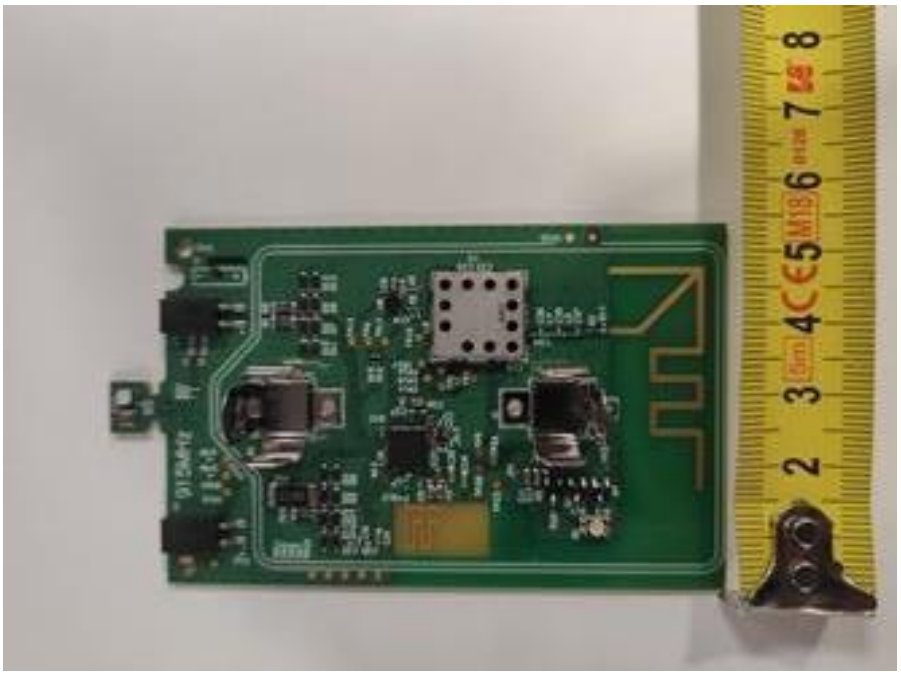
1.1 Photos – Equipment External

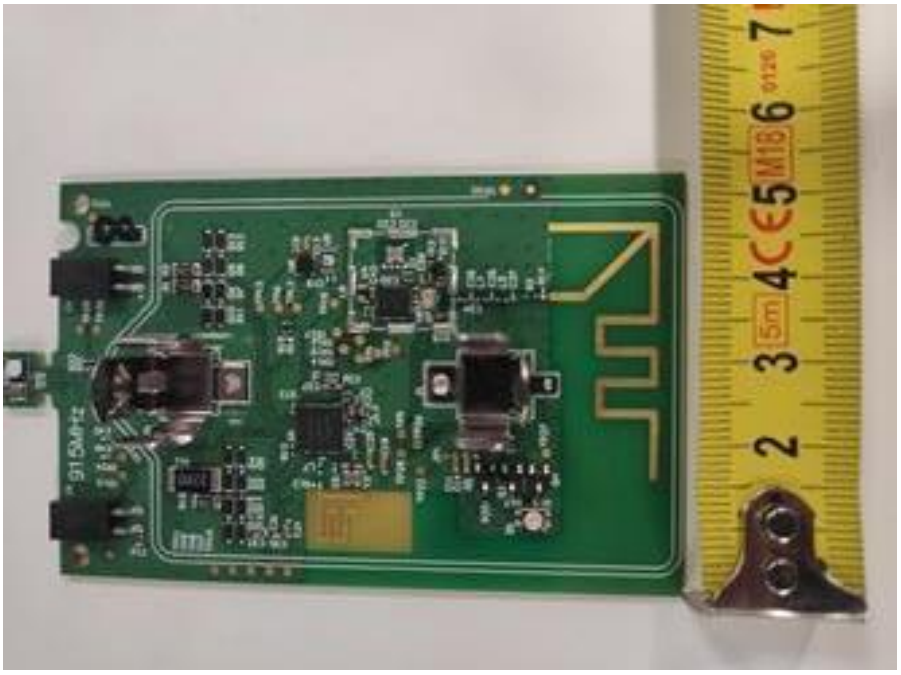
EUT BLE Radiated Sample Top View


EUT BLE Conducted SampleTop View


1.2 Photos – Equipment Internal

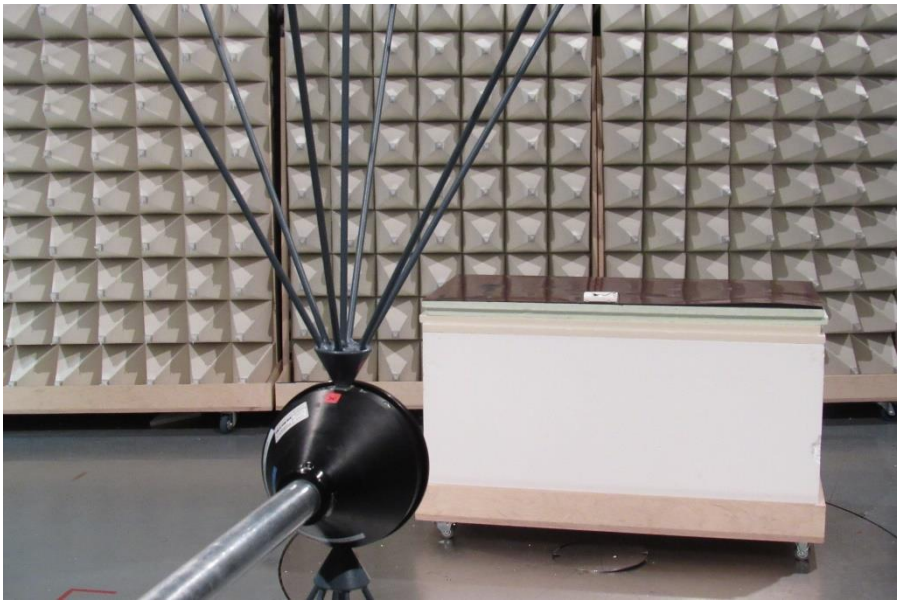
EUT Housing Opened View

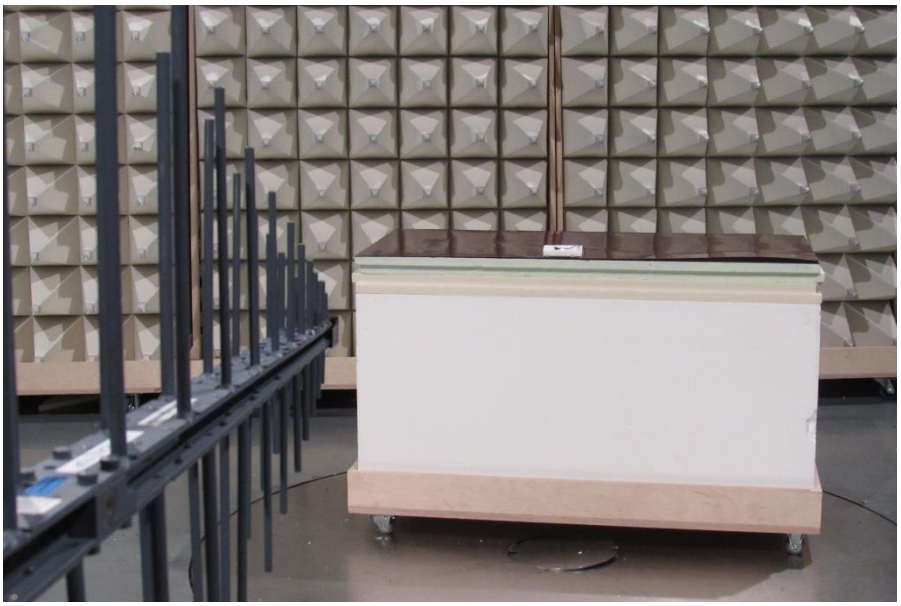

PCB Top View Without Potting Compound


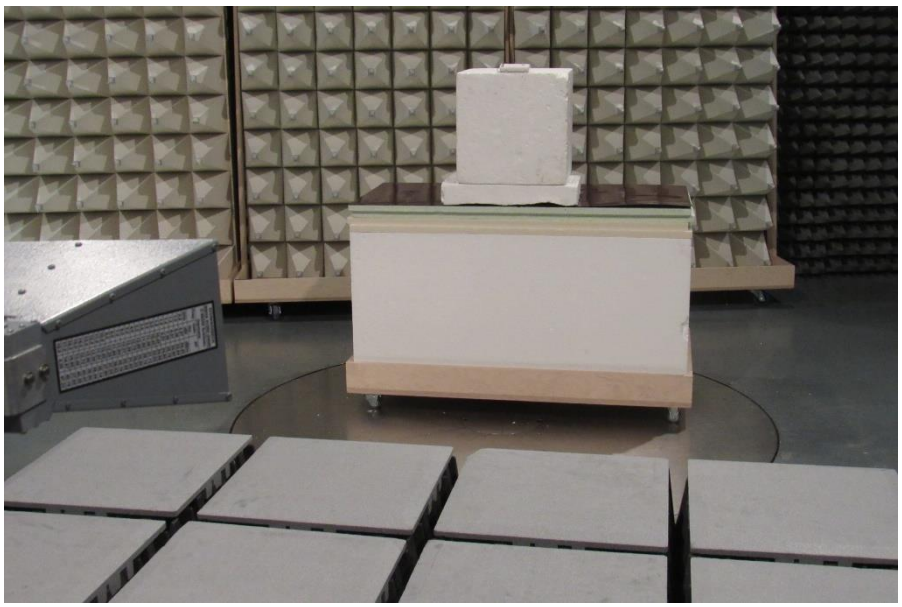
PCB Without Shielding View


RF-Module Without Shielding


1.3 Photos – Test Setup

Radiated Setup View A


Radiated Setup View B


Radiated Setup View C


1.4 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
AE	USB-UART converter	unknown	unknown	Converter is used to communicate with the device under test
SFT	Terminal	Grinn	Customer specific software	To set the EUT in specific test mode
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
CBL	Connecting Cable			
SFT	Software			
Comment: N/C				

1.5 Test Modes

Mode	Description
Mode 1	Mode = Transmit Modulation = GFSK Spreading = None Data rate = 1 Mbit/s Duty cycle =100%
Mode 2	Mode = Receive
Comment: N/C	

1.6 Test Frequencies

Designator	Mode	Channel	Frequency [MHz]
F1	Mode 1	0	2402
F2	Mode 1 + mode 2	19	2440
F3	Mode 1	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	N/R	No powered (directly or indirectly) via AC-Mains
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: N/C				

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

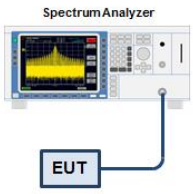
3.1.1 Information

Test Information	
Reference	ISED RSS-Gen, Issue 5 (section 6.6)
Measurement Method	ANSI C63.10 6.9.3
Measurement Uncertainty	± 1.26 %
Operator	Wilfried Treffke
Date	2020-12-11

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
Cable	GigaLane	CAABC	EF00779	2018-10	2020-12
Spectrum Analyzer	R&S	FSU 26	EF01003	2020-07	2021-07

3.1.5 Procedure

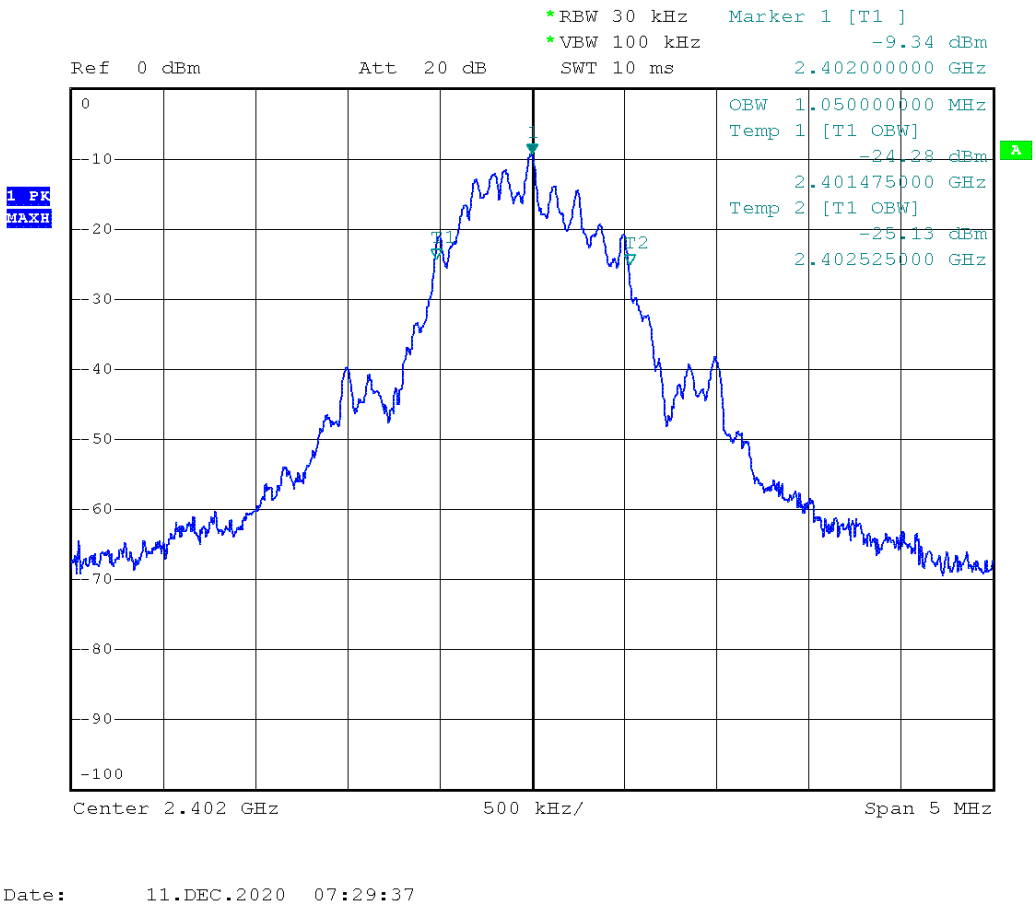
Test Procedure
1. EUT transmitter is activated in test mode under normal conditions 2. The spectrum analyzer is set to peak detection and maximum hold with a span twice the emission spectrum 3. The resolution bandwidth is set to the range of 1 % to 5 % of the occupied bandwidth 4. The occupied bandwidth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

3.1.6 Results

Test Results		
Mode	Channel frequency [MHz]	Bandwidth [MHz]
Mode 1	2402	1.050
	2440	1.060
	2480	1.085

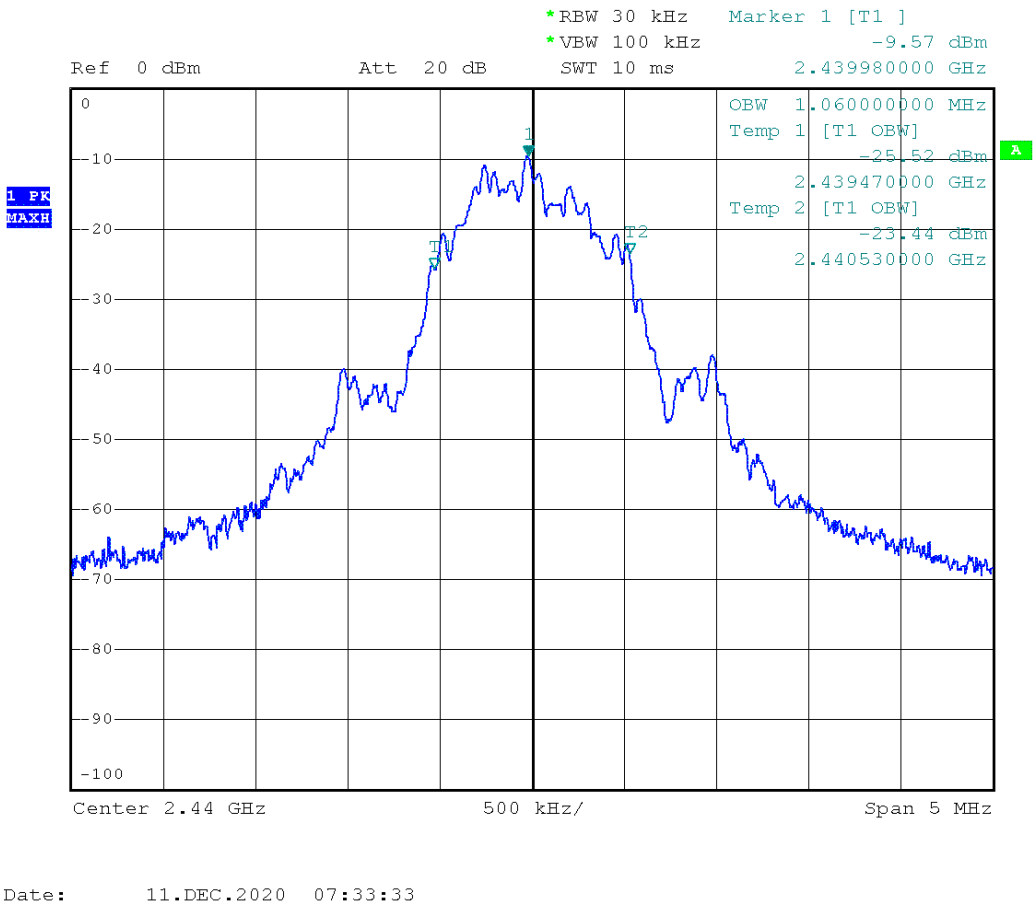
Occupied Bandwidth

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32410
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:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-12-11
Occupied Bandwidth [MHz]:	1.050



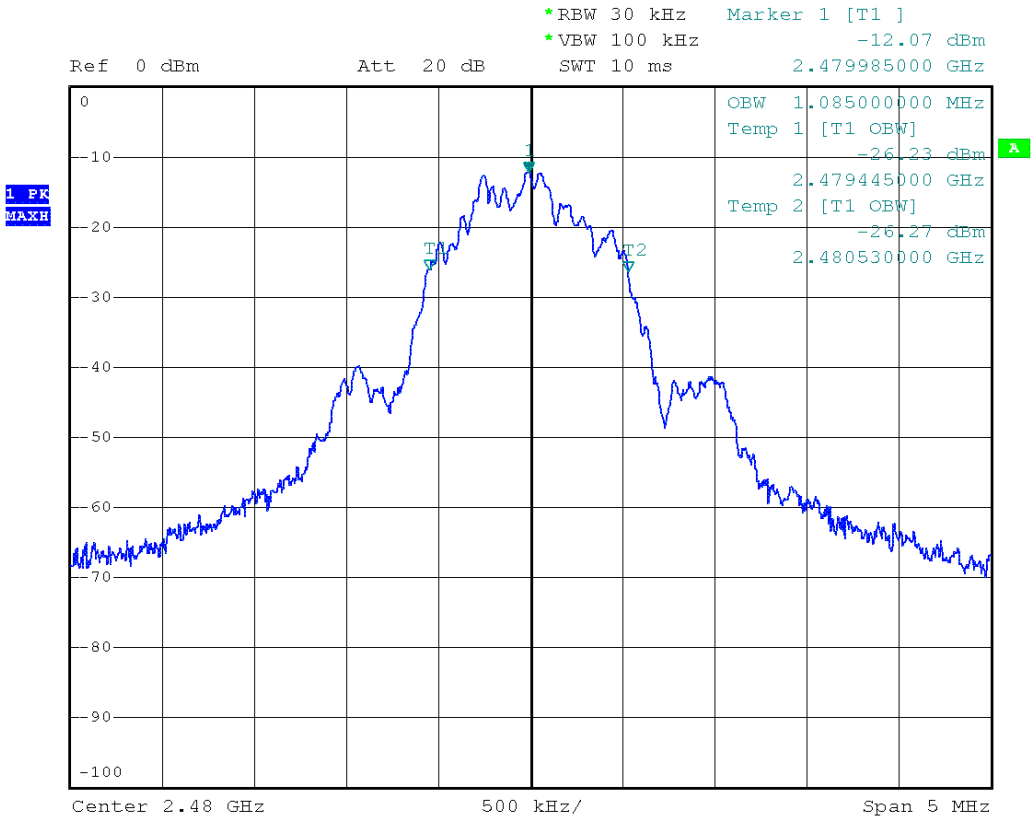
Occupied Bandwidth

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32410
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:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-12-11
Occupied Bandwidth [MHz]:	1.060



Occupied Bandwidth

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32410
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:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-12-11
Occupied Bandwidth [MHz]:	1.085



3.2 Test Conditions and Results - 6 dB bandwidth

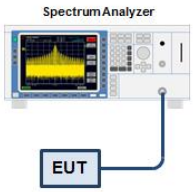
3.2.1 Information

Test Information	
Reference	FCC § 15.247(a)(2); ISED RSS-247, Issue 2 (section 5.2)
Measurement Method	ANSI C63.10 11.8
Measurement Uncertainty	± 1.26 %
Operator	Wilfried Treffke
Date	2020-12-11

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
Cable	GigaLane	CAABC	EF00779	2018-10	2020-12
Spectrum Analyzer	R&S	FSU 26	EF01003	2020-07	2021-07

3.2.5 Procedure

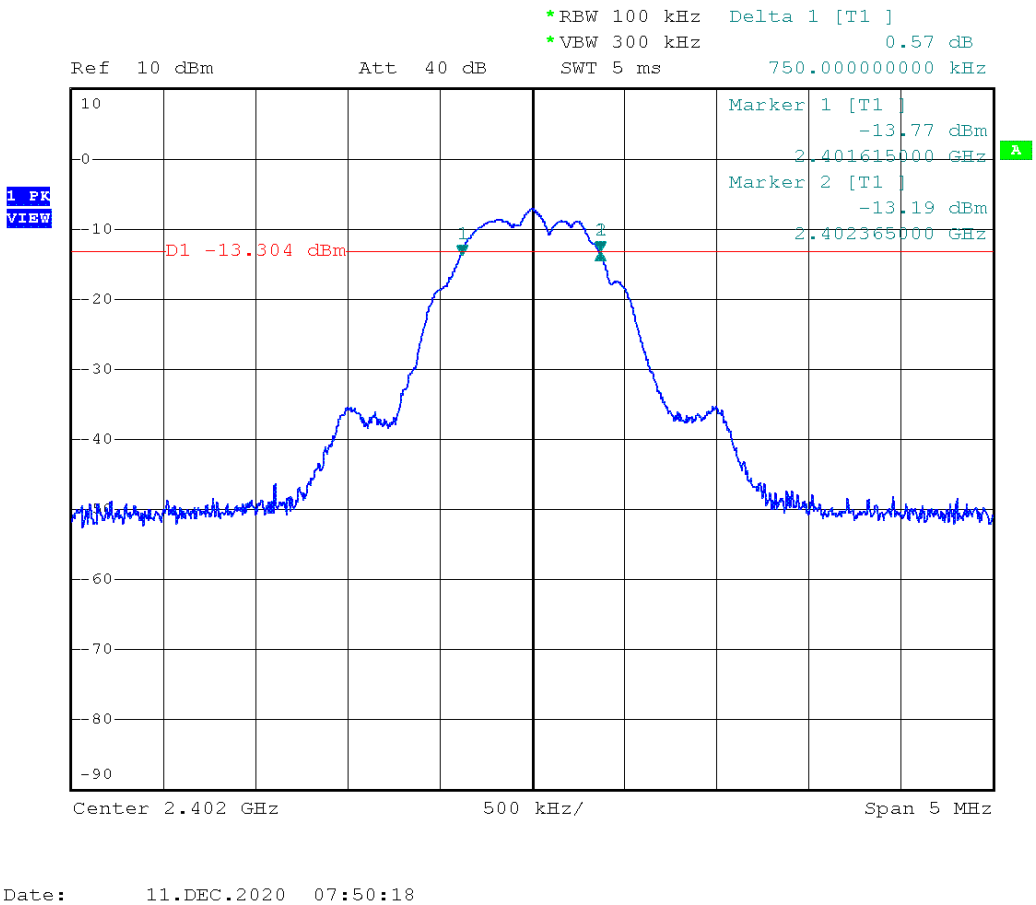
Test Procedure
1. EUT set to test mode 2. Span set to at least twice the emission spectrum 3. Detector set to peak and max hold and RBW is set to 100 kHz 4. Envelope peak value of emission spectrum is selected 5. Marker on envelope of spectrum is set to level of -6 dB to the left of the peak 6. Marker 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	Channel frequency [MHz]	Bandwidth [kHz]	Limit [kHz]	Margin [kHz]	Verdict
Mode 1	2402	750	500	250.00	PASS
	2440	730	500	230.00	PASS
	2480	745	500	245.00	PASS

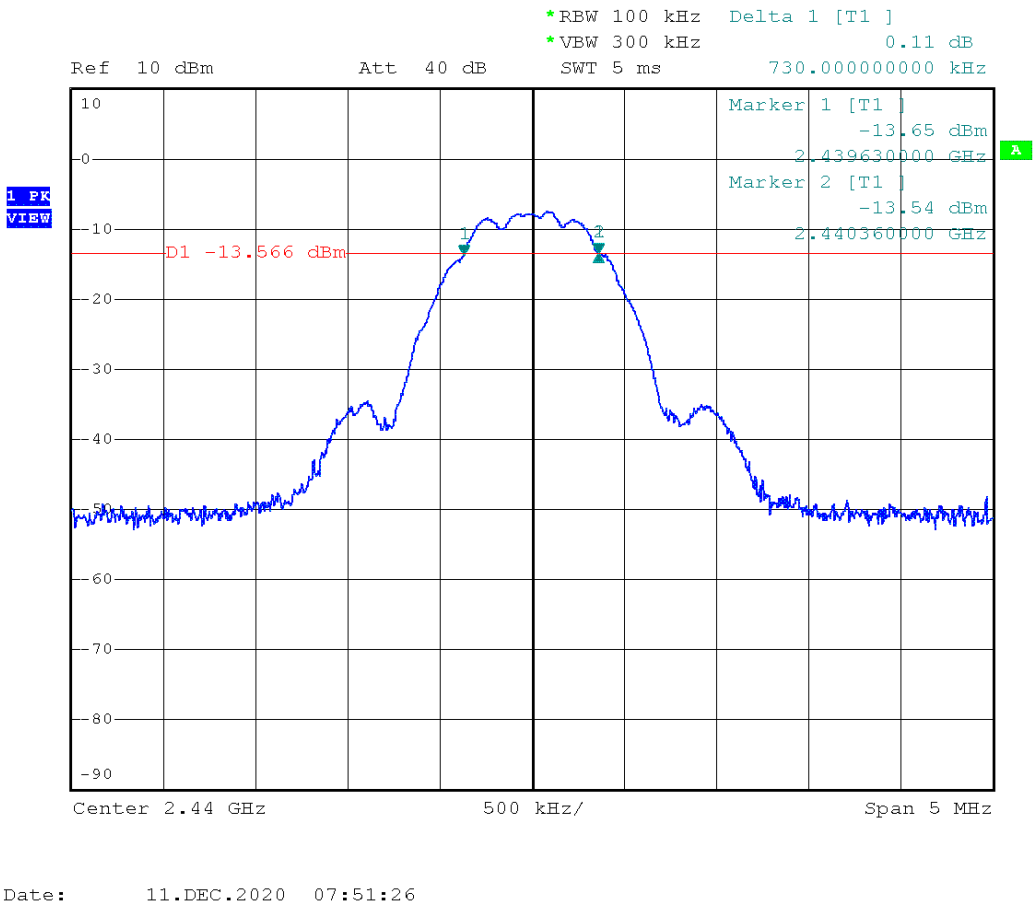
DTS (6 dB) Bandwidth

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32410
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:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-12-11
Lower Frequency [MHz]:	2401.615
Upper Frequency [MHz]:	2402.365
6 dB Bandwidth [kHz]:	750



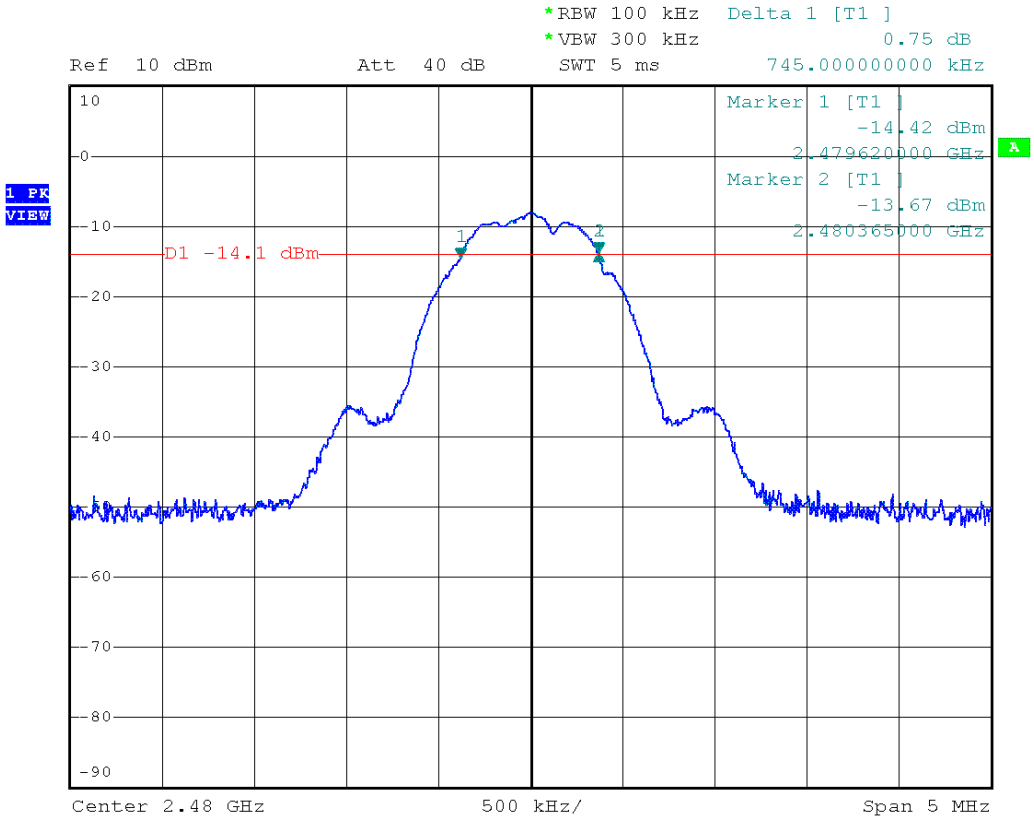
DTS (6 dB) Bandwidth

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32410
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:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-12-11
Lower Frequency [MHz]:	2439.630
Upper Frequency [MHz]:	2440.360
6 dB Bandwidth [kHz]:	730



DTS (6 dB) Bandwidth

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32410
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:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-12-11
Lower Frequency [MHz]:	2479.620
Upper Frequency [MHz]:	2480.365
6 dB Bandwidth [kHz]:	745



3.3 Test Conditions and Results - Maximum peak conducted output power

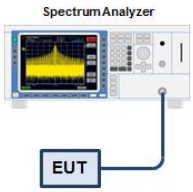
3.3.1 Information

Test Information	
Reference	FCC § 15.247(b)(1); ISED RSS-247, Issue 2 (section 5.4)
Measurement Method	ANSI C63.10 11.9.1
Measurement Uncertainty	± 2.86 dB
Operator	Wilfried Treffke
Date	2020-12-11

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
Cable	GigaLane	CAABC	EF00779	2018-10	2020-12
Spectrum Analyzer	R&S	FSU 26	EF01003	2020-07	2021-07

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						
Mode	Channel frequency [MHz]	Power [dBm]	Power [W]	Limit [W]	Margin [W]	Verdict
Mode 1	2402	-5.395	0.00029	1.0	-0.9997	PASS
	2440	-5.356	0.00029	1.0	-0.9997	PASS
	2480	-6.217	0.00024	1.0	-0.9998	PASS

3.4 Test Conditions and Results - Power spectral density

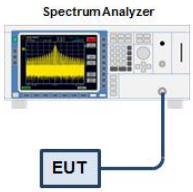
3.4.1 Information

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
Measurement Uncertainty	± 2.86 dB
Operator	Wilfried Treffke
Date	2020-12-11

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
Cable	GigaLane	CAABC	EF00779	2018-10	2020-12
Spectrum Analyzer	R&S	FSU 26	EF01003	2020-07	2021-07

3.4.5 Procedure

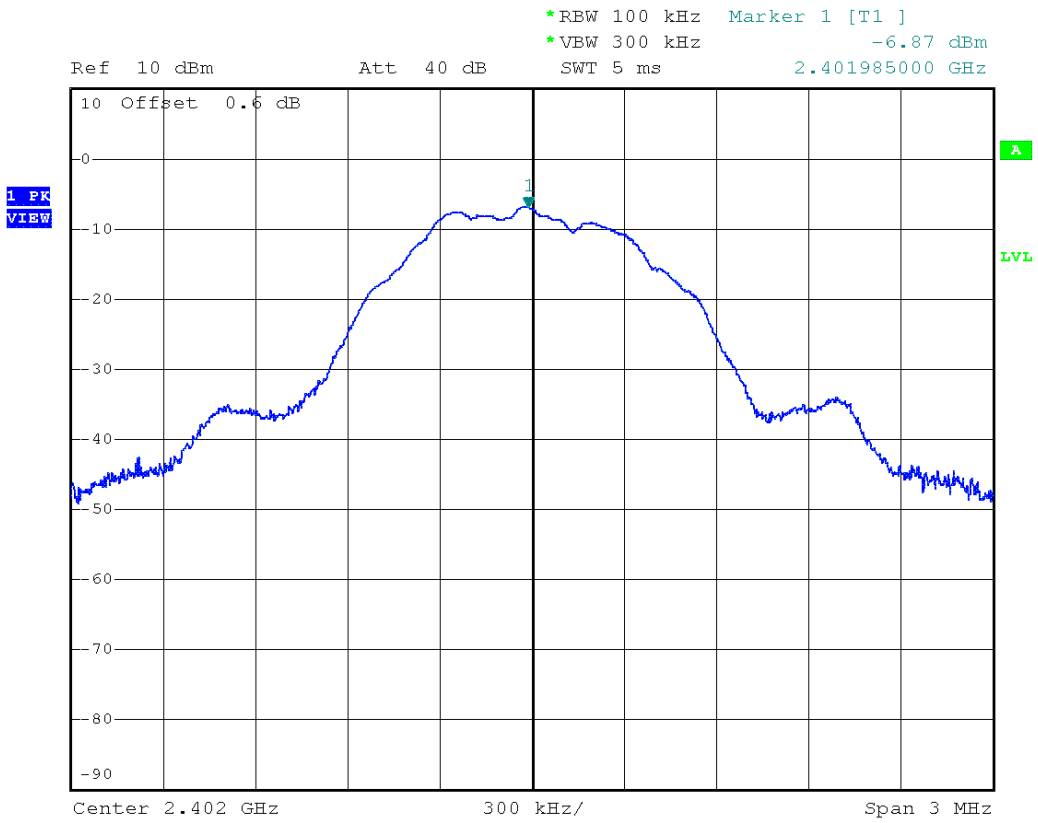
Test Procedure
1. EUT set to test mode 2. The analyzer is set to DTS channel center frequency with a span of 1.5 times the DTS bandwidth 3. The RBW is set to 100 kHz with VBW ≥ RBW and the detector is set to peak with max hold 4. After the trace has stabilized a marker is set to the envelope maximum 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				
Mode	Channel frequency [MHz]	PSD [dBm/RBW]	Limit [dBm/3kHz]	Verdict
Mode 1	2402	-6.869	8.0	PASS
	2440	-6.270	8.0	PASS
	2480	-8.087	8.0	PASS
RBW = 100 kHz				

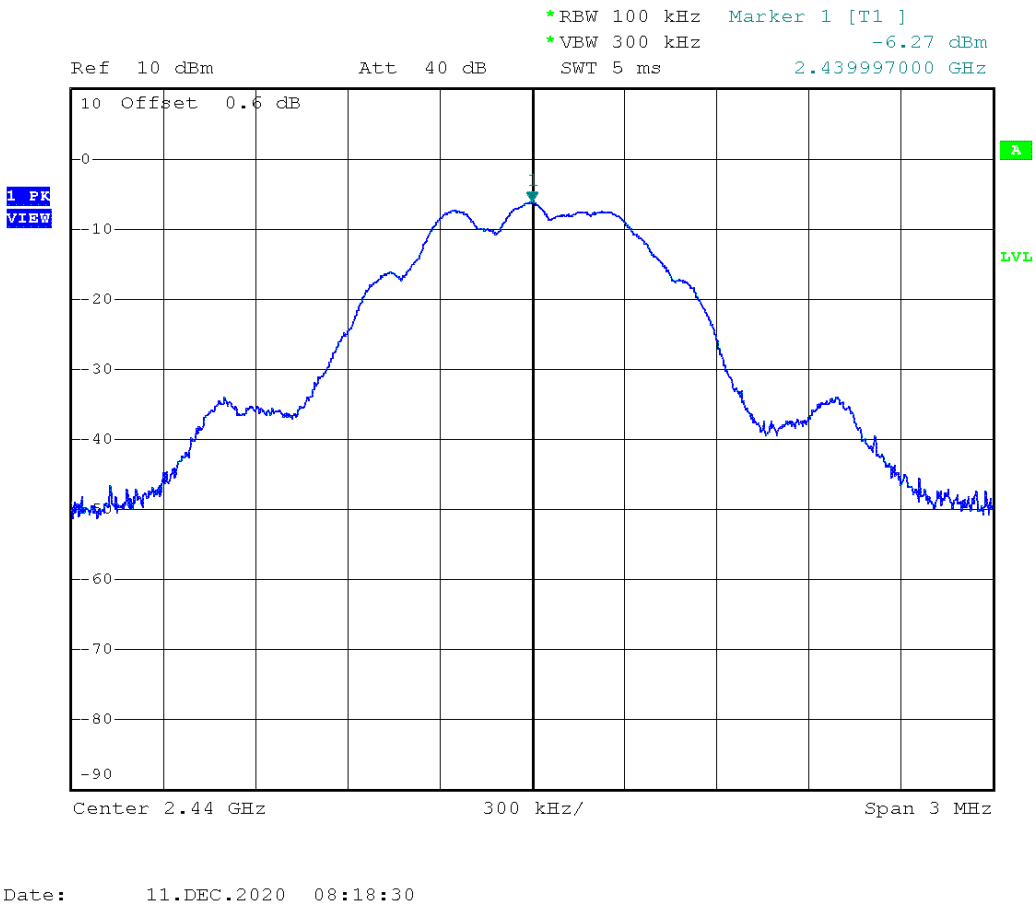
Peak Power Spectral Density

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32410
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:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-12-11
Peak Frequency [MHz]:	2401.985
Spectral Density [dBm/RBW]:	-6.869
Resolution Bandwidth [kHz]:	100 kHz



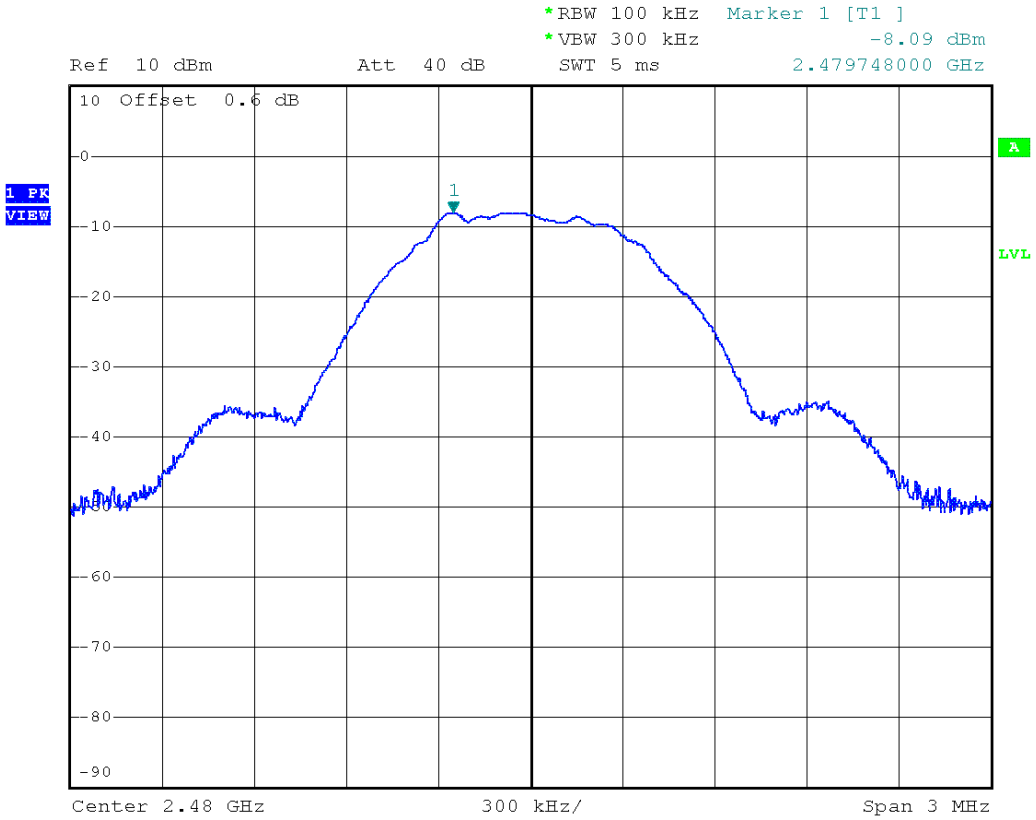
Peak Power Spectral Density

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32410
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:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-12-11
Peak Frequency [MHz]:	2439.997
Spectral Density [dBm/RBW]:	-6.270
Resolution Bandwidth [kHz]:	100 kHz



Peak Power Spectral Density

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32410
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:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-12-11
Peak Frequency [MHz]:	2479.748
Spectral Density [dBm/RBW]:	-8.087
Resolution Bandwidth [kHz]:	100 kHz



Date: 11.DEC.2020 08:19:29

3.5 Test Conditions and Results - Band-edge compliance

3.5.1 Information

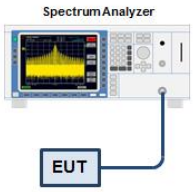
Test Information	
Reference	FCC § 15.247(d); ISED RSS-247, Issue 2 (section 5.5)
Measurement Uncertainty	± 3.64 dB
Measurement Method	ANSI C63.10 6.10
Operator	Wilfried Treffke
Date	2020-12-11

3.5.2 Limits

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

3.5.3 Setup

Test Setup



3.5.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Cable	GigaLane	CAABC	EF00779	2018-10	2020-12
Spectrum Analyzer	R&S	FSU 26	EF01003	2020-07	2021-07

3.5.5 Procedure

Test Procedure

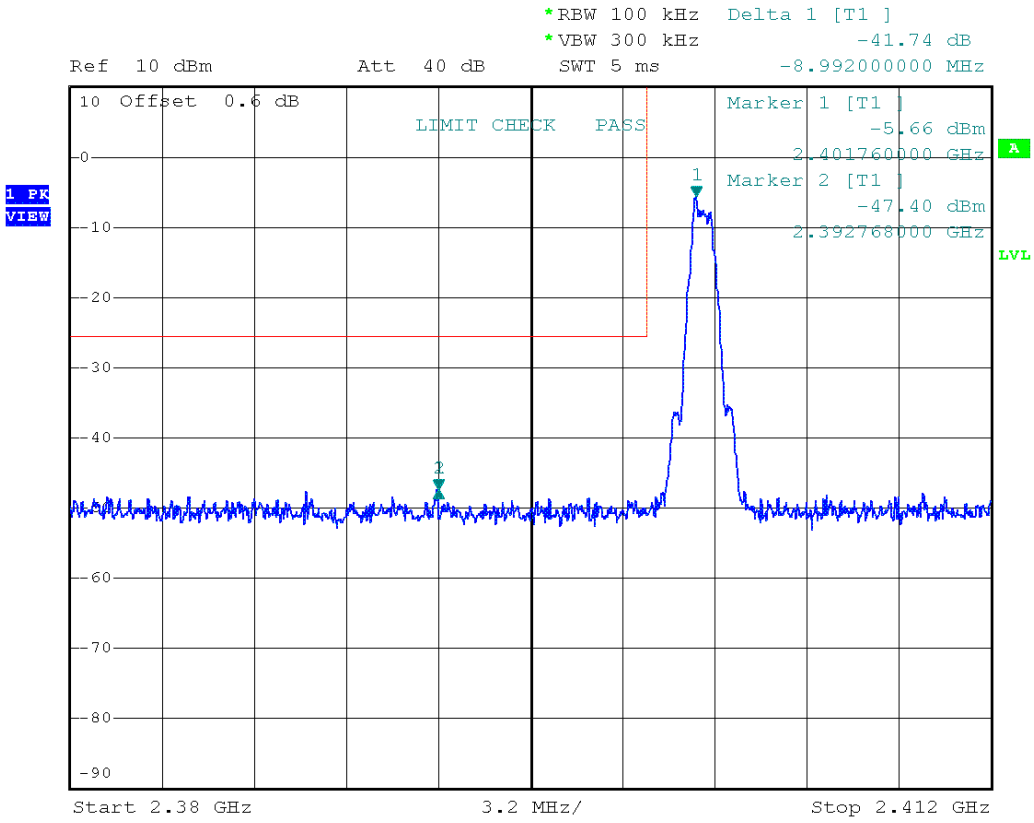
1. EUT set to test mode (Communication tester is used if needed)
2. Span set around lower band edge and detector is set to peak and max hold
3. Resolution bandwidth is set to 100 kHz
4. Markers are set to peak emission levels within frequency band and outside frequency band
5. Band edge attenuation is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

3.5.6 Results

Test Results				
Mode	Channel frequency [MHz]	Out-of-band Attenuation [dB]	Limit [dB]	Verdict
Mode 1	2402	-41.74	-20	PASS
	2480	-39.73	-20	PASS

Emissions in nonrestricted frequency bands at the Band-edge

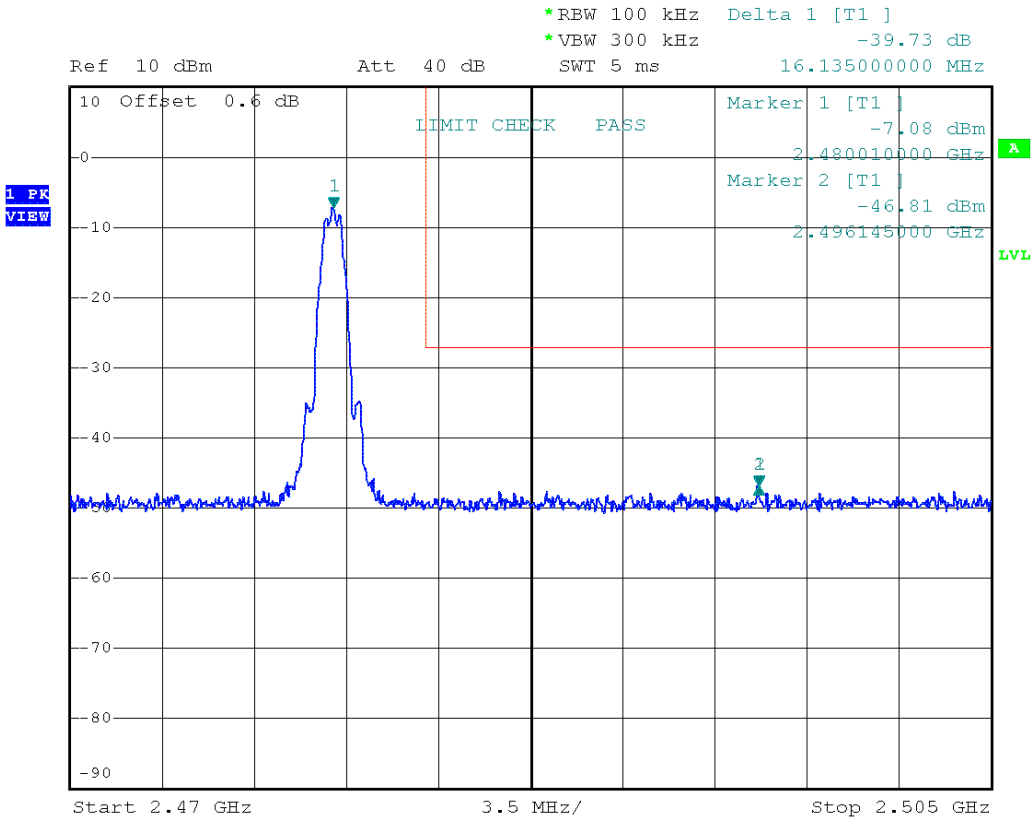
Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa
Model:	915 MHz
Test Sample ID:	32410
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 7.8.6, 6.10.4
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-12-11
Band-edge	Lower
In-band Frequency [MHz]:	2401.76
Max. in-band Level [dBm/100 kHz]:	-5.664
Out-of-band Frequency [MHz]:	2392.768
Max. out-of-band Level [dBm/100 kHz]:	-47.403
Attenuation [dB]:	-41.74



Date: 11.DEC.2020 08:39:38

Emissions in nonrestricted frequency bands at the Band-edge

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa
Model:	915 MHz
Test Sample ID:	32410
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:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-12-11
Band-edge	Upper
In-band Frequency [MHz]:	2480.01
Max. in-band Level [dBm/100 kHz]:	-7.075
Out-of-band Frequency [MHz]:	2496.145
Max. out-of-band Level [dBm/100 kHz]:	-46.808
Attenuation [dB]:	-39.73



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3.6 Test Conditions and Results - Conducted spurious emissions

3.6.1 Information

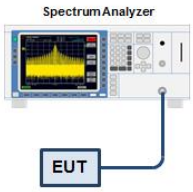
Test Information	
Reference	FCC § 15.247(d); ISED RSS-247, Issue 2 (section 5.5)
Measurement Uncertainty	± 4.25 dB
Measurement Method	ANSI C63.10 6.10
Operator	Wilfried Treffke
Date	2020-12-11

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
Cable	GigaLane	CAABC	EF00779	2018-10	2020-12
Spectrum Analyzer	R&S	FSU 26	EF01003	2020-07	2021-07

3.6.5 Procedure

Test Procedure

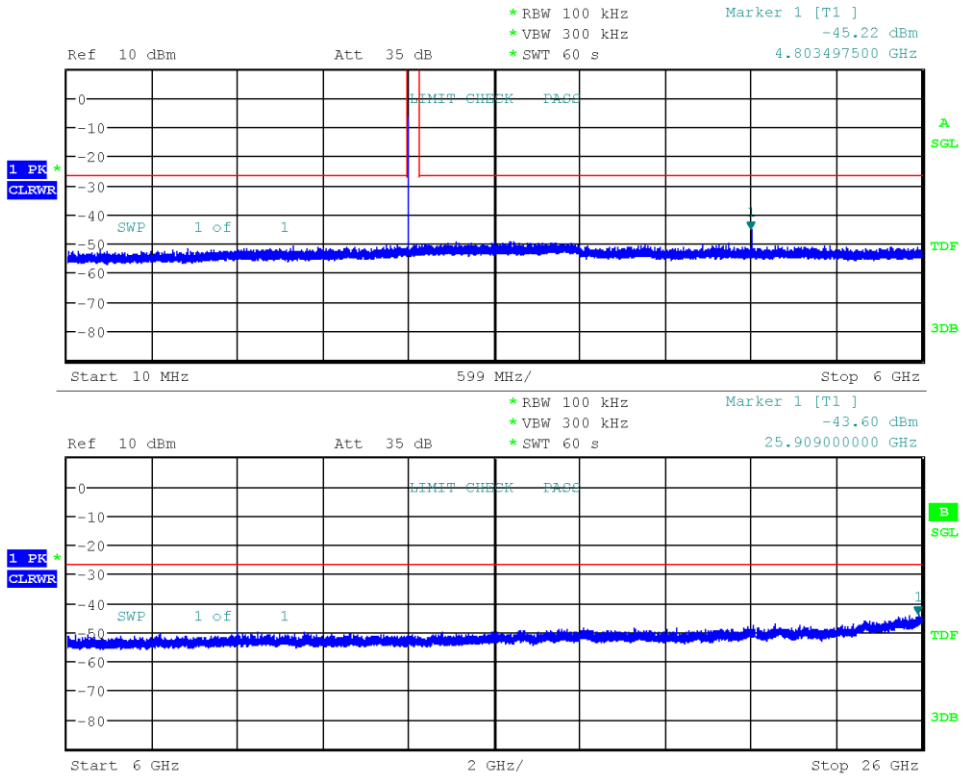
1. EUT set to test mode (Communication tester is used if needed)
2. Span set around lower band edge and detector is set to peak and max hold
3. Resolution bandwidth is set to 100 kHz
4. Markers are set to peak emission levels outside frequency band

3.6.6 Results

Test Results		
Mode	Channel [MHz]	Verdict
Mode 1	2402	PASS
	2440	PASS
	2480	PASS

Conducted Spurious Emissions

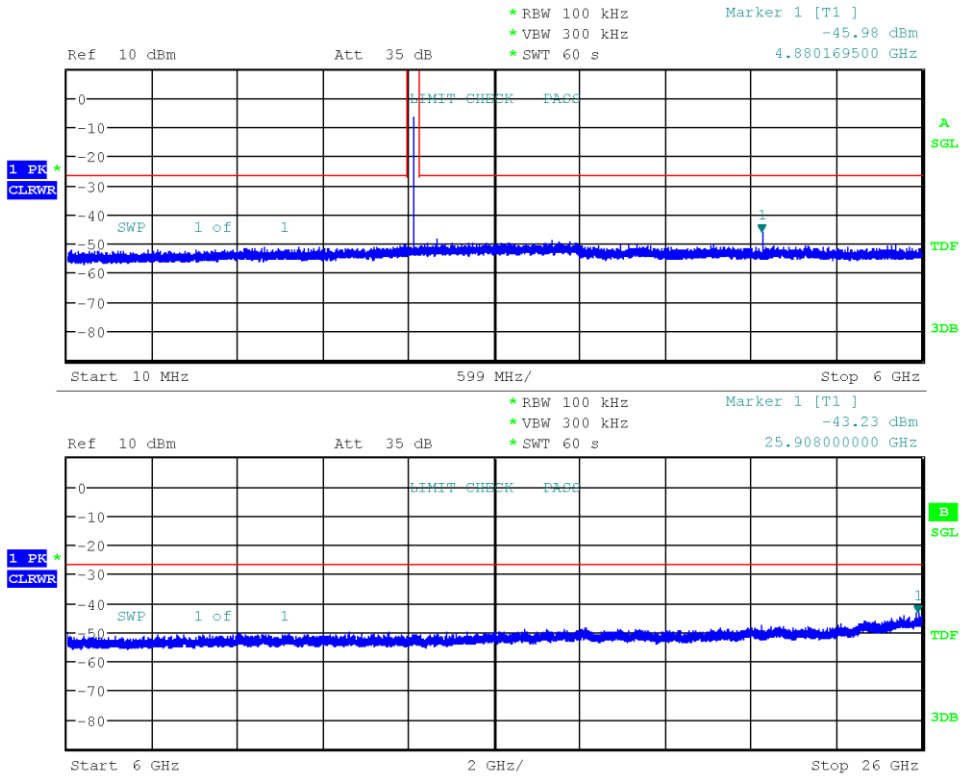
Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32410
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.11
Operational Mode:	GFSK, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-12-11
Max. in-band Frequency [MHz]:	2401.7
Max. in-band Level [dBm/100 kHz]:	-6.6
Out-of-band Limit [dBm/100 kHz]:	-26.6



Date: 11.DEC.2020 09:29:46

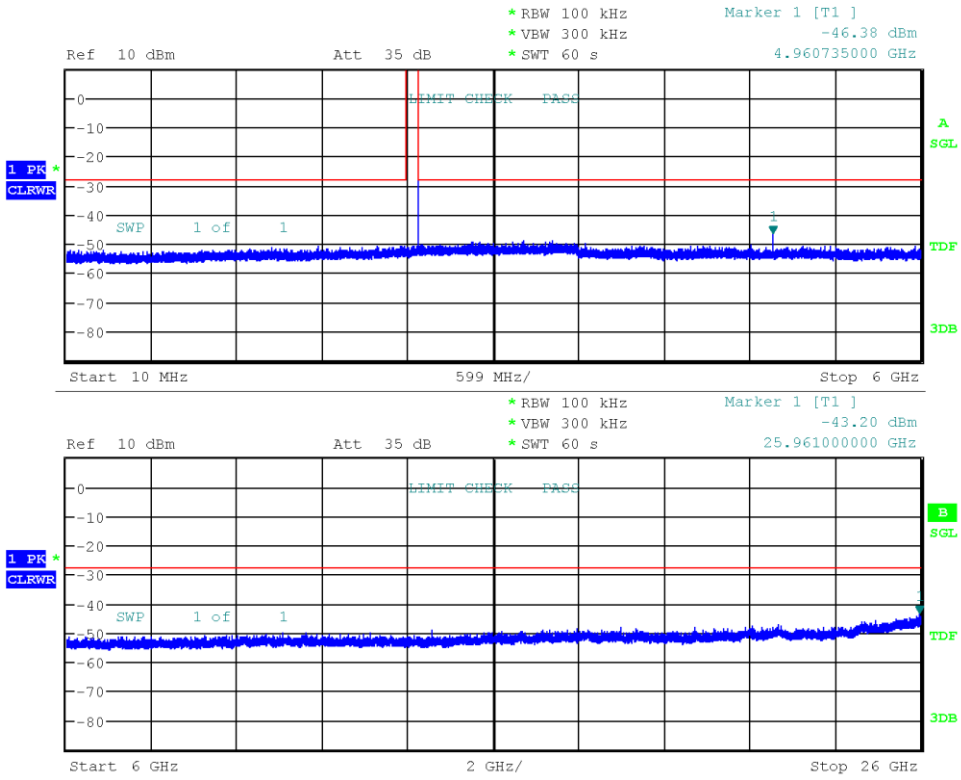
Conducted Spurious Emissions

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32410
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:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-12-11
Max. in-band Frequency [MHz]:	2440.0
Max. in-band Level [dBm/100 kHz]:	-6.6
Out-of-band Limit [dBm/100 kHz]:	-26.6



Conducted Spurious Emissions

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32410
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:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-12-11
Max. in-band Frequency [MHz]:	2480.0
Max. in-band Level [dBm/100 kHz]:	-7.6
Out-of-band Limit [dBm/100 kHz]:	-27.6



Date: 11.DEC.2020 09:43:52

3.7 Test Conditions and Results - Transmitter radiated emissions

3.7.1 Information

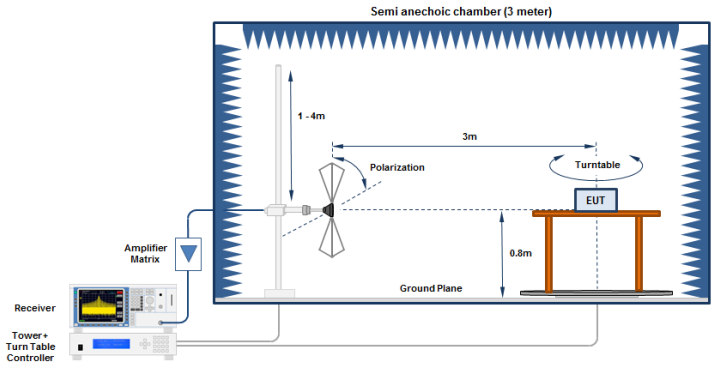
Test Information	
Reference	FCC § 15.247(d); FCC § 15.209; ISED RSS-Gen, Issue 5 (section 6.13)
Measurement Uncertainty	± 5.95 dB
Measurement Method	ANSI C63.10 6.4, 6.5, 6.6, 11.12
Operator	Wilfried Treffke
Date	2020-12-09

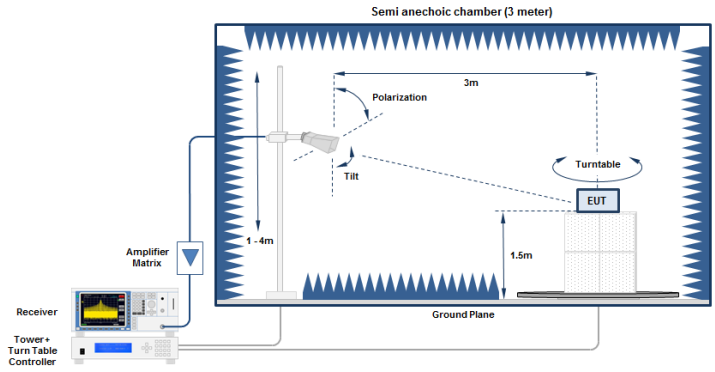
3.7.2 Limits

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

3.7.3 Setup

Test Setup 30 MHz - 1000 MHz



Test Setup > 1 GHz


3.7.4 Equipment

Test Software			
Description	Manufacturer	Name	Version
EMC Software	DARE Instruments	RadiMation	2020.1.8

Test Equipment 30 - 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
Antenna	Schwarzbeck	BBHA 9120D	EF00018	2019-10	2022-10
Antenna	Amplifier Research	AT4560	EF00302	2019-05	2021-05

3.7.5 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

3.7.6 Results

Test Results - Mode 1						
Channel [MHz]	Emission [MHz]	Level [dBµV/m]	Det.	Pol.	Limit [dBµV/m]	Margin [dB]
2402	240.013	42.13	pk	hor	46.00	-03.87
2402	240.013	39.83	qpk	hor	46.00	-06.17
2402	241.026	32.30	pk	ver	46.00	-13.70
2402	960.256	42.11	pk	hor	54.00	-11.89
2402	960.256	42.89	pk	ver	54.00	-11.11
2402	4801	43.33	pk	ver	74.00	-30.67
2402	4805	54.05	pk	hor	74.00	-19.95
2402	4805	48.19	avg	hor	54.00	-05.81
2440	4878	43.72	pk	ver	74.00	-30.28
2440	4880	54.20	pk	hor	74.00	-19.80
2440	4880	49.39	avg	hor	54.00	-04.61
2480	4960	53.85	pk	hor	74.00	-20.15
2480	4960	48.03	avg	hor	54.00	-05.97
2480	4962	46.54	pk	ver	74.00	-27.46

3.8 Test Conditions and Results - Receiver radiated emissions

3.8.1 Information

Test Information	
Reference	ISED RSS-247, Issue 2 (section 3.1)
Measurement Uncertainty	± 5.95 dB
Measurement Method	ANSI C63.10 6.5, 6.6, 11.12
Operator	Wilfried Treffke
Date	2020-12-10

3.8.2 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

3.8.3 Setup

Test Software			
Description	Manufacturer	Name	Version
EMC Software	DARE Instruments	RadiMation	2020.1.8

Test Equipment 30 - 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
Antenna	Schwarzbeck	BBHA 9120D	EF00018	2019-10	2022-10

3.8.4 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

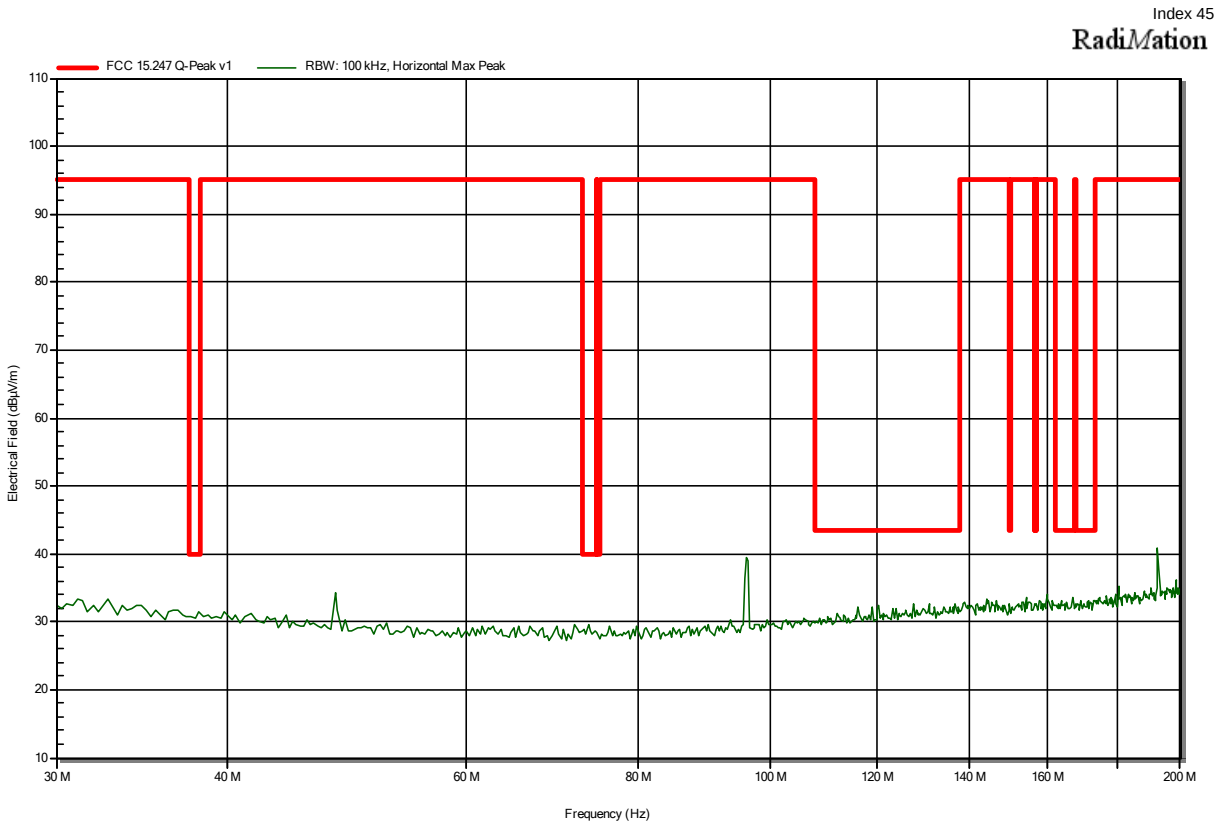
3.8.5 Results

Test Results - Mode 2						
Channel [MHz]	Emission [MHz]	Level [dBµV/m]	Det.	Pol.	Limit [dBµV/m]	Margin [dB]
2440	1438	32.85	pk	hor	53.98	-21.13
2440	1438	30.99	pk	ver	53.98	-22.99
2440	7974	40.45	pk	hor	53.98	-13.53
2440	10582	44.39	pk	hor	53.98	-09.59
2440	11000	43.65	pk	ver	53.98	-10.33

ANNEX A Transmitter spurious emissions

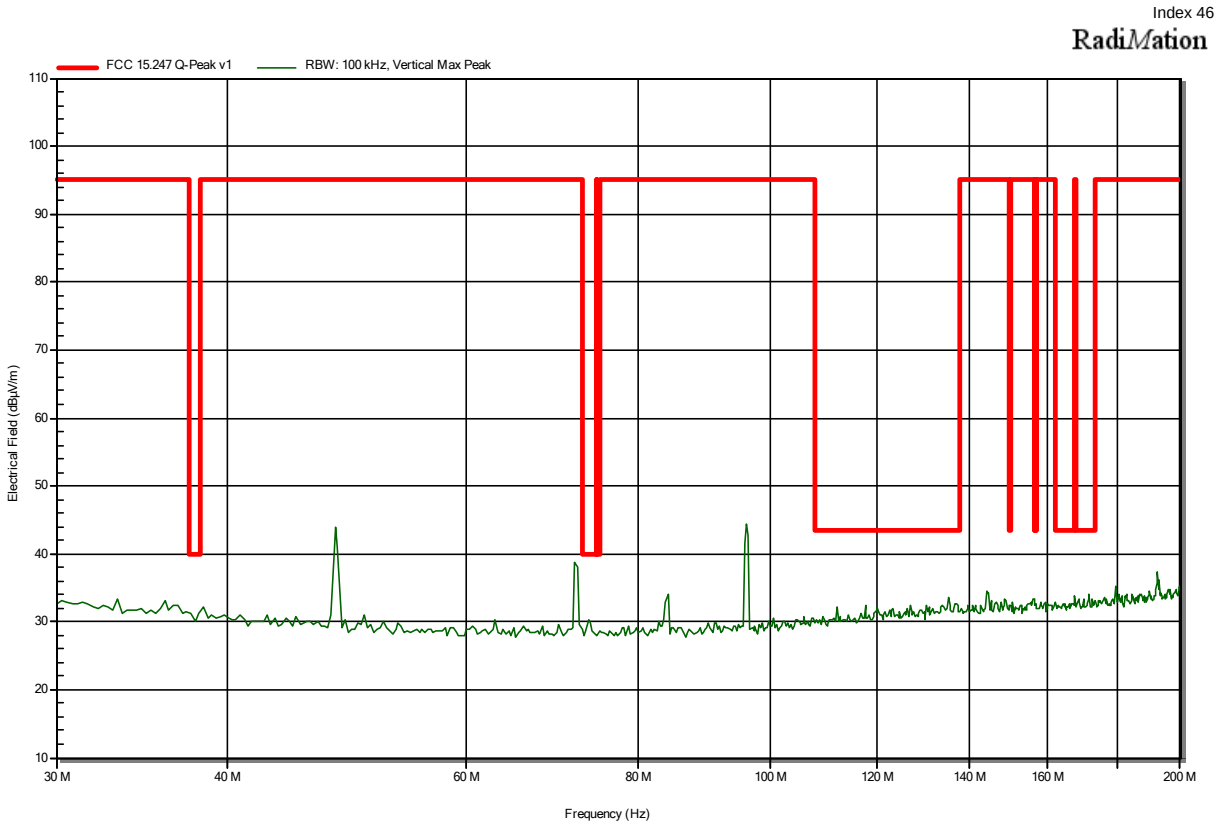
Radiated Spurious Emissions according to FCC 47 CFR 15.247

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	Tx; BLE; 1Mbit; P=-4 dBm; 2402 MHz
Test Date:	2020-12-09
Note:	EUT horizontal



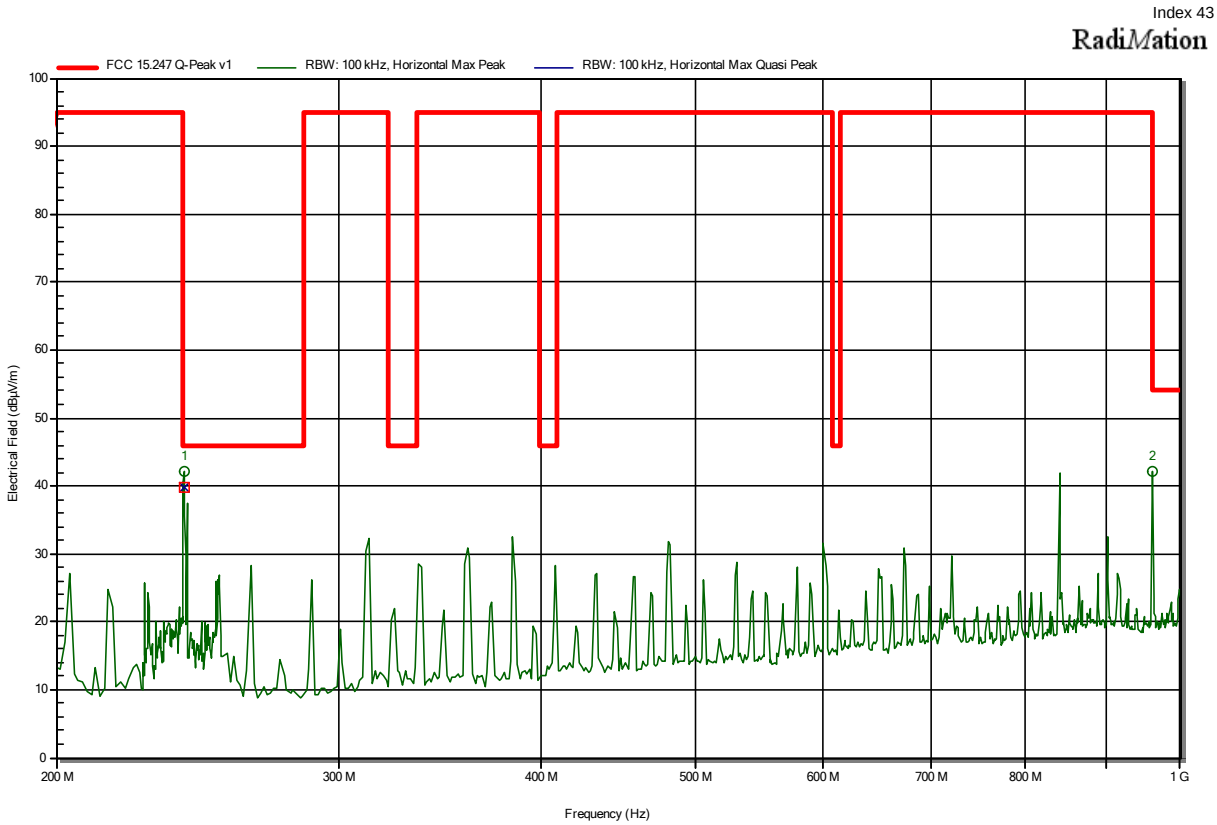
Radiated Spurious Emissions according to FCC 47 CFR 15.247

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	Tx; BLE; 1Mbit; P=-4 dBm; 2402 MHz
Test Date:	2020-12-09
Note:	EUT horizontal



Radiated Spurious Emissions according to FCC 47 CFR 15.247

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	Tx; BLE; 1Mbit; P=-4 dBm; 2402 MHz
Test Date:	2020-12-09
Note:	EUT horizontal

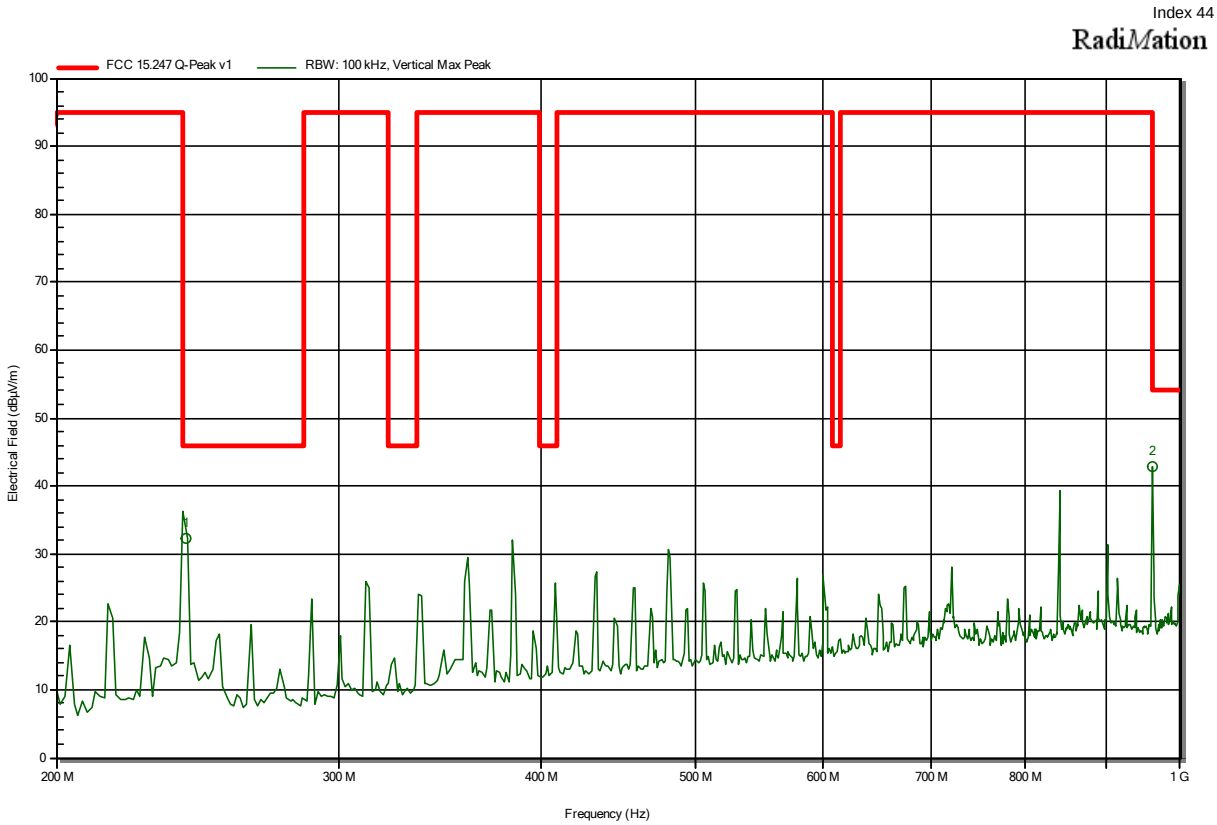


Frequency	Peak	Peak Limit	Peak Difference	Peak Status
240.013 MHz	42.13 dBµV/m	46 dBµV/m	-3.87 dB	Pass
960.256 MHz	42.11 dBµV/m	54 dBµV/m	-11.89 dB	Pass

Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
240.013 MHz	39.83 dBµV/m	46 dBµV/m	-6.17 dB	Pass

Radiated Spurious Emissions according to FCC 47 CFR 15.247

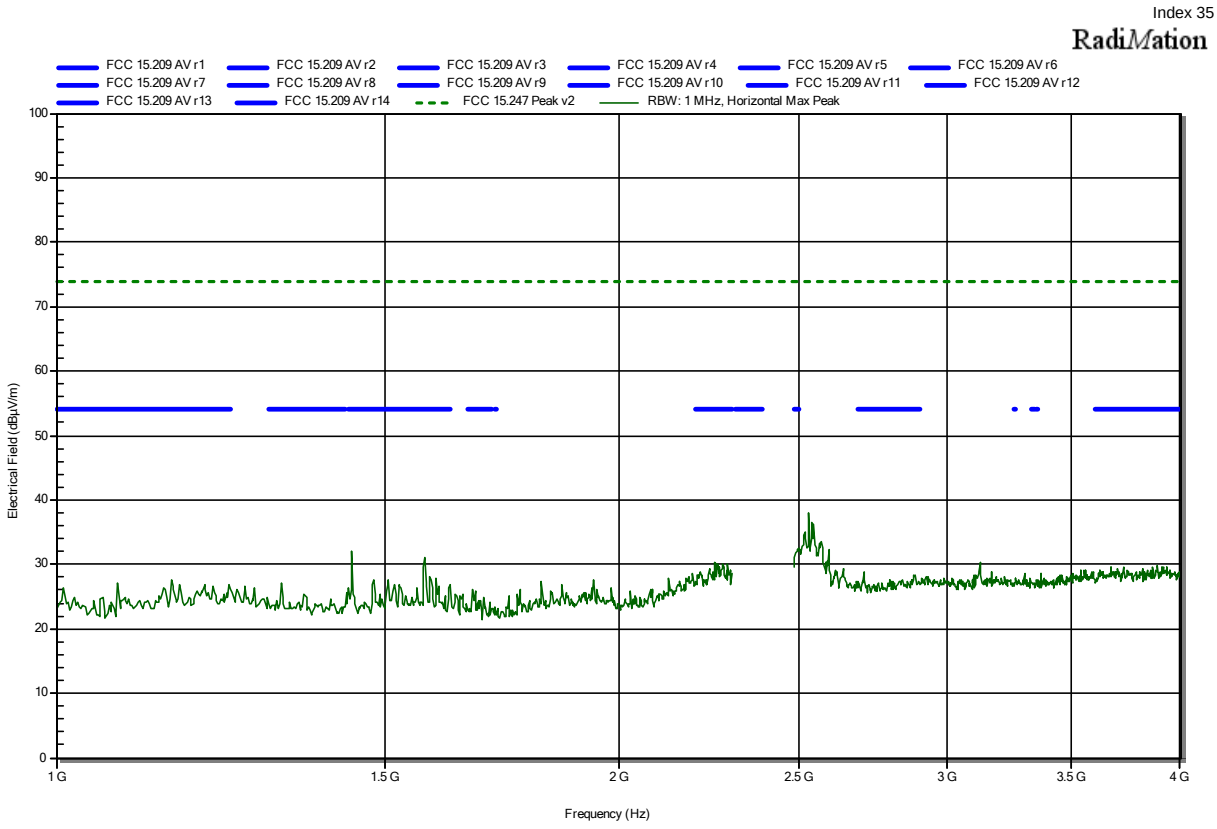
Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	Tx; BLE; 1Mbit; P=-4 dBm; 2402 MHz
Test Date:	2020-12-09
Note:	EUT horizontal



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
241.026 MHz	32.3 dBµV/m	46 dBµV/m	-13.7 dB	Pass
960.256 MHz	42.89 dBµV/m	54 dBµV/m	-11.11 dB	Pass

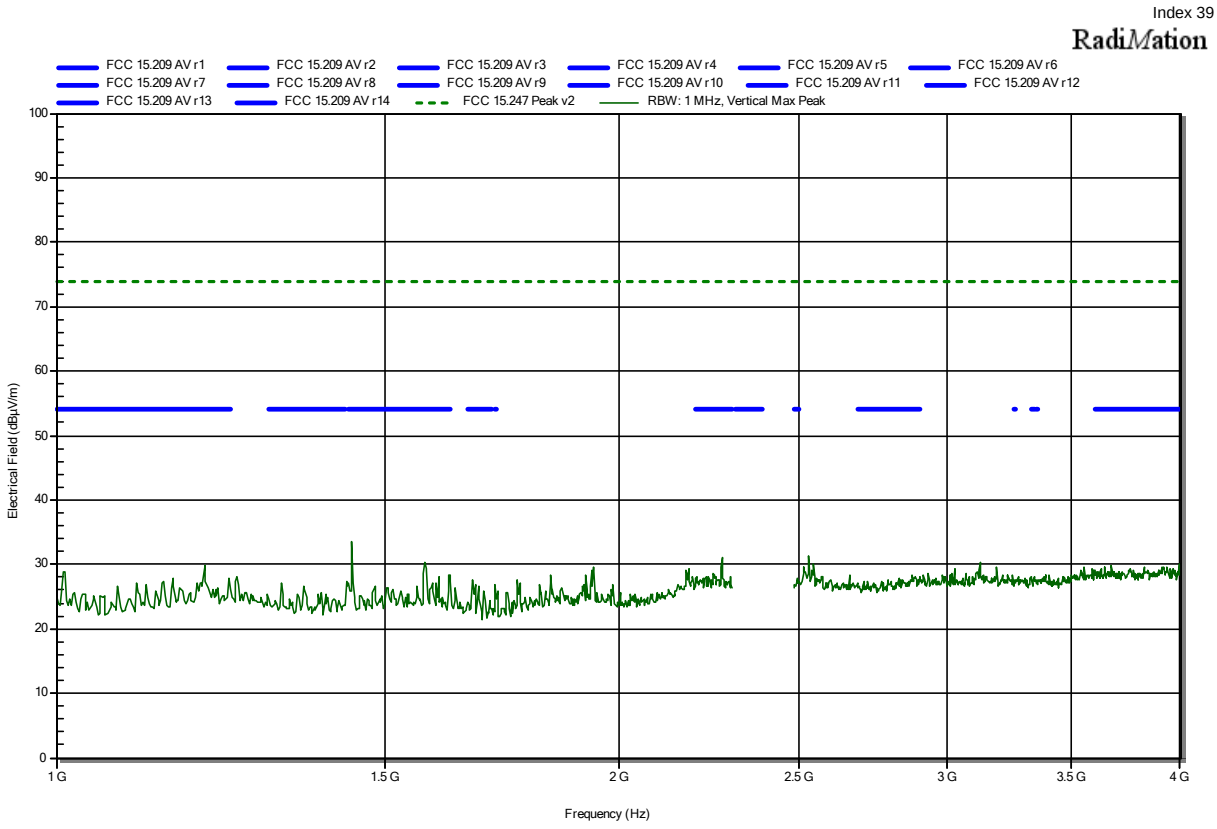
Radiated Spurious Emissions according to FCC 47 CFR 15.247

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m, converted to 3 m
Mode:	Tx; BLE; 1Mbit; P=-4 dBm; 2402 MHz
Test Date:	2020-12-09
Note:	EUT horizontal



Radiated Spurious Emissions according to FCC 47 CFR 15.247

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m, converted to 3 m
Mode:	Tx; BLE; 1Mbit; P=-4 dBm; 2402 MHz
Test Date:	2020-12-09
Note:	EUT horizontal



Radiated Spurious Emissions according to FCC 47 CFR 15.247

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m, converted to 3 m
Mode:	Tx; BLE; 1Mbit; P=-4 dBm; 2402 MHz
Test Date:	2020-12-09
Note:	lower bandedge, EUT horizontal

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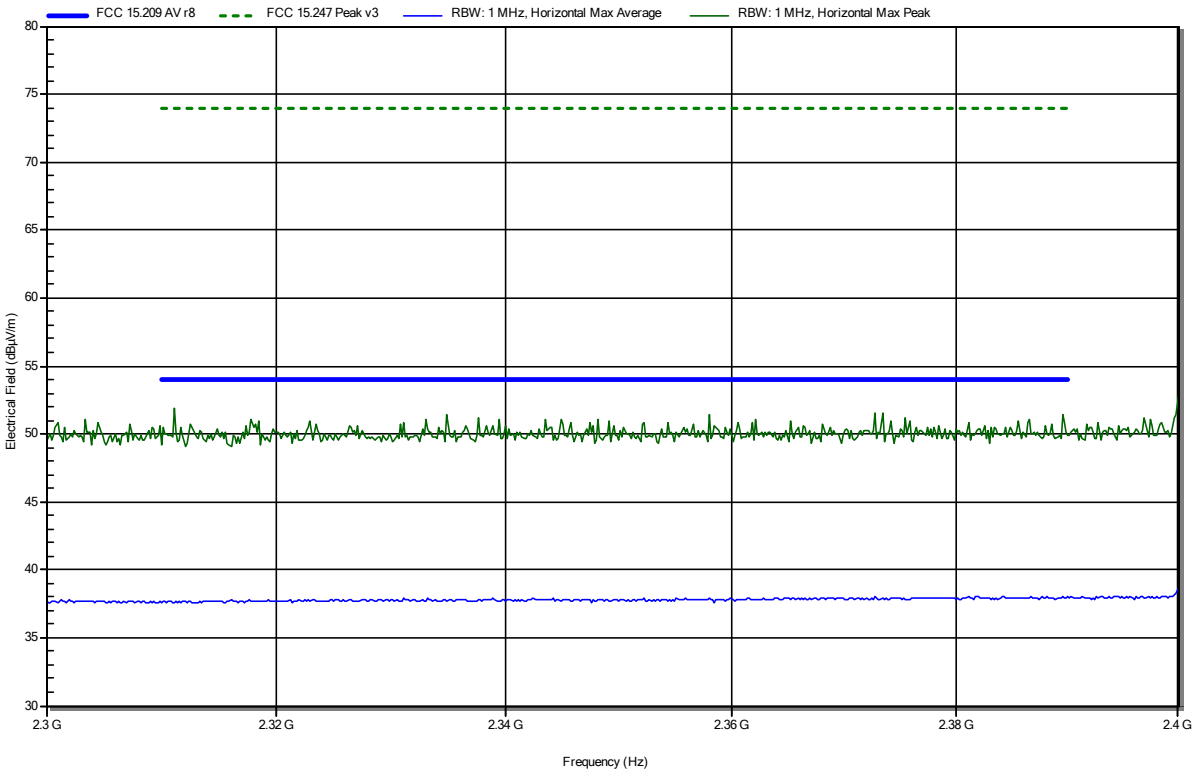
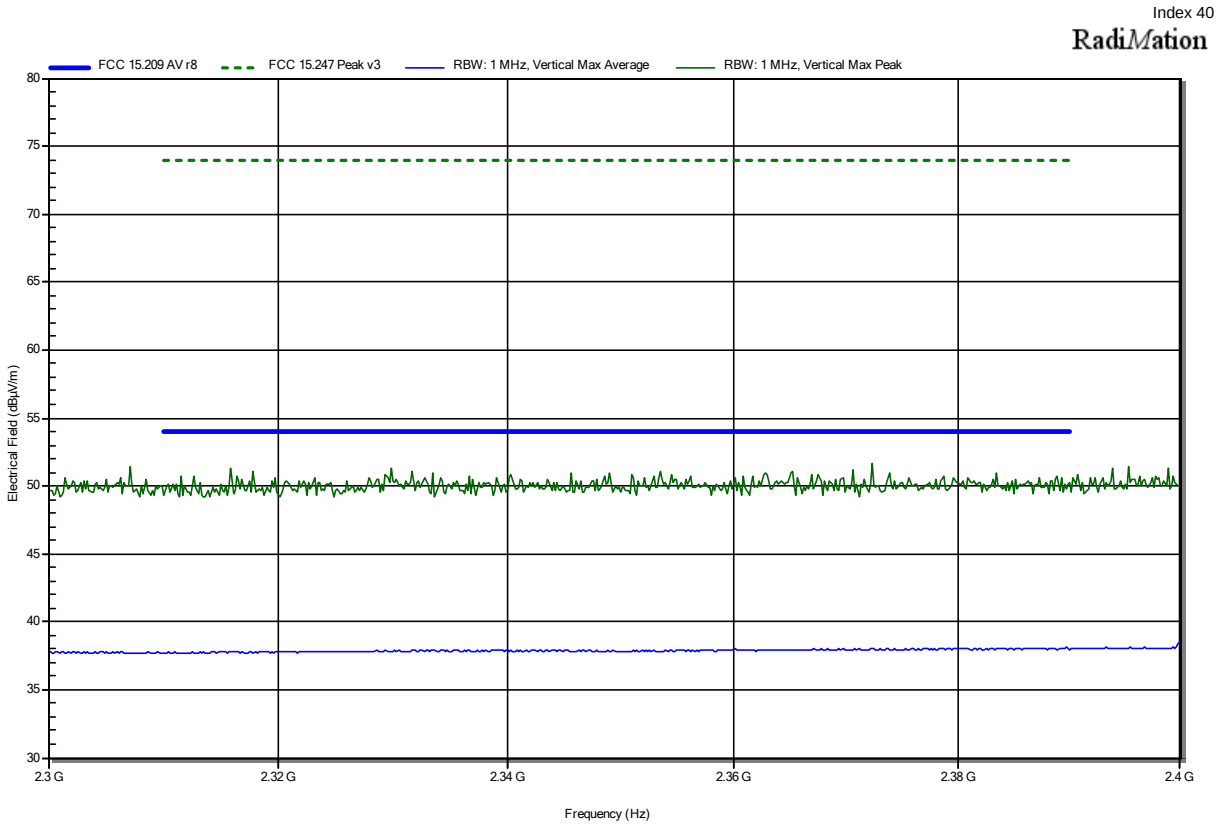
RadiMation



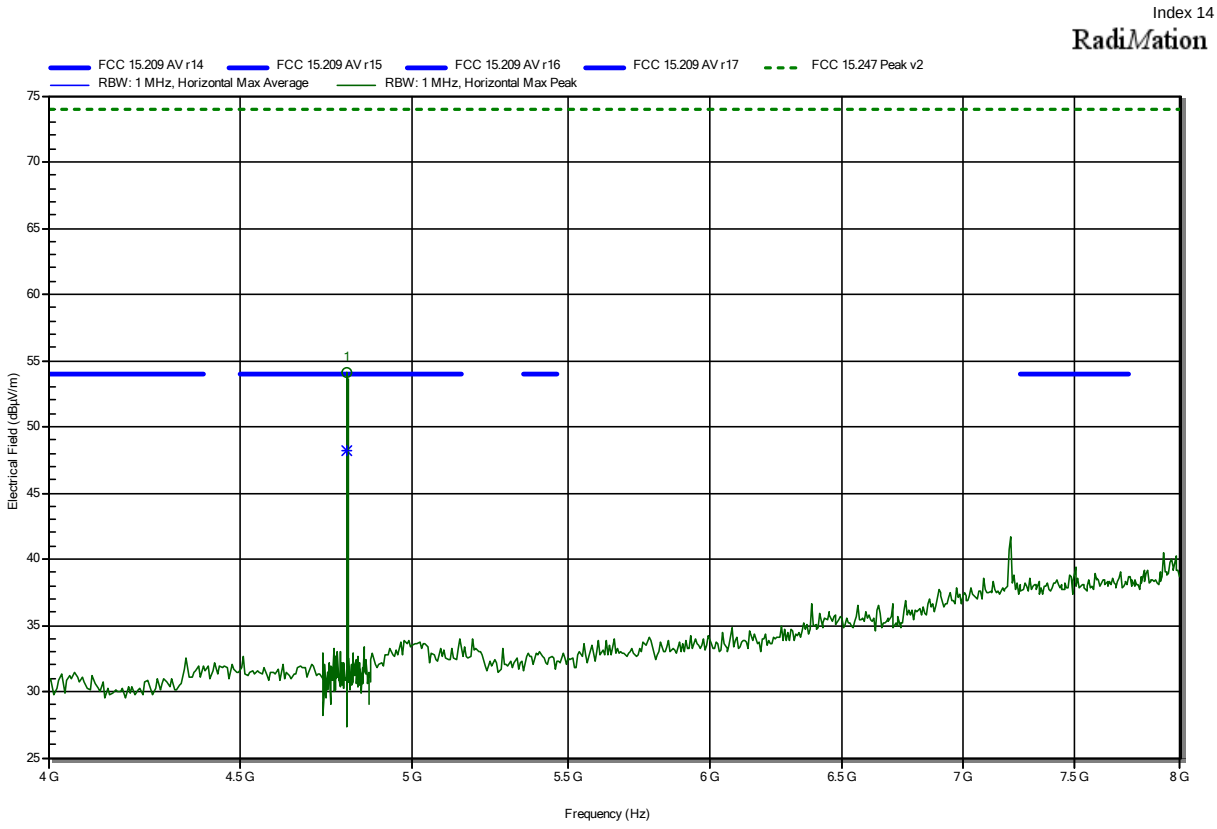
Radiated Spurious Emissions according to FCC 47 CFR 15.247

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m, converted to 3 m
Mode:	Tx; BLE; 1Mbit; P=-4 dBm; 2402 MHz
Test Date:	2020-12-09
Note:	lower bandedge



Radiated Spurious Emissions according to FCC 47 CFR 15.247

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m, converted to 3 m
Mode:	Tx; BLE; 1Mbit; P=-4 dBm; 2402 MHz
Test Date:	2020-12-09
Note:	EUT horizontal



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
4.805 GHz	54.05 dBµV/m	74 dBµV/m	-19.95 dB	Pass

Frequency	Average	Average Limit	Average Difference	Average Status
4.805 GHz	48.19 dBµV/m	54 dBµV/m	-5.81 dB	Pass

Radiated Spurious Emissions according to FCC 47 CFR 15.247

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m, converted to 3 m
Mode:	Tx; BLE; 1Mbit; P=-4 dBm; 2402 MHz
Test Date:	2020-12-09
Note:	EUT horizontal

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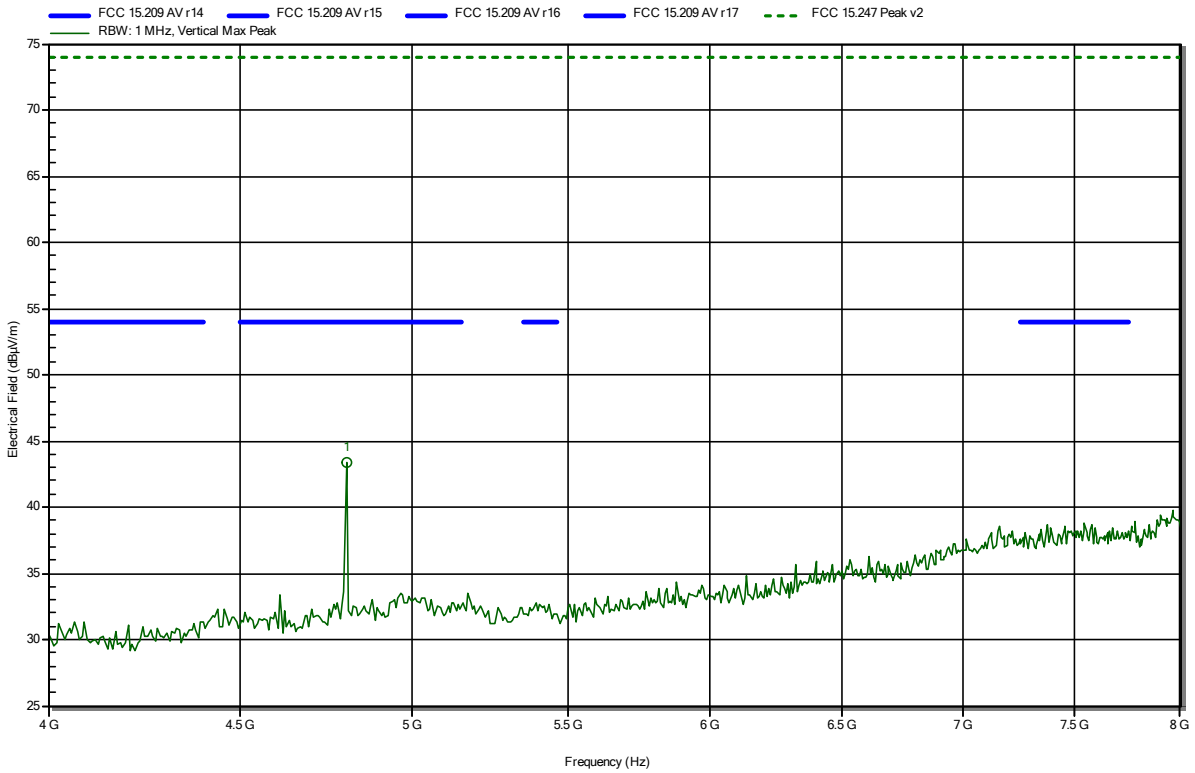
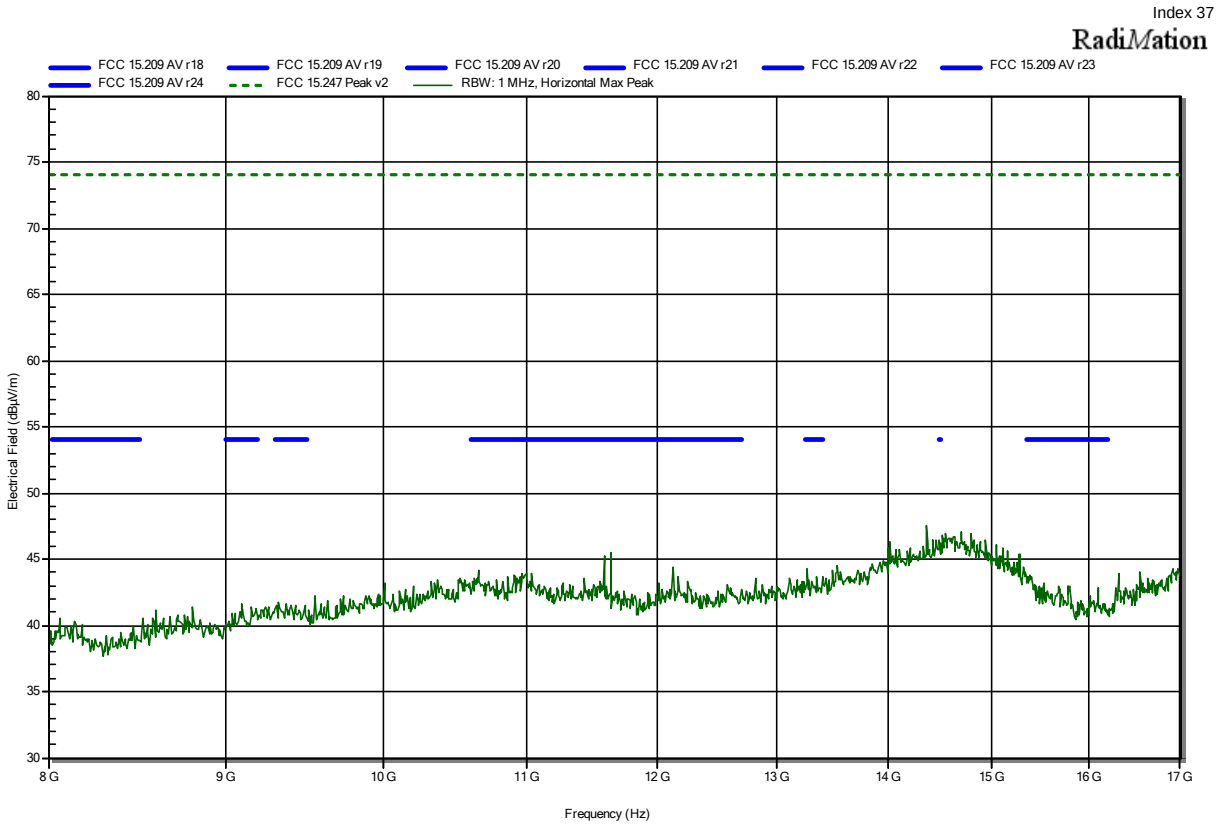
RadiMation



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
4.801 GHz	43.33 dBµV/m	74 dBµV/m	-30.67 dB	Pass

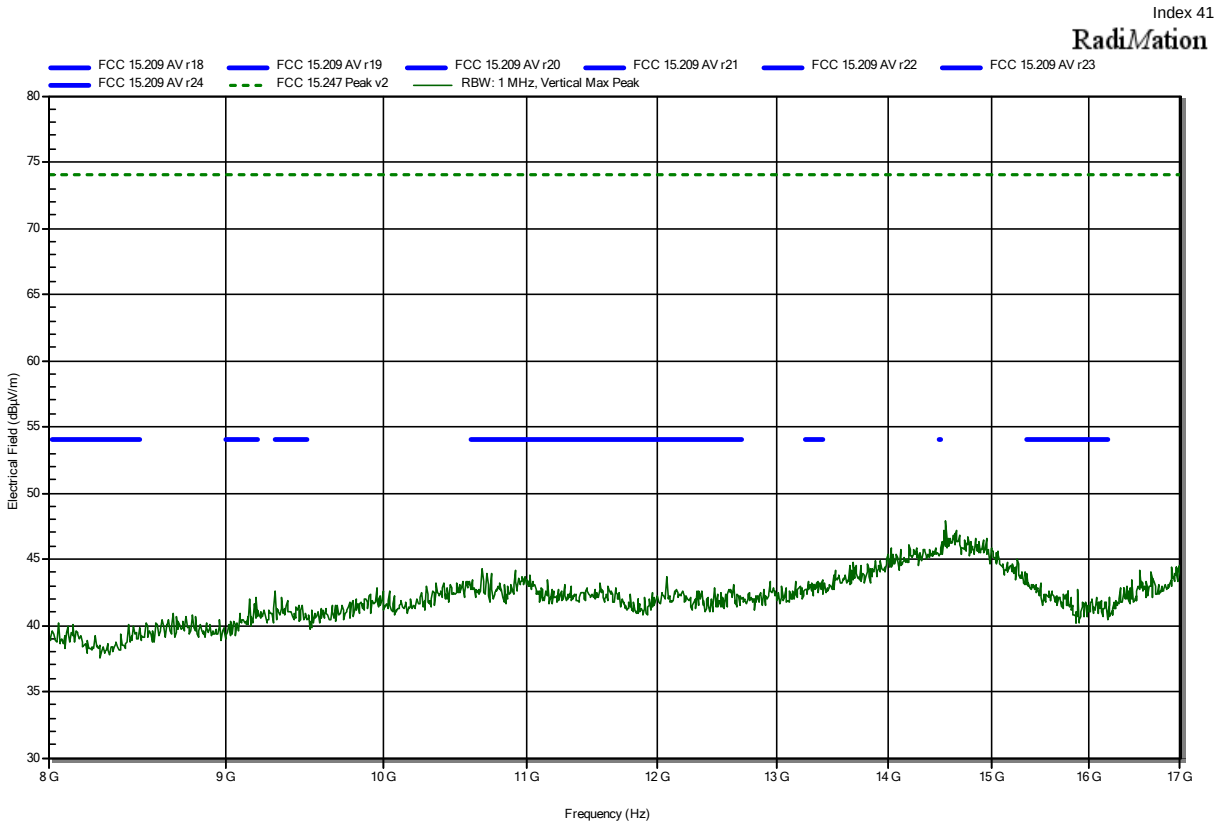
Radiated Spurious Emissions according to FCC 47 CFR 15.247

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m, converted to 3 m
Mode:	Tx; BLE; 1Mbit; P=-4 dBm; 2402 MHz
Test Date:	2020-12-09
Note:	EUT horizontal



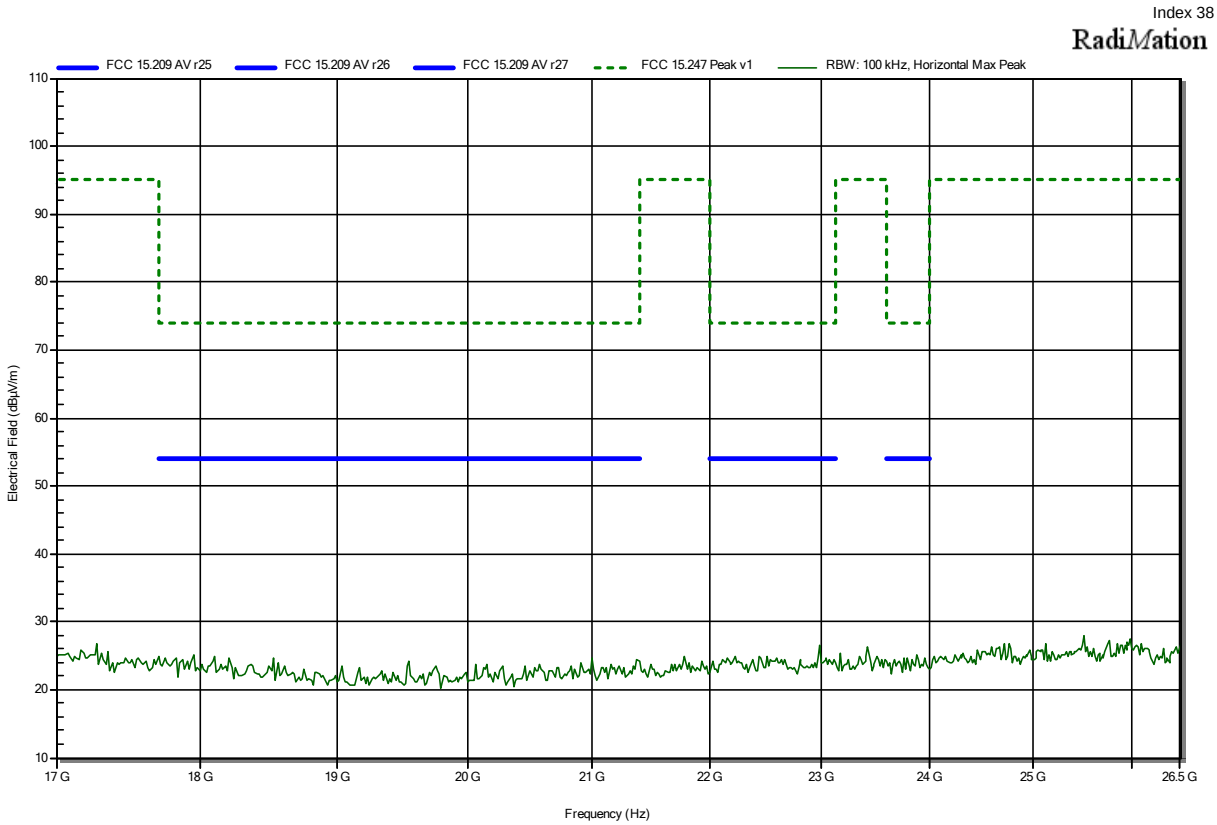
Radiated Spurious Emissions according to FCC 47 CFR 15.247

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m, converted to 3 m
Mode:	Tx; BLE; 1Mbit; P=-4 dBm; 2402 MHz
Test Date:	2020-12-09
Note:	EUT horizontal



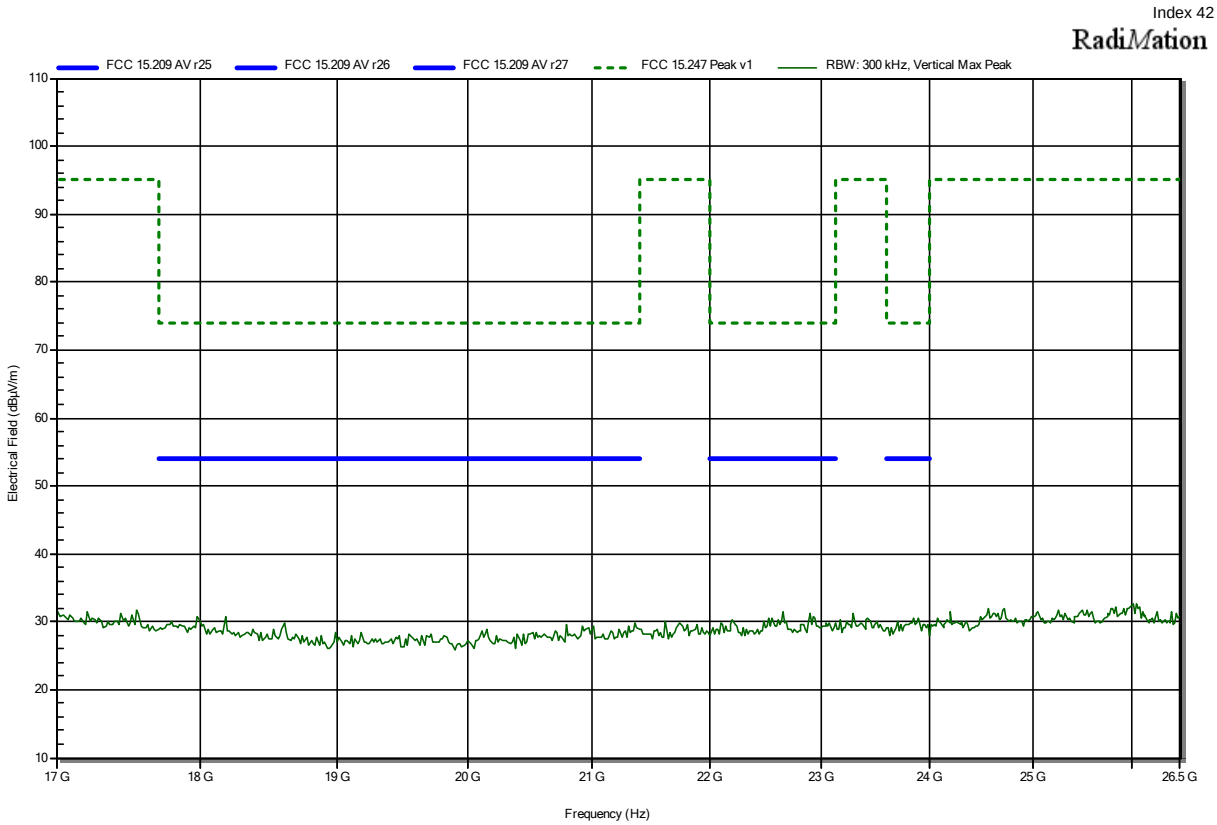
Radiated Spurious Emissions according to FCC 47 CFR 15.247

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Amplifier Research AT4560, Horizontal
Measurement distance:	1 m, converted to 3 m
Mode:	Tx; BLE; 1Mbit; P=-4 dBm; 2402 MHz
Test Date:	2020-12-09
Note:	EUT horizontal



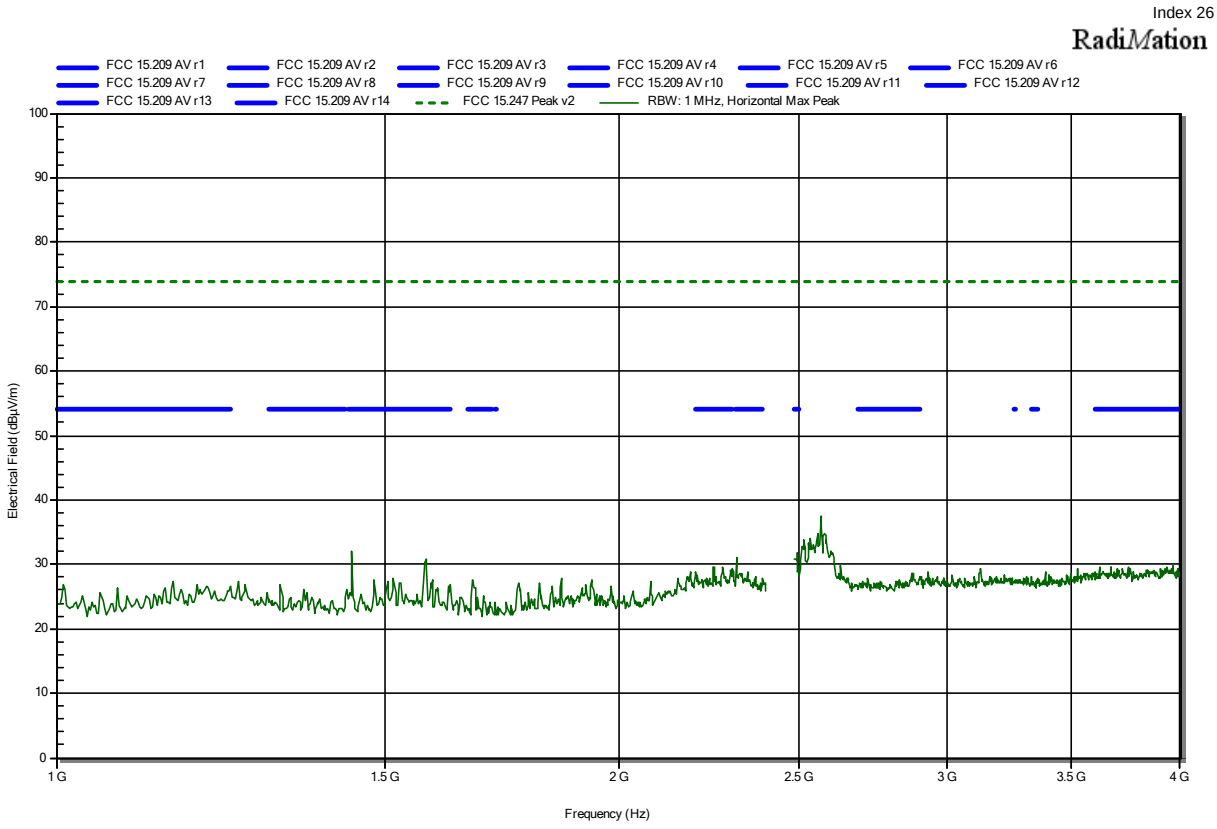
Radiated Spurious Emissions according to FCC 47 CFR 15.247

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Amplifier Research AT4560, Vertical
Measurement distance:	1 m, converted to 3 m
Mode:	Tx; BLE; 1Mbit; P=-4 dBm; 2402 MHz
Test Date:	2020-12-09
Note:	EUT horizontal



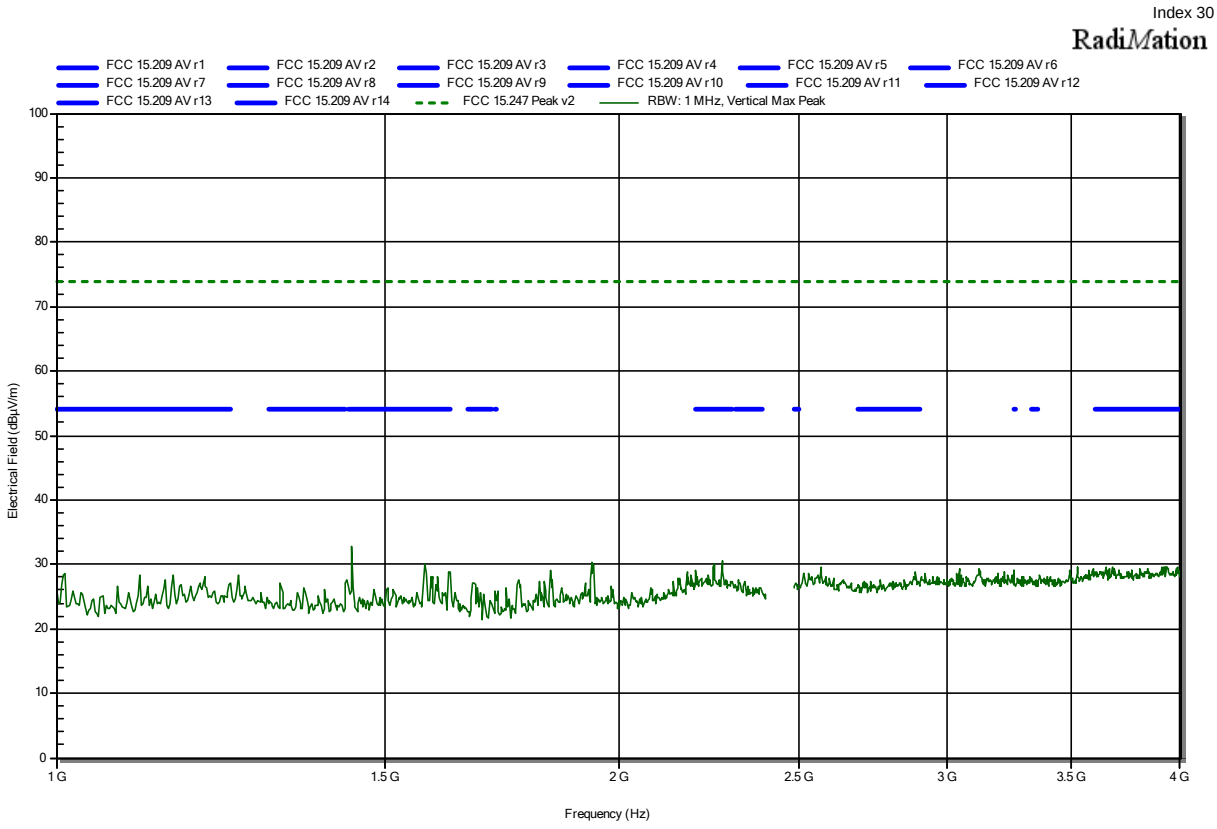
Radiated Spurious Emissions according to FCC 47 CFR 15.247

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m, converted to 3 m
Mode:	Tx; BLE; 1Mbit; P=-4 dBm; 2440 MHz
Test Date:	2020-12-09
Note:	EUT horizontal



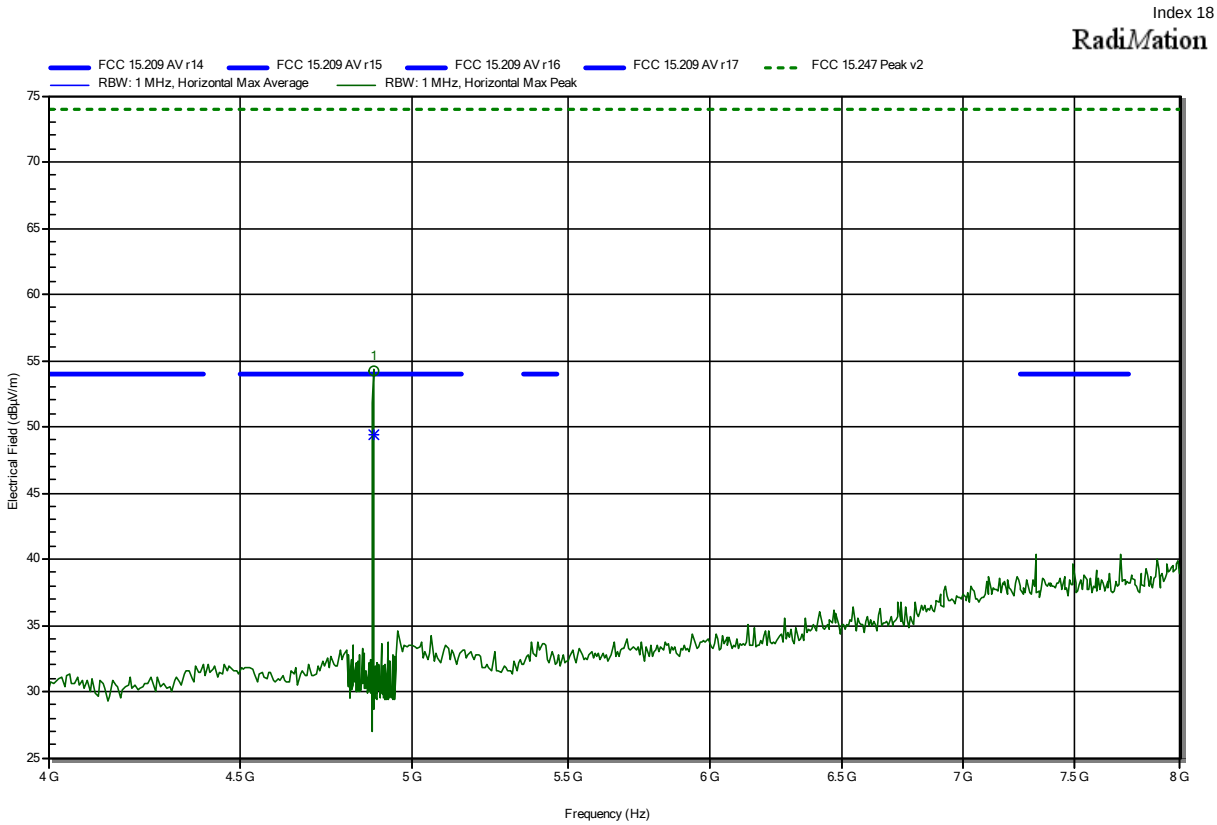
Radiated Spurious Emissions according to FCC 47 CFR 15.247

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m, converted to 3 m
Mode:	Tx; BLE; 1Mbit; P=-4 dBm; 2440 MHz
Test Date:	2020-12-09
Note:	EUT horizontal



Radiated Spurious Emissions according to FCC 47 CFR 15.247

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m, converted to 3 m
Mode:	Tx; BLE; 1Mbit; P=-4 dBm; 2440 MHz
Test Date:	2020-12-09
Note:	EUT horizontal



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
4.88 GHz	54.2 dBµV/m	74 dBµV/m	-19.8 dB	Pass

Frequency	Average	Average Limit	Average Difference	Average Status
4.88 GHz	49.39 dBµV/m	54 dBµV/m	-4.61 dB	Pass

Radiated Spurious Emissions according to FCC 47 CFR 15.247

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m, converted to 3 m
Mode:	Tx; BLE; 1Mbit; P=-4 dBm; 2440 MHz
Test Date:	2020-12-09
Note:	EUT horizontal

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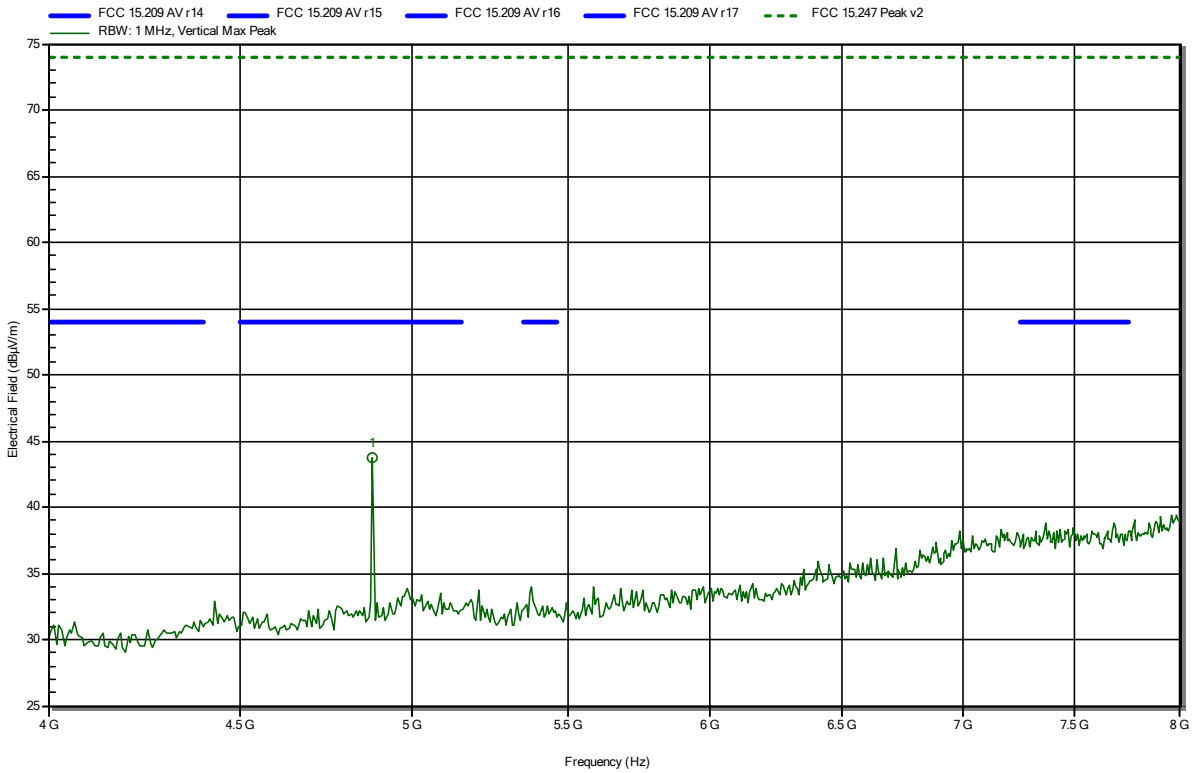
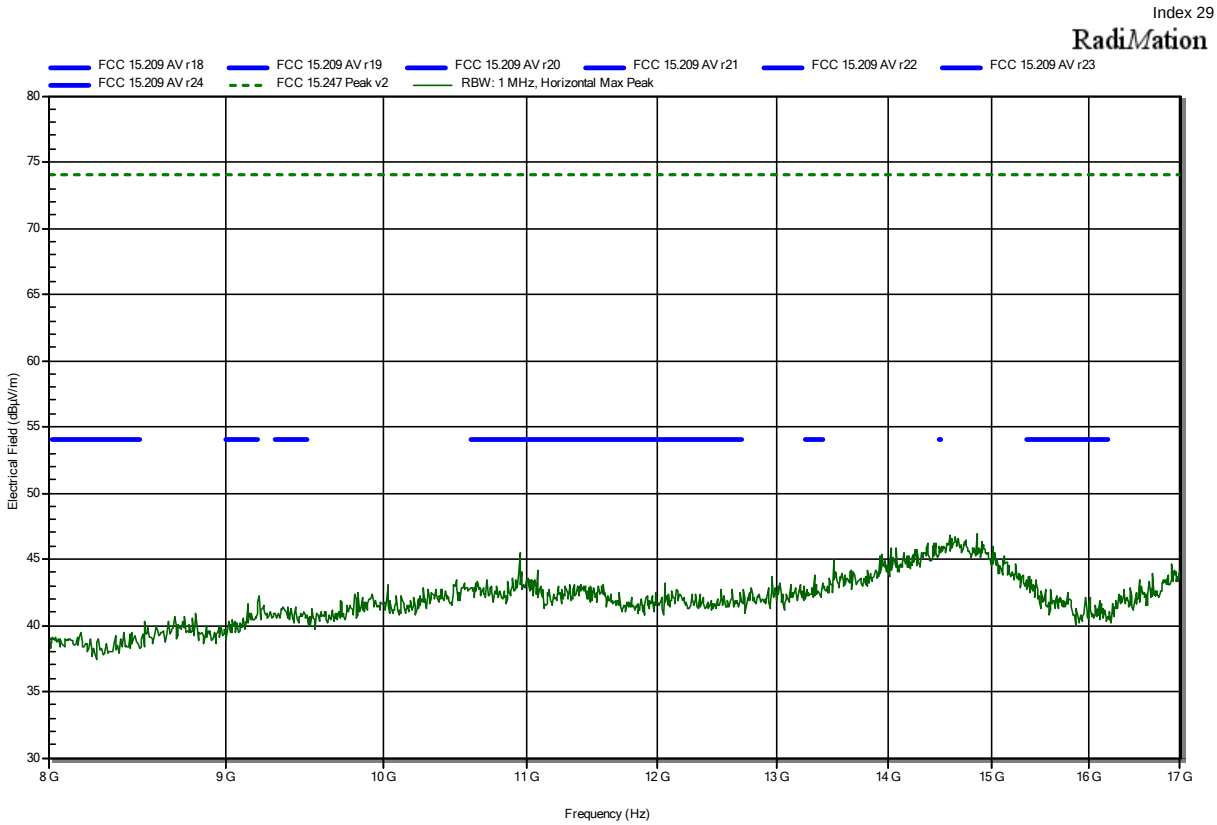
RadiMation



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
4.878 GHz	43.72 dBµV/m	74 dBµV/m	-30.28 dB	Pass

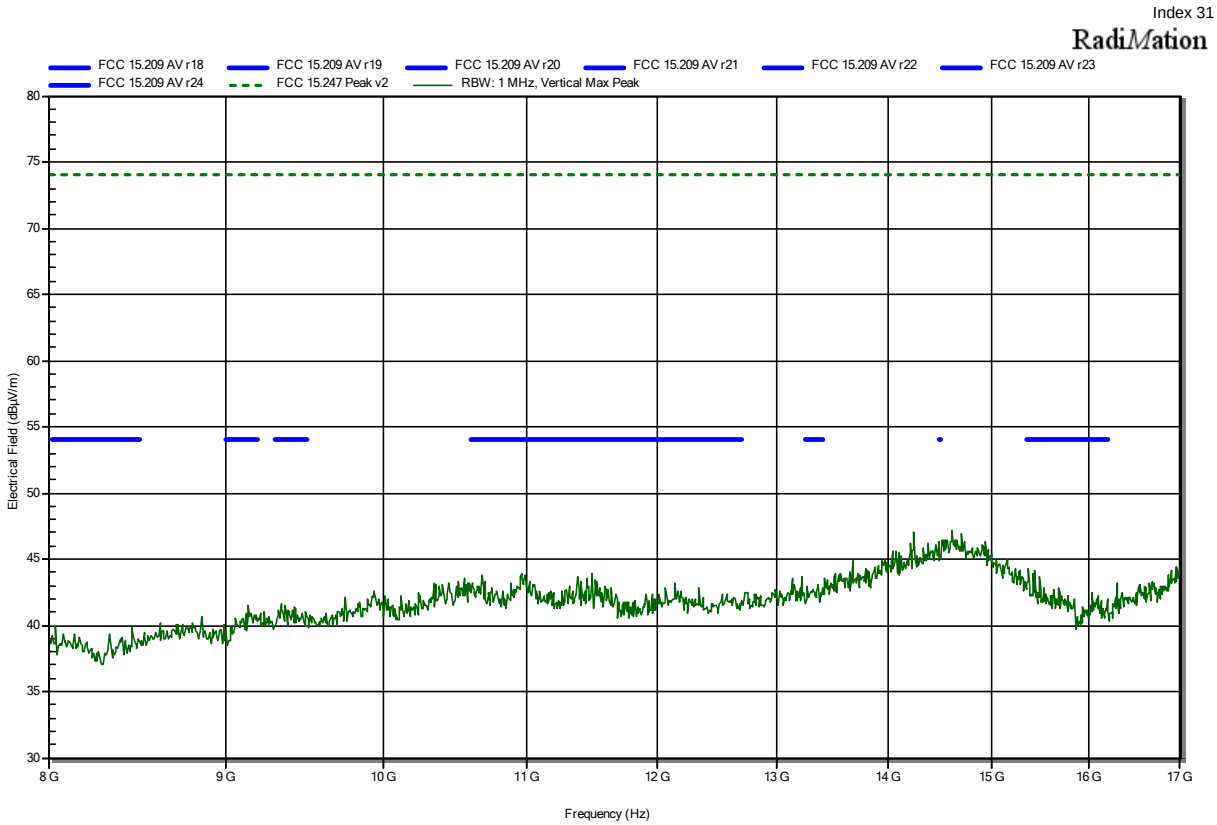
Radiated Spurious Emissions according to FCC 47 CFR 15.247

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m, converted to 3 m
Mode:	Tx; BLE; 1Mbit; P=-4 dBm; 2440 MHz
Test Date:	2020-12-09
Note:	EUT horizontal



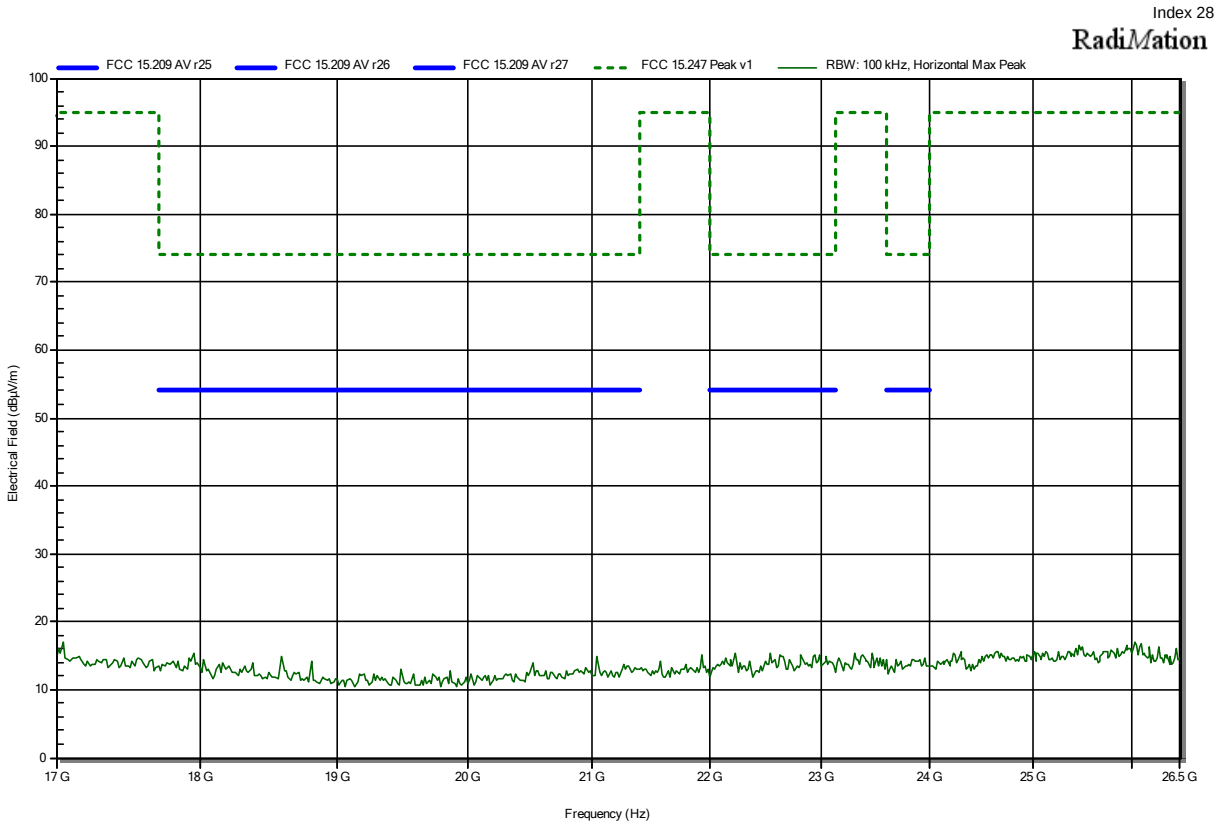
Radiated Spurious Emissions according to FCC 47 CFR 15.247

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m, converted to 3 m
Mode:	Tx; BLE; 1Mbit; P=-4 dBm; 2440 MHz
Test Date:	2020-12-09
Note:	EUT horizontal



Radiated Spurious Emissions according to FCC 47 CFR 15.247

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Amplifier Research AT4560, Horizontal
Measurement distance:	1 m, converted to 3 m
Mode:	Tx; BLE; 1Mbit; P=-4 dBm; 2440 MHz
Test Date:	2020-12-09
Note:	EUT horizontal



Radiated Spurious Emissions according to FCC 47 CFR 15.247

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
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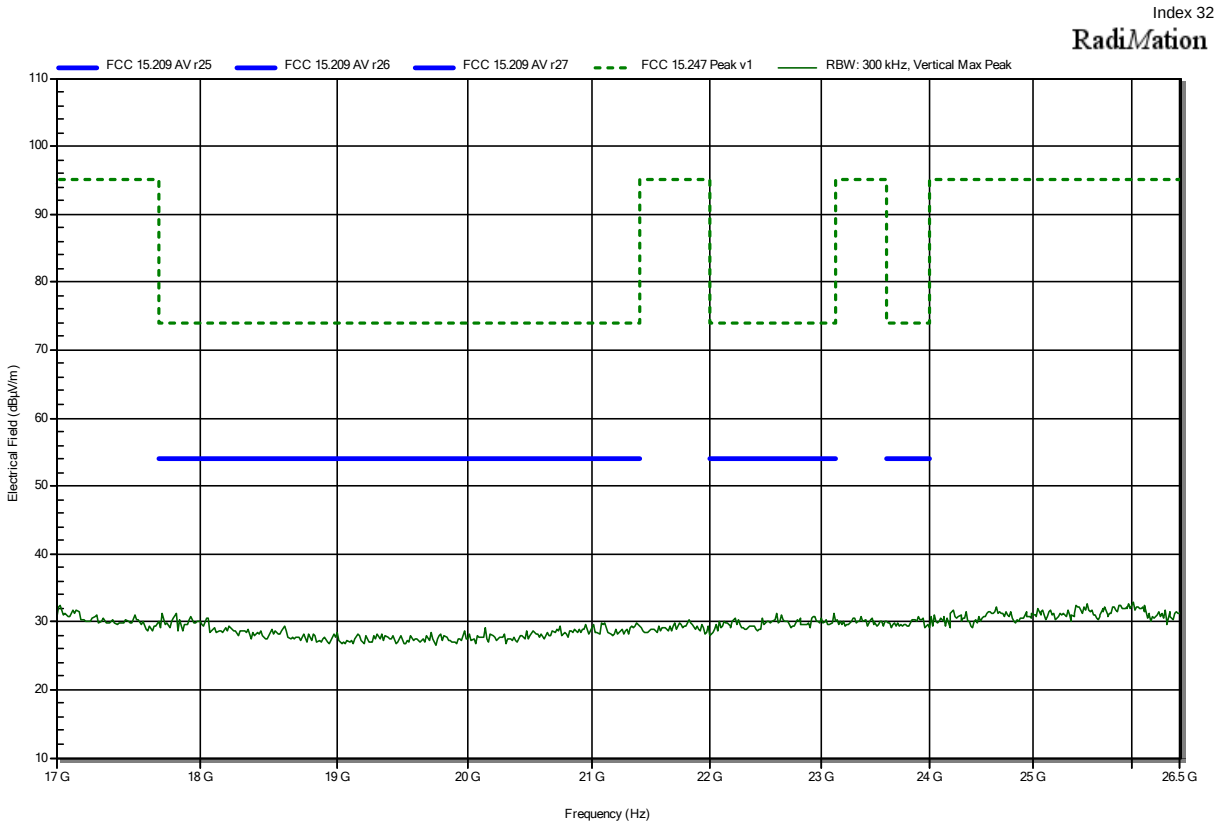
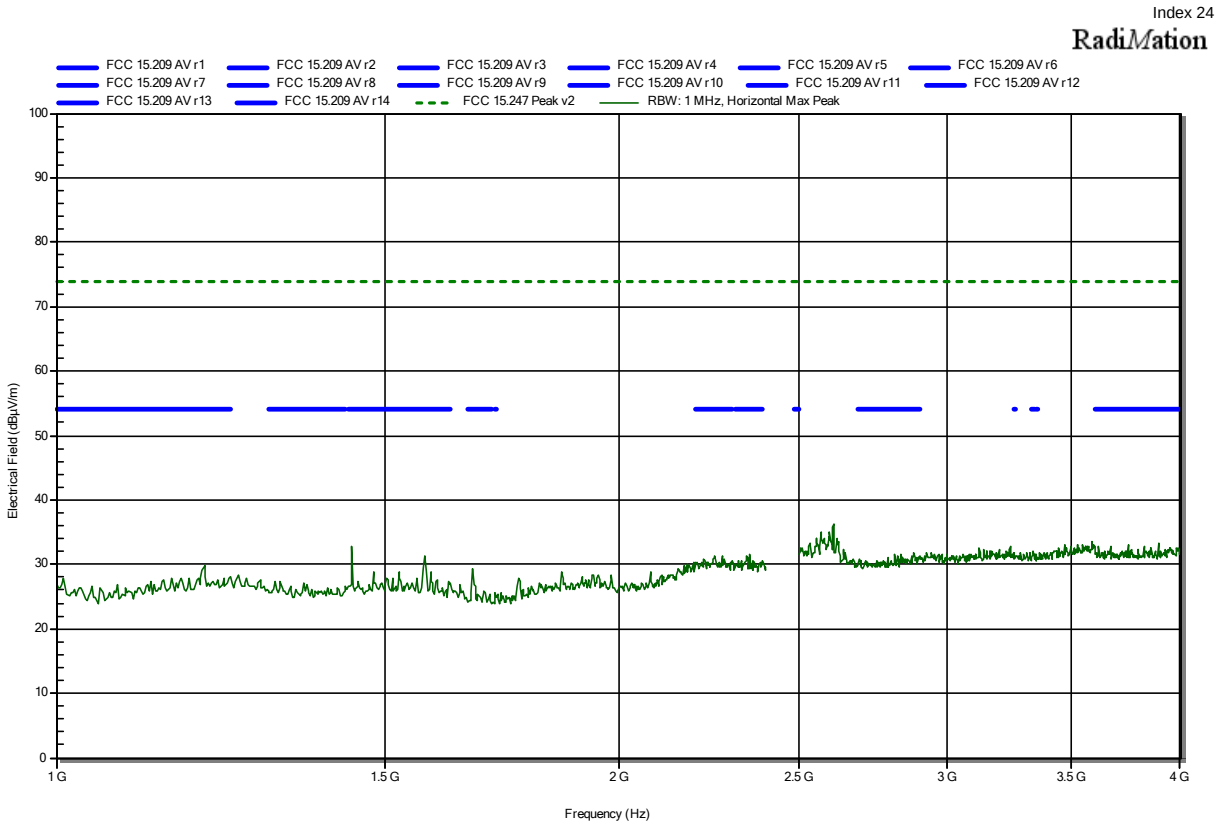
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Amplifier Research AT4560, Vertical
Measurement distance:	1 m, converted to 3 m
Mode:	Tx; BLE; 1Mbit; P=-4 dBm; 2440 MHz
Test Date:	2020-12-09
Note:	EUT horizontal



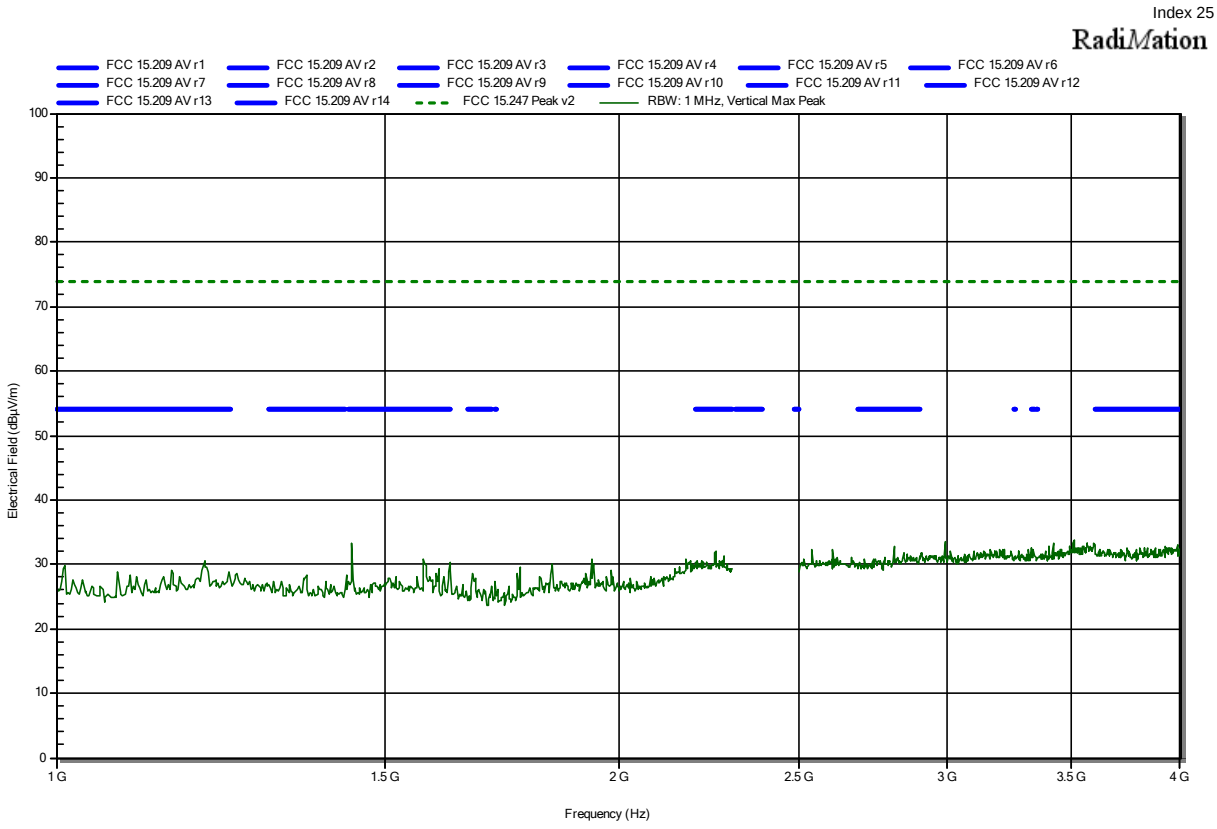
Radiated Spurious Emissions according to FCC 47 CFR 15.247

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m, converted to 3 m
Mode:	Tx; BLE; 1Mbit; P=-4 dBm; 2480 MHz
Test Date:	2020-12-09
Note:	EUT horizontal



Radiated Spurious Emissions according to FCC 47 CFR 15.247

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m, converted to 3 m
Mode:	Tx; BLE; 1Mbit; P=-4 dBm; 2480 MHz
Test Date:	2020-12-09
Note:	EUT horizontal



Radiated Spurious Emissions according to FCC 47 CFR 15.247

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m, converted to 3 m
Mode:	Tx; BLE; 1Mbit; P=-4 dBm; 2480 MHz
Test Date:	2020-12-09
Note:	upper bandedge

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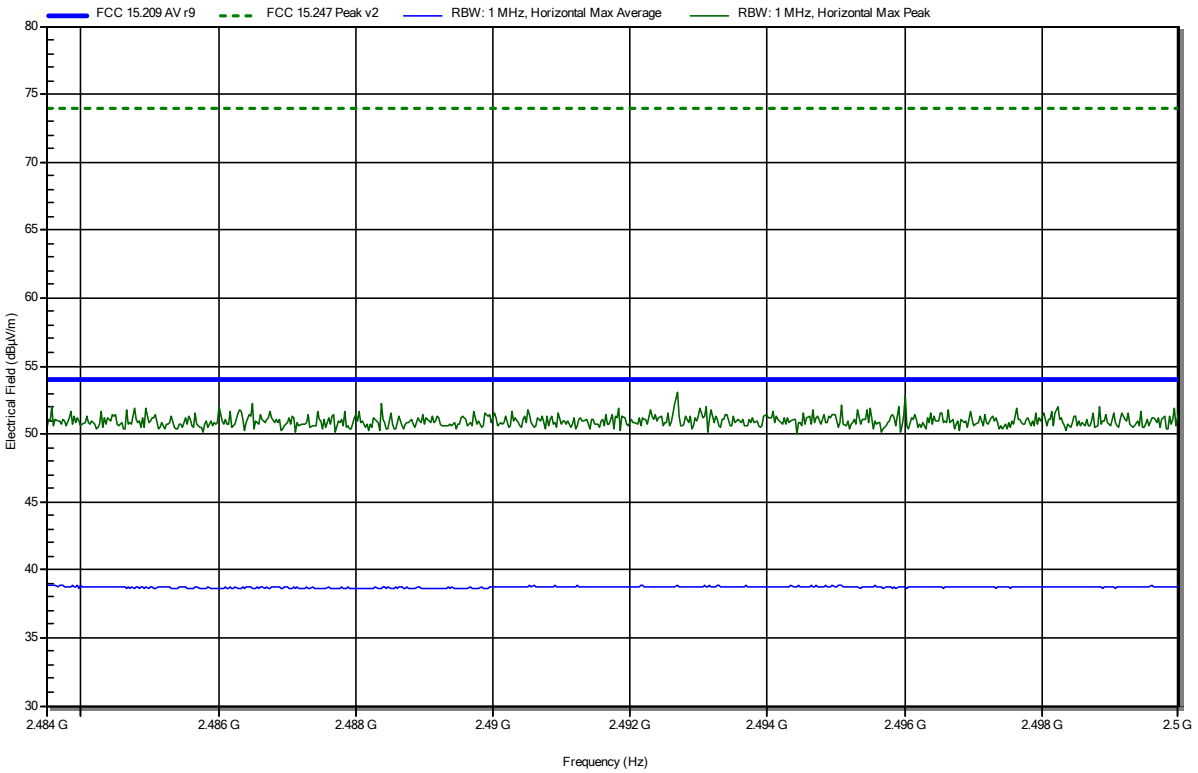
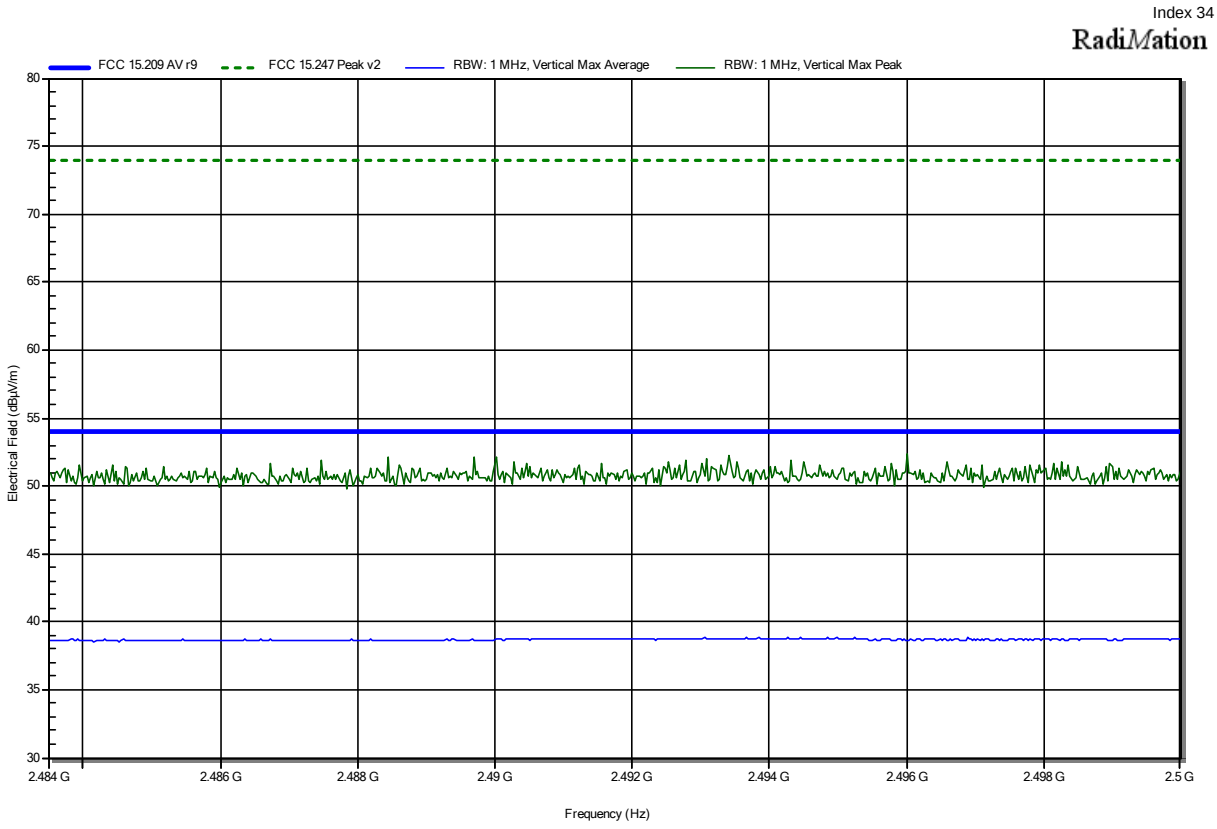
RadiMation



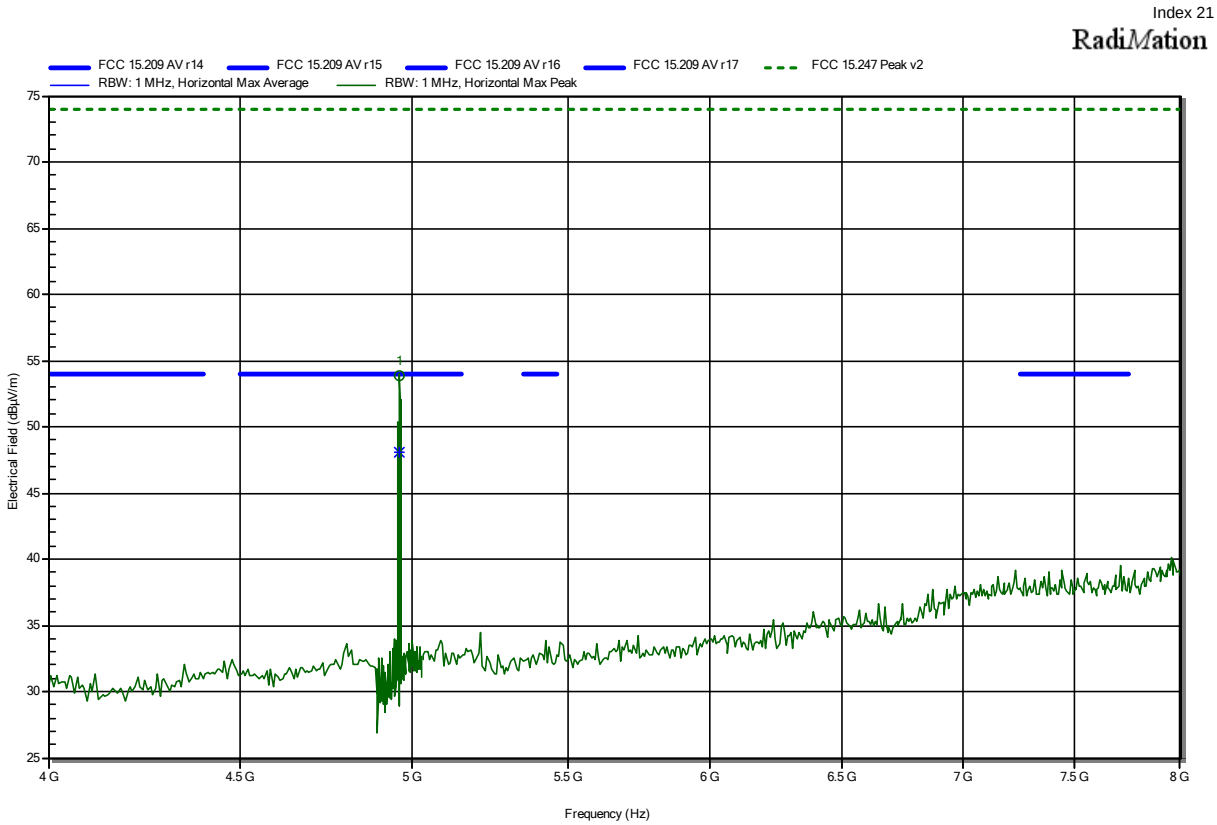
Radiated Spurious Emissions according to FCC 47 CFR 15.247

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m, converted to 3 m
Mode:	Tx; BLE; 1Mbit; P=-4 dBm; 2480 MHz
Test Date:	2020-12-09
Note:	upper bandedge



Radiated Spurious Emissions according to FCC 47 CFR 15.247

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m, converted to 3 m
Mode:	Tx; BLE; 1Mbit; P=-4 dBm; 2480 MHz
Test Date:	2020-12-09
Note:	EUT horizontal



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
4.96 GHz	53.85 dBµV/m	74 dBµV/m	-20.15 dB	Pass

Frequency	Average	Average Limit	Average Difference	Average Status
4.96 GHz	48.03 dBµV/m	54 dBµV/m	-5.97 dB	Pass

Radiated Spurious Emissions according to FCC 47 CFR 15.247

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m, converted to 3 m
Mode:	Tx; BLE; 1Mbit; P=-4 dBm; 2480 MHz
Test Date:	2020-12-09
Note:	EUT horizontal

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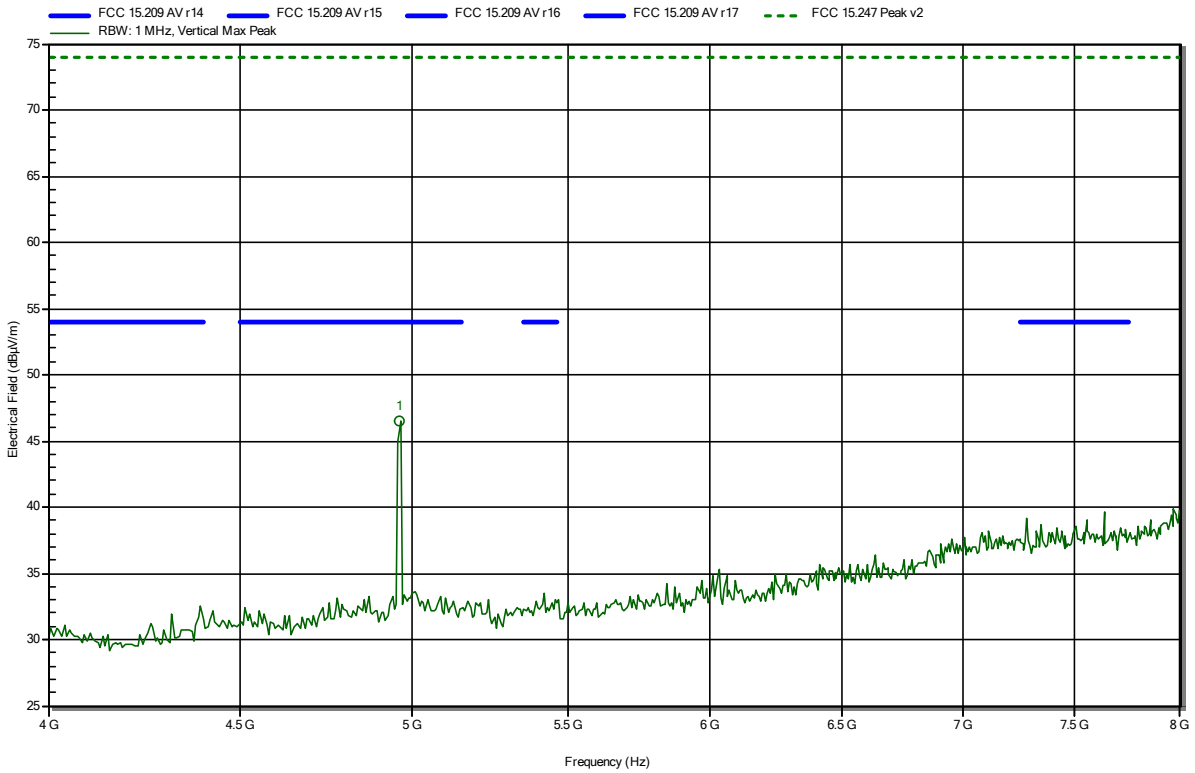
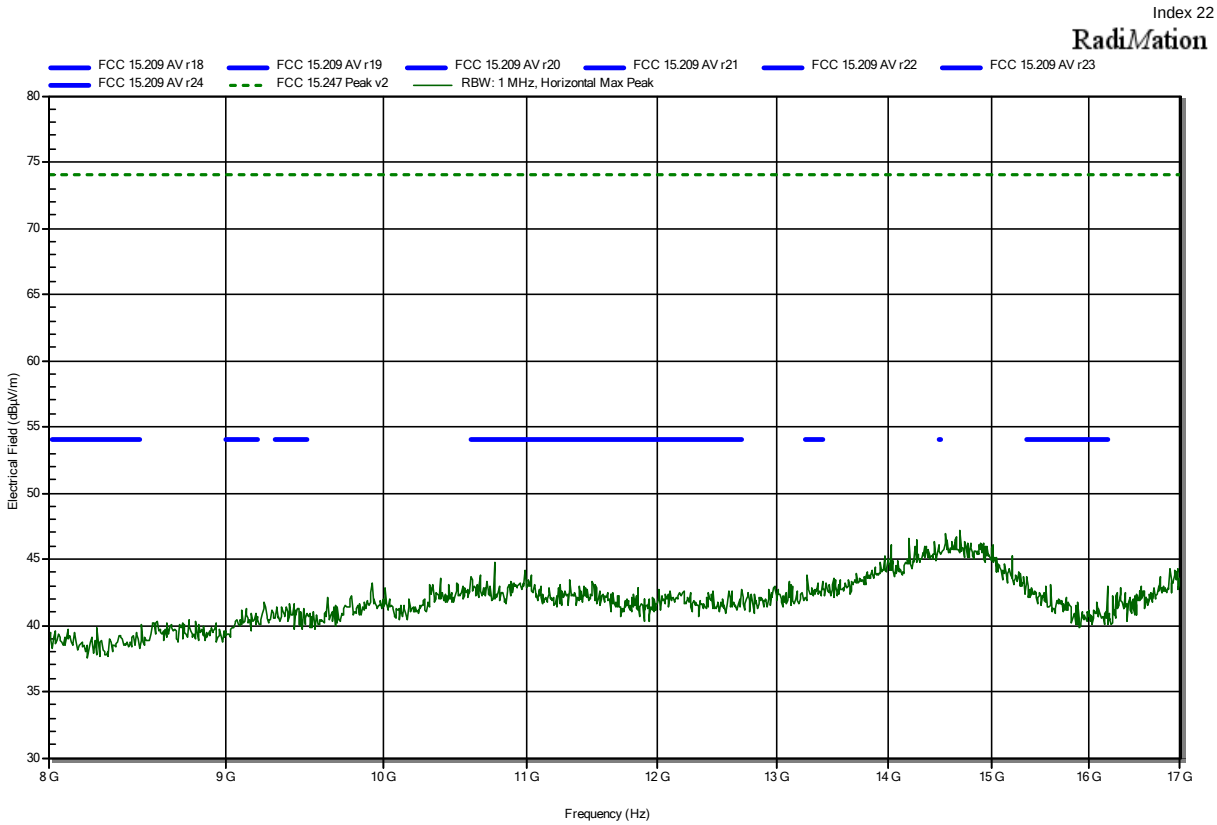


Frequency	Peak	Peak Limit	Peak Difference	Peak Status
4.962 GHz	46.54 dBµV/m	74 dBµV/m	-27.46 dB	Pass

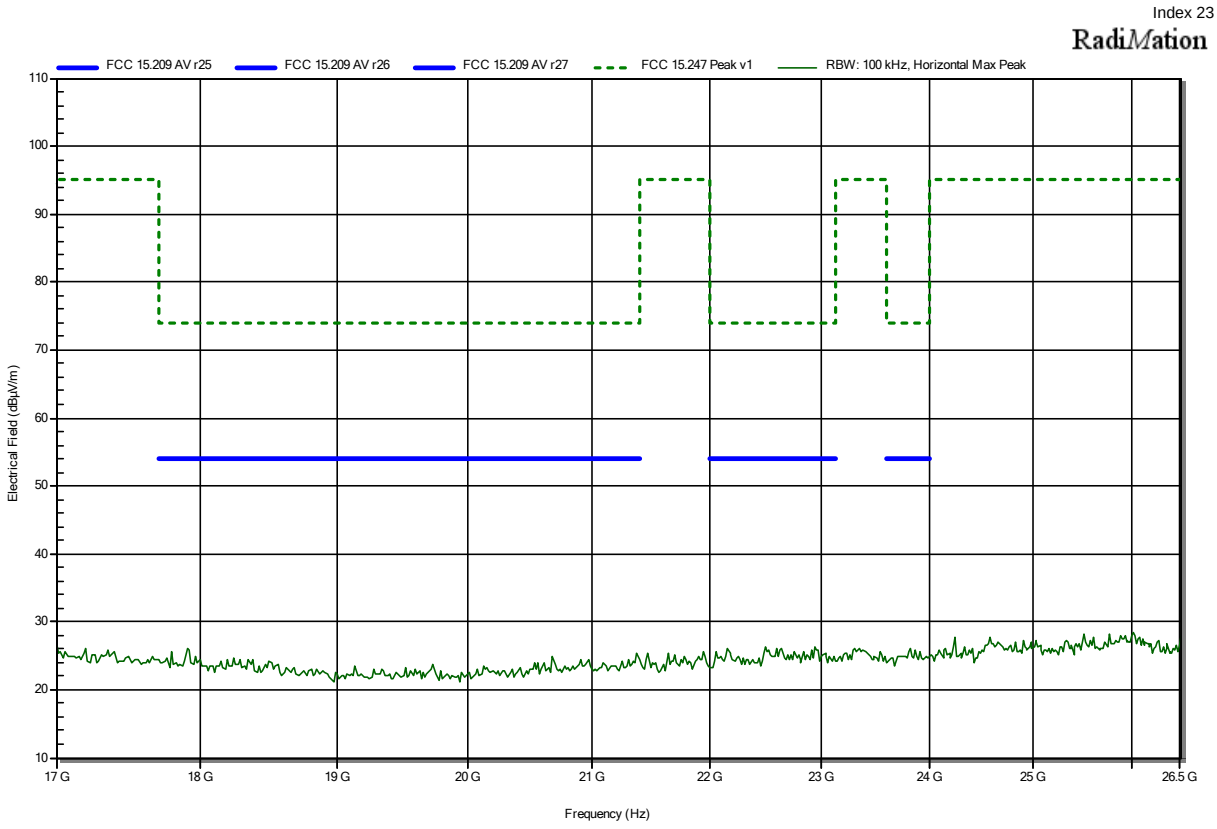
Radiated Spurious Emissions according to FCC 47 CFR 15.247

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m, converted to 3 m
Mode:	Tx; BLE; 1Mbit; P=-4 dBm; 2480 MHz
Test Date:	2020-12-09
Note:	EUT horizontal



Radiated Spurious Emissions according to FCC 47 CFR 15.247

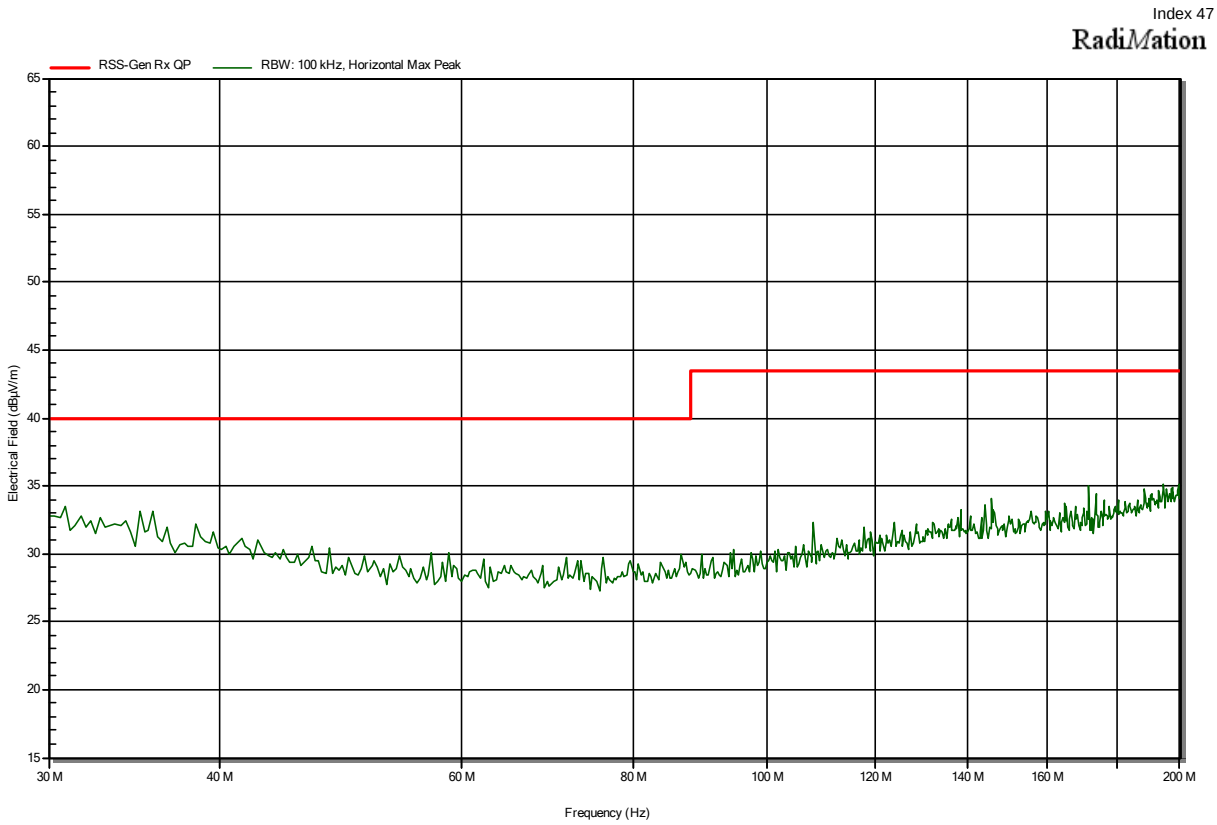
Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Amplifier Research AT4560, Horizontal
Measurement distance:	1 m, converted to 3 m
Mode:	Tx; BLE; 1Mbit; P=-4 dBm; 2480 MHz
Test Date:	2020-12-09
Note:	EUT horizontal



ANNEX B Receiver spurious emissions

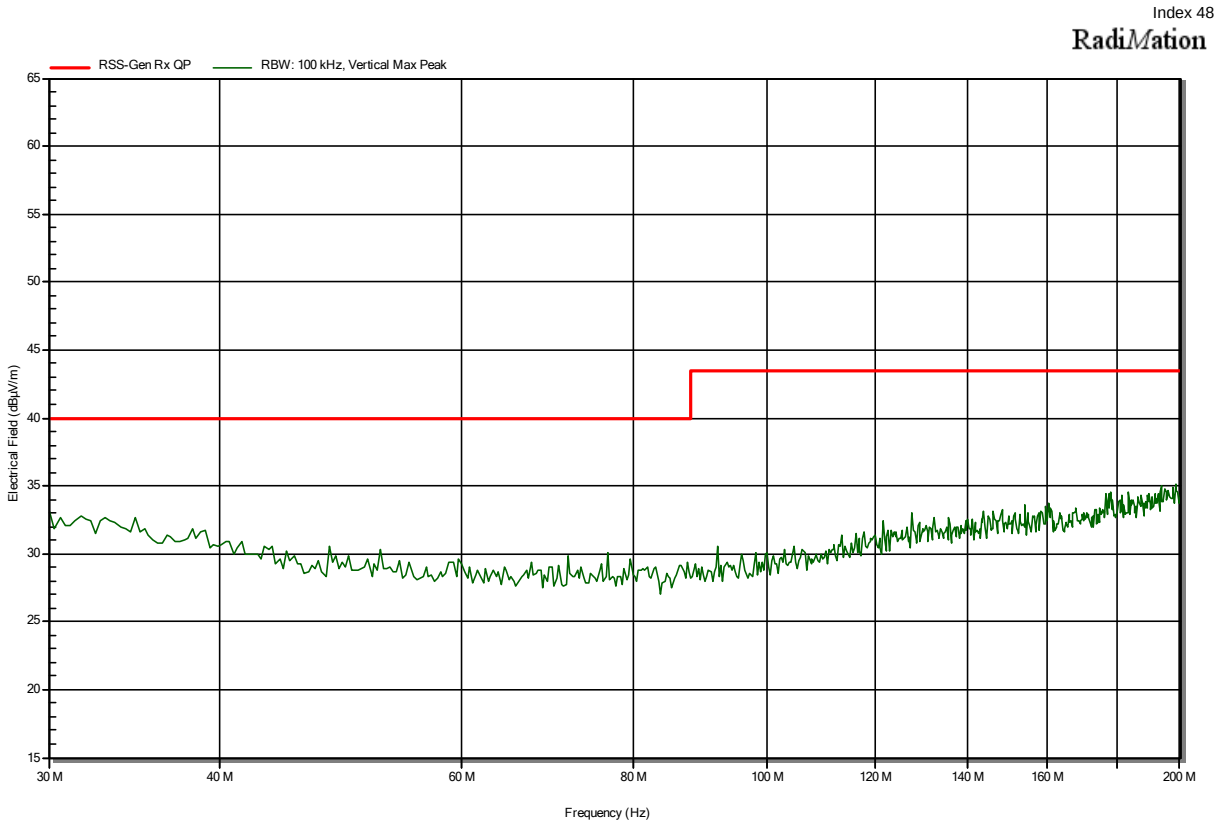
Radiated Spurious Emissions according to ISED RSS-Gen Issue 5, Amendment 1 (March 2019)

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	Rx; BLE; 2440 MHz
Test Date:	2020-12-09
Note:	EUT horizontal



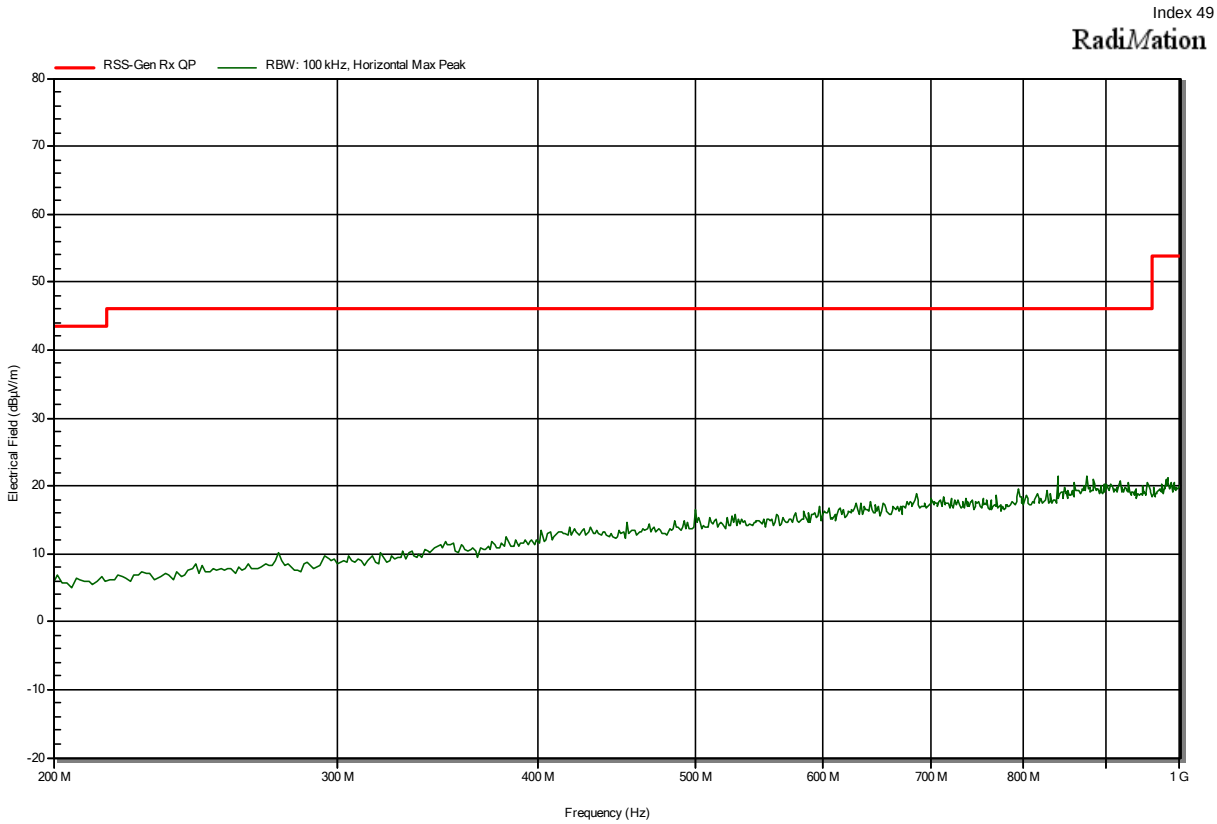
Radiated Spurious Emissions according to ISED RSS-Gen Issue 5, Amendment 1 (March 2019)

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	Rx; BLE; 2440 MHz
Test Date:	2020-12-09
Note:	EUT horizontal



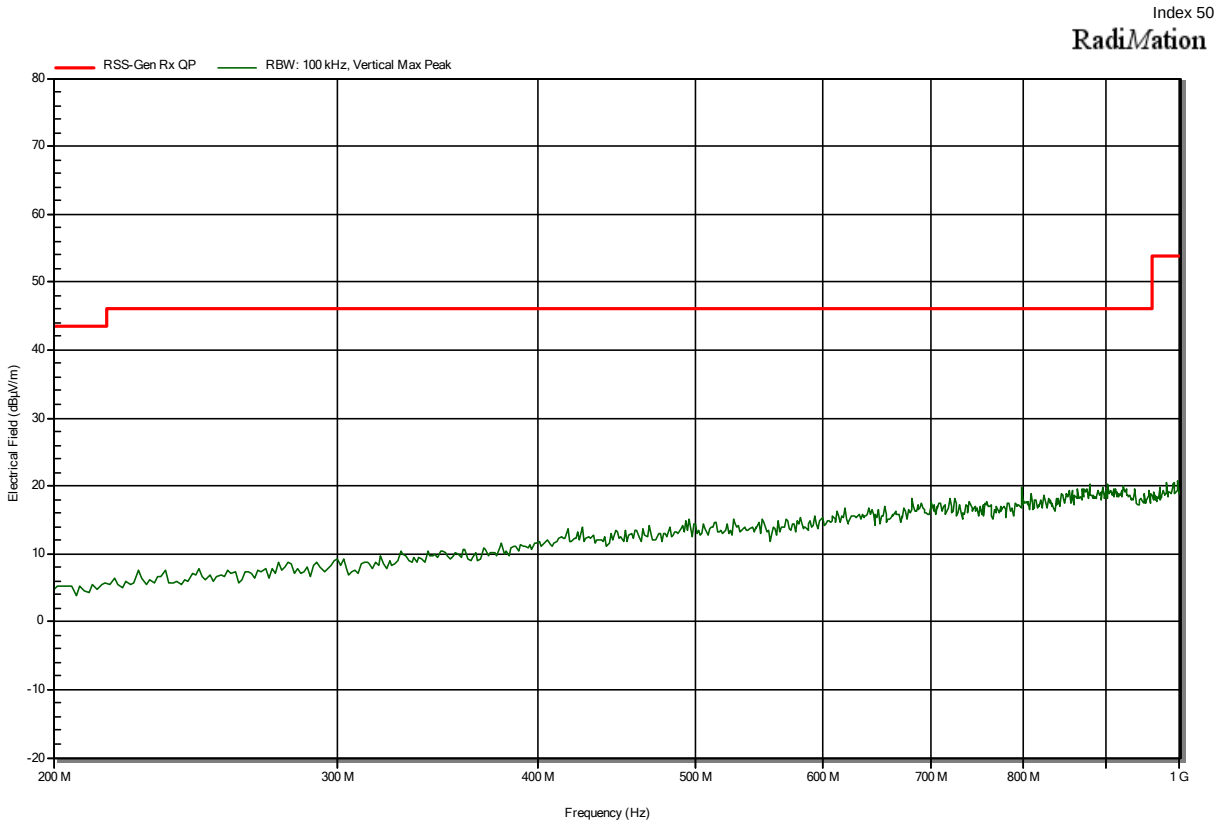
Radiated Spurious Emissions according to ISED RSS-Gen Issue 5, Amendment 1 (March 2019)

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	Rx; BLE; 2440 MHz
Test Date:	2020-12-09
Note:	EUT horizontal



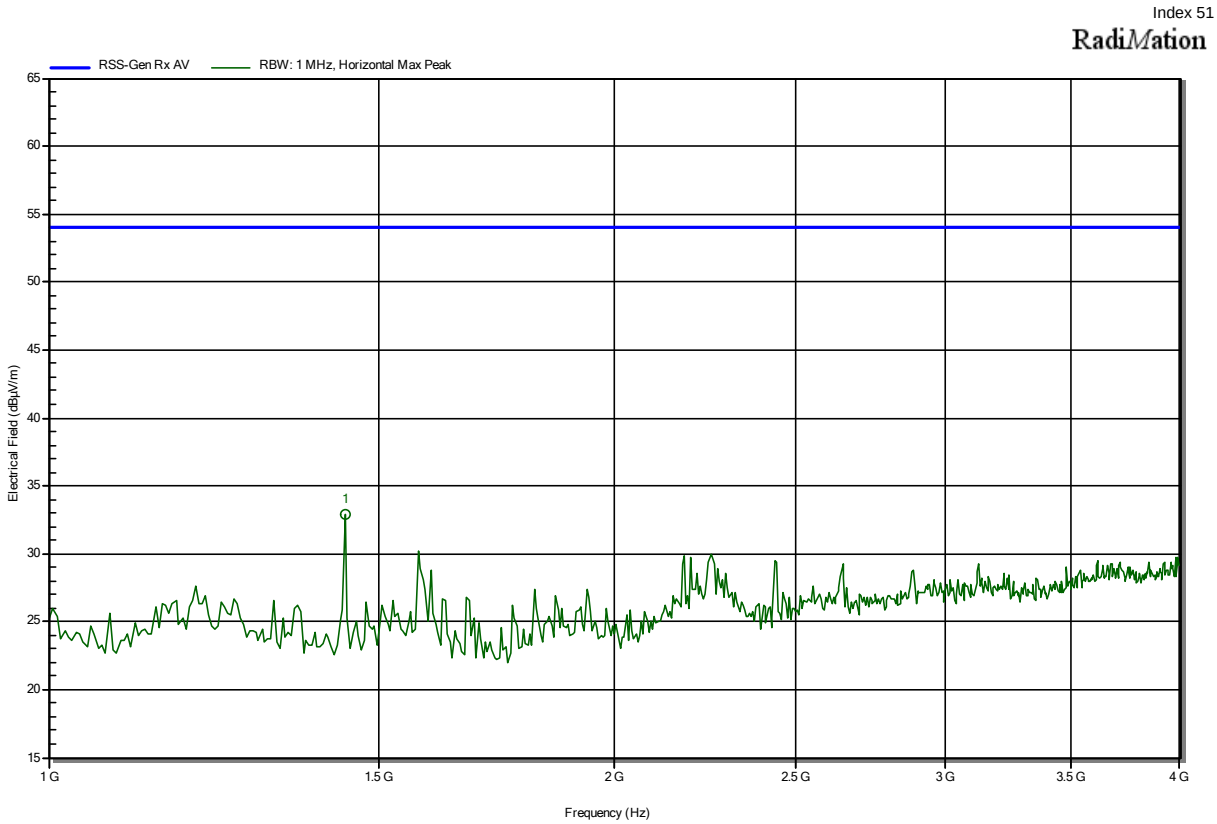
Radiated Spurious Emissions according to ISED RSS-Gen Issue 5, Amendment 1 (March 2019)

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	Rx; BLE; 2440 MHz
Test Date:	2020-12-09
Note:	EUT horizontal



Radiated Spurious Emissions according to ISED RSS-Gen Issue 5, Amendment 1 (March 2019)

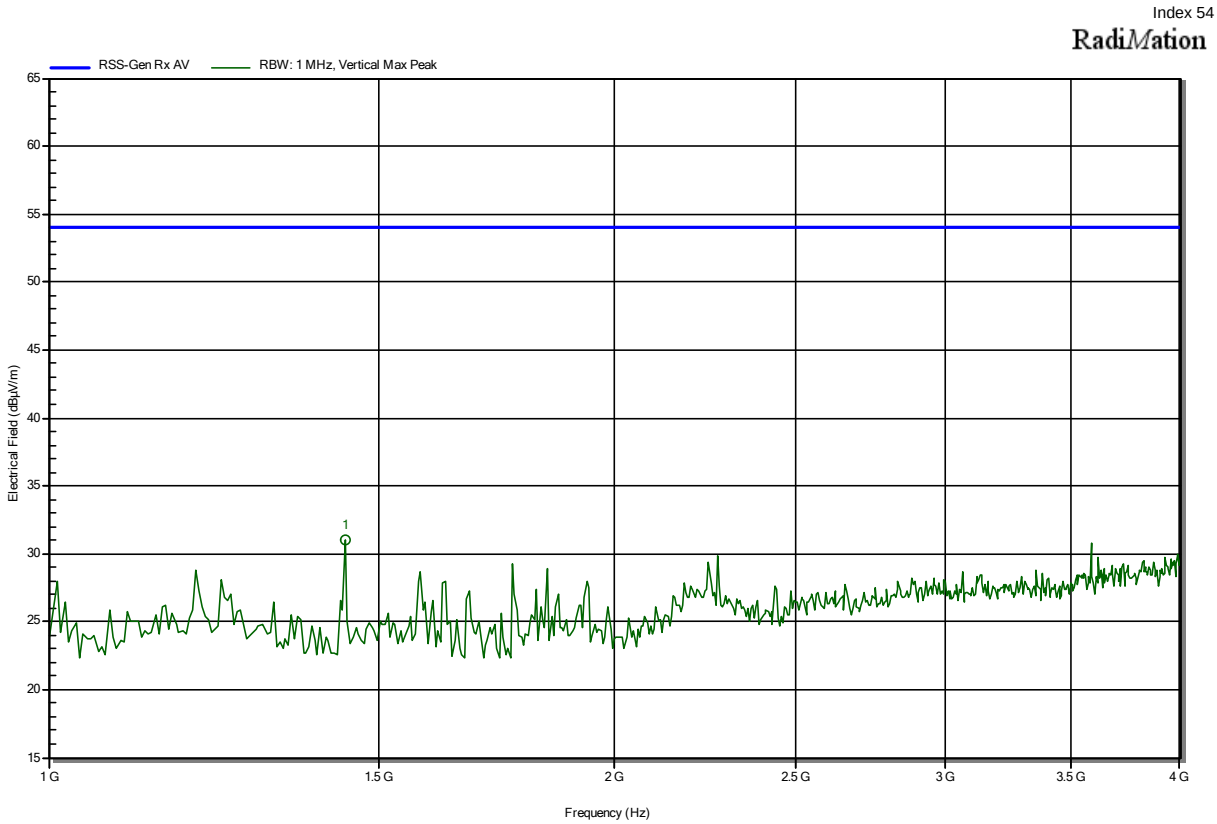
Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m
Mode:	Rx; BLE; 2440 MHz
Test Date:	2020-12-10
Note:	EUT horizontal



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
1.438 GHz	32.85 dBµV/m	53.98 dBµV/m	-21.13 dB	Pass

Radiated Spurious Emissions according to ISED RSS-Gen Issue 5, Amendment 1 (March 2019)

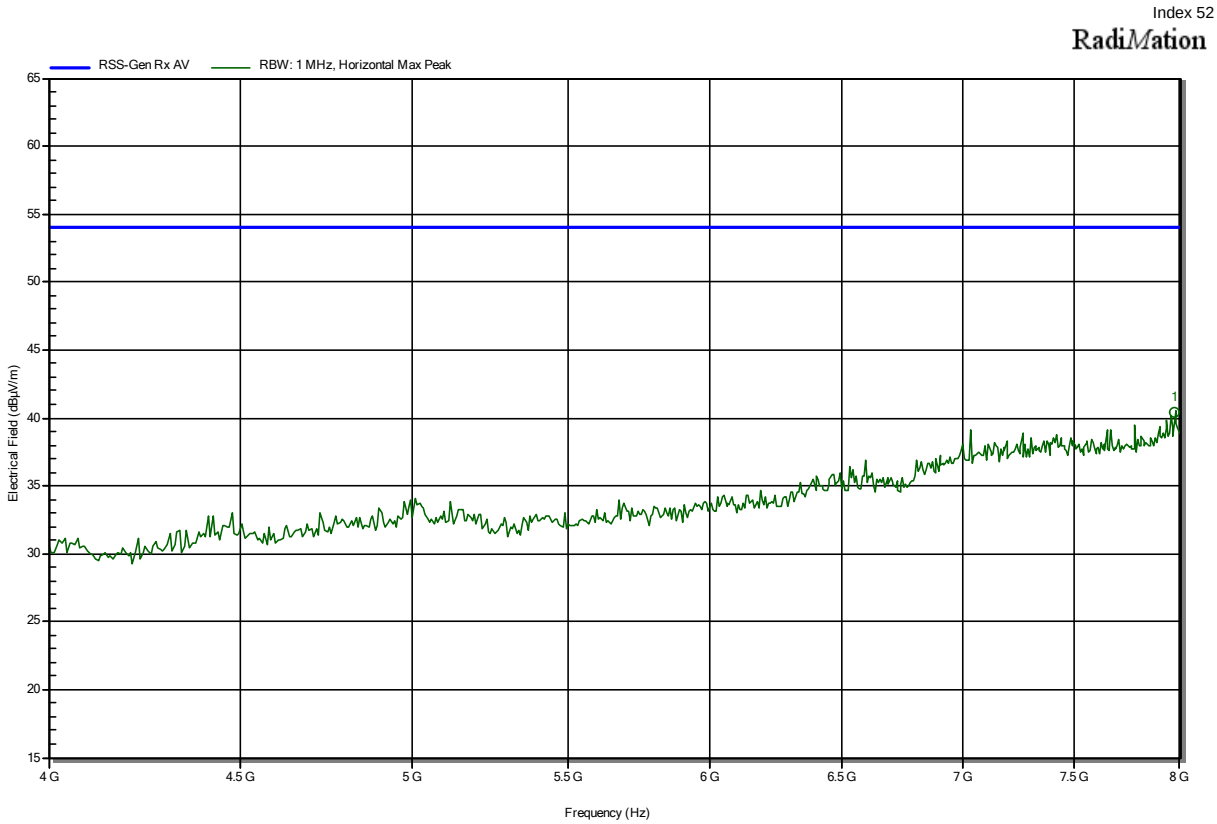
Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m, converted to 3 m
Mode:	Rx; BLE; 2440 MHz
Test Date:	2020-12-10
Note:	EUT horizontal



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
1.438 GHz	30.99 dBµV/m	53.98 dBµV/m	-22.99 dB	Pass

Radiated Spurious Emissions according to ISED RSS-Gen Issue 5, Amendment 1 (March 2019)

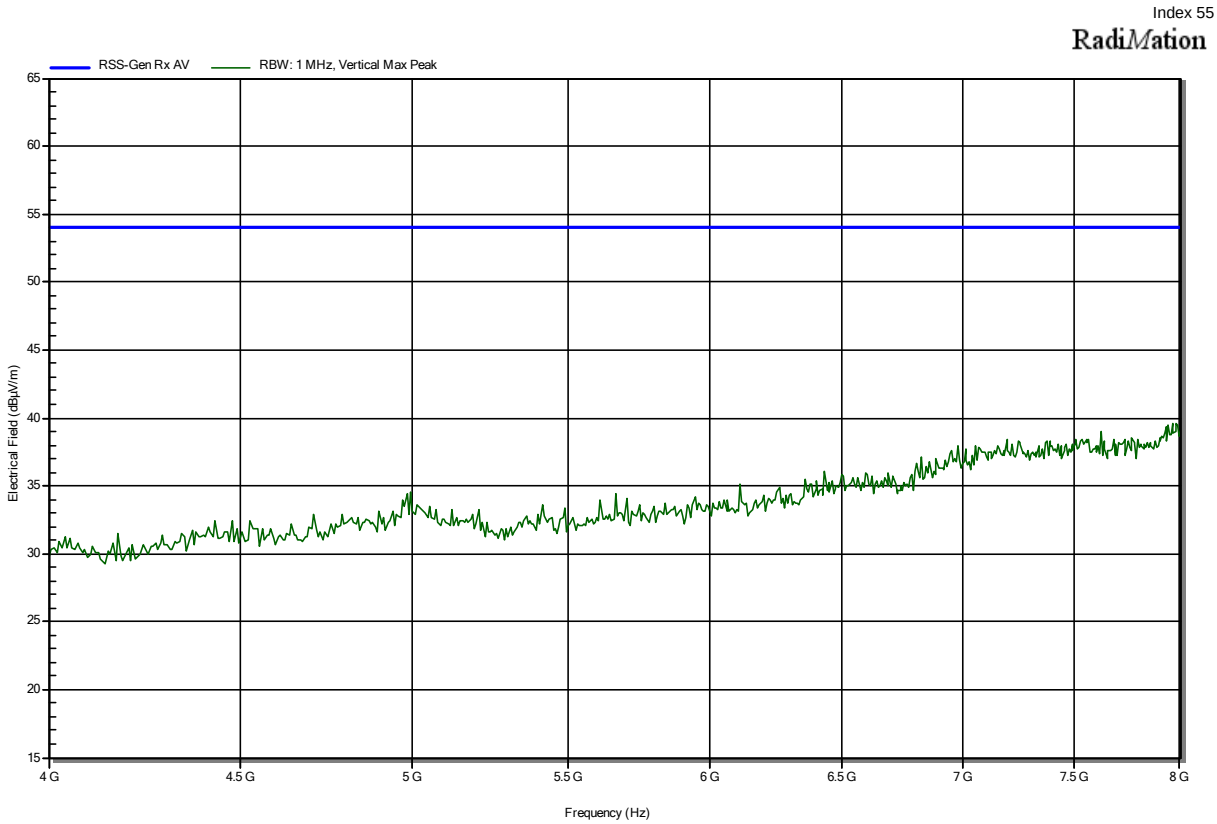
Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m, converted to 3 m
Mode:	Rx; BLE; 2440 MHz
Test Date:	2020-12-10
Note:	EUT horizontal



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
7.974 GHz	40.45 dBµV/m	53.98 dBµV/m	-13.53 dB	Pass

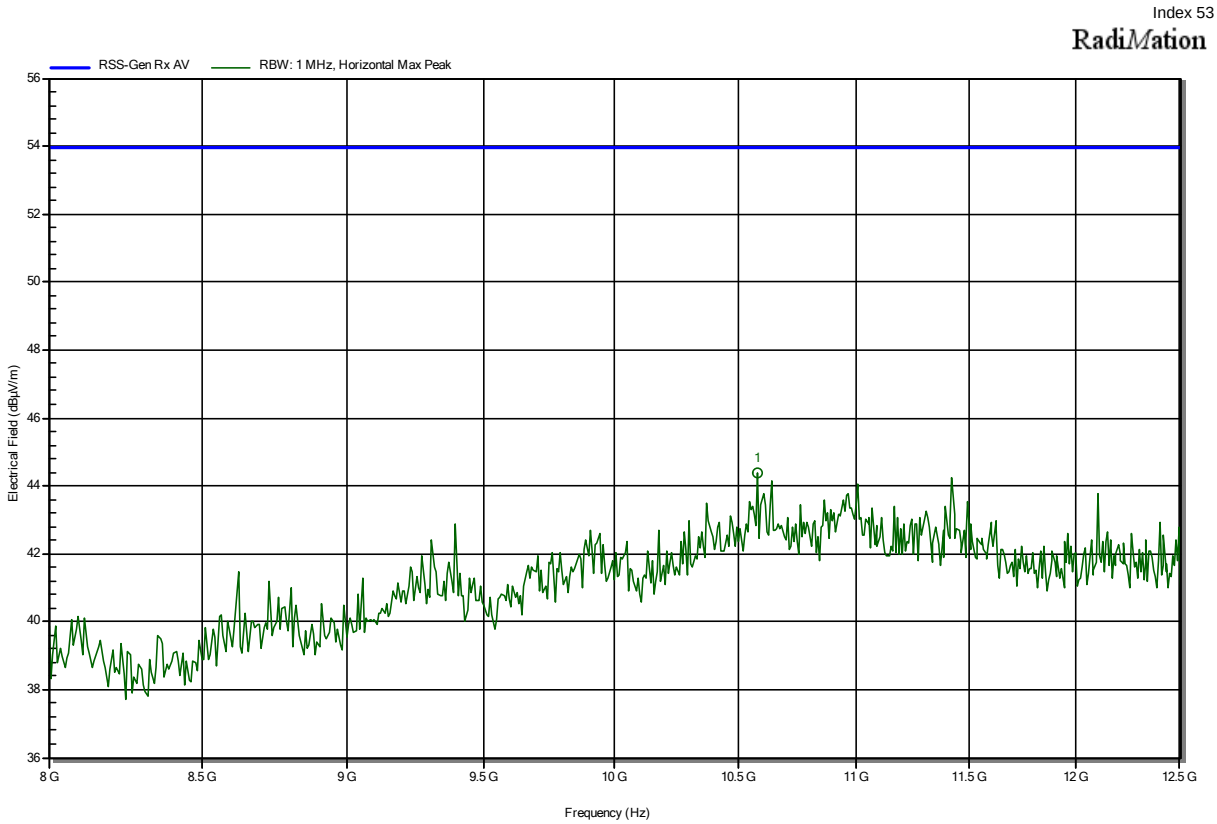
Radiated Spurious Emissions according to ISED RSS-Gen Issue 5, Amendment 1 (March 2019)

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m, converted to 3 m
Mode:	Rx; BLE; 2440 MHz
Test Date:	2020-12-10
Note:	EUT horizontal



Radiated Spurious Emissions according to ISED RSS-Gen Issue 5, Amendment 1 (March 2019)

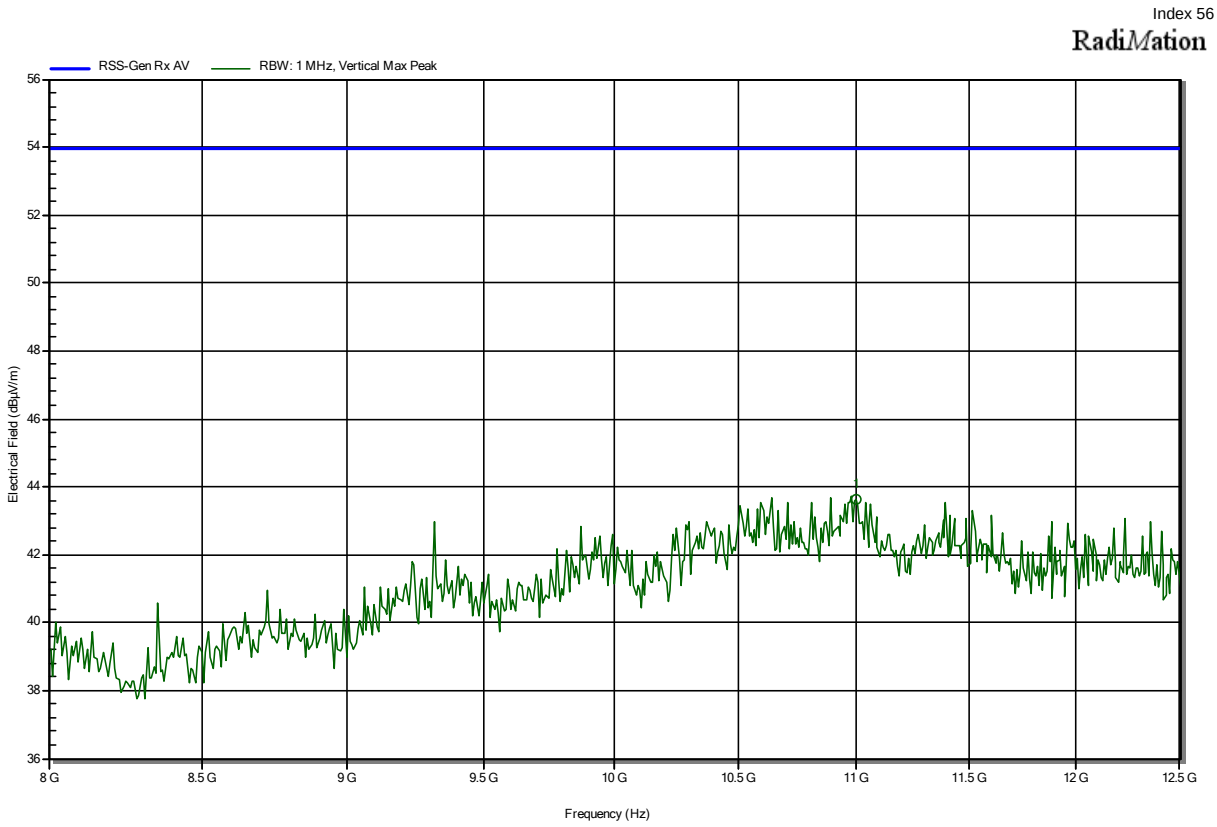
Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m, converted to 3 m
Mode:	Rx; BLE; 2440 MHz
Test Date:	2020-12-10
Note:	EUT horizontal



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
10.582 GHz	44.39 dBµV/m	53.98 dBµV/m	-9.59 dB	Pass

Radiated Spurious Emissions according to ISED RSS-Gen Issue 5, Amendment 1 (March 2019)

Project Number:	G0M-2008-9229
Applicant:	Hempel A/S
Model Description:	Temperature and humidity logger with BLE and LoRa communication
Model:	915 MHz
Test Sample ID:	32411
Test Site:	Eurofins Product Service GmbH
Operator:	Wilfried Treffke
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 3.6 VDC (Lithium battery)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m, converted to 3 m
Mode:	Rx; BLE; 2440 MHz
Test Date:	2020-12-10
Note:	EUT horizontal



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
11 GHz	43.65 dBµV/m	53.98 dBµV/m	-10.33 dB	Pass

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