RADIO REPORT

FCC 47 CFR Part 15E

Unlicensed National Information Infrastructure Devices in the 5 GHz Bands

Report Reference No	G0M-1907-8361-TFC407WF-V01
Testing Laboratory	Eurofins Product Service GmbH
Address	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation	DAkkS - Registration number : D-PL-12092-01-04 FCC Filed Test Laboratory, Reg.-No.: 96970
Applicant	R3 - Reliable Realtime Radio Communications GmbH
Address	Bismarckstr. 10-12 10625 Berlin GERMANY
Test Specification	47 CFR Part 15E
Non-Standard Test Method	None
Equipment under Test (EUT):	
Product Description	EchoRing Ethernet Bridge
Model(s)	ER-EB 1001M
Additional Model(s)	None
Brand Name(s)	ECHORING
Hardware Version(s)	V2.2
Software Version(s)	V2
FCC-ID	2AWGE3CH0
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	2019-04-28	Test Sample ID 29090
Report:		
Compiled by	Abdullah Al Jamal	
Tested by (+ signature) (Responsible for Test)	Abdullah Al Jamal	.....
Approved by (+ signature) (Deputy Head of Lab)	Toralf Jahn	.....
Date of Issue	2020-09-18	
Total number of pages	148	
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:		
None.		

VERSION HISTORY

Version History			
Version	Issue Date	Remarks	Revised By
01	2020-09-18	Initial Release	

ABBREVIATIONS AND ACRONYMS

Acronyms	
Acronym	Description
BPSK	Binary Phase Shift Keying
EIRP	Equivalent Isotropic Radiated Power
EUT	Equipment Under Test
FCC	Federal Communications Commission
HT	High Throughput
IEEE 802.11	MAC and PHY Layer for WiFi
OFDM	Orthogonal Frequency Division Multiplexing
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying
RBW	Resolution bandwidth
RMS	Root mean square
TPC	Transmit Power Control
VBW	Video bandwidth
VHT	Very High Throughput

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1 Equipment (Test Item) Under Test

Description	EchoRing Ethernet Bridge	
Model	ER-EB 1001M	
Additional Model(s)	None	
Brand Name(s)	ECHORING	
Serial Number(s)	00 00 00 04	
Hardware Version(s)	V2.2	
Software Version(s)	V2	
FCC-ID	2AWGE3CH0	
Equipment type	End Product	
Device type	Access point, Client	
Radio type	Transceiver	
Assigned frequency bands	5150 MHz - 5250 MHz 5725 MHz - 5850 MHz	
Radio technology	Proprietary (Similar to IEEE 802.11, mode a)	
Modulation	BPSK 1/2, BPSK 3/4, QPSK 1/2, QPSK 3/4, 16-QAM 1/2, 16-QAM 3/4, 64 QAM 2/3	
Number of antenna ports	1	
Transmit power control	No	
Antenna	Type	External antenna (dedicated antenna)
	Model	W5097
	Manufacturer	Pulse Larsen
	Gain	3.5 dBi (decalred by applicant)
Supply Voltage	V_{NOM}	24.0 VDC
	V_{MIN}	21.6 VDC
	V_{MAX}	26.4 VDC
Operating Temperature	T_{NOM}	20 °C
	T_{MIN}	-20 °C
	T_{MAX}	65 °C
Battery supply	No	
AC/DC-Adaptor	Model	DRB120241
	Vendor	TDK Lambda
	Input	85 VAC - 265 VAC
	Output	24 VDC
Manufacturer	WEPTECH elektronik GmbH Ostring 10 76829 Landau Germany	

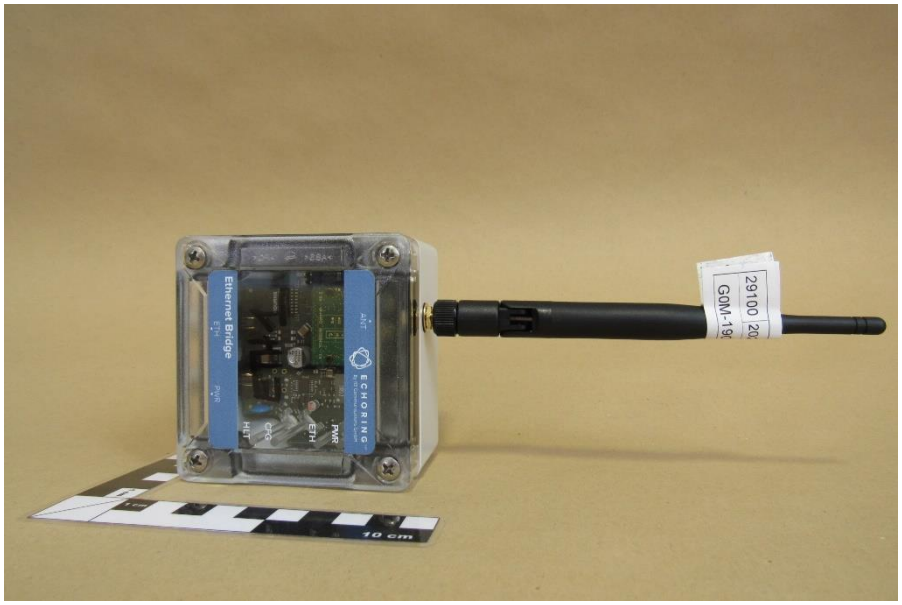
1.1 Photos – Equipment External

VIEW A[1]

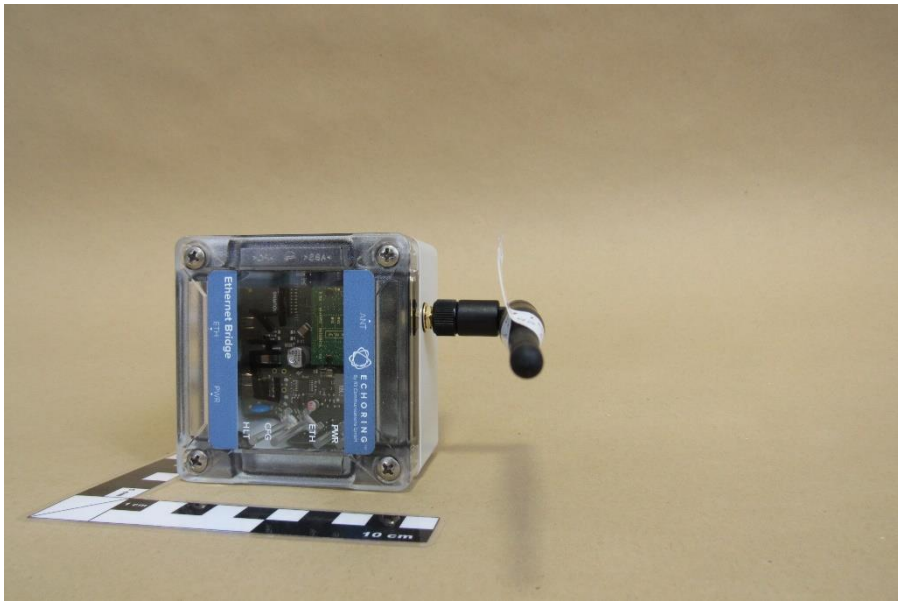
VIEW B[2]

[1]EUT measurement position HORIZONTAL, antenna 0°
[2]EUT measurement position HORIZONTAL, antenna 90°

VIEW C[3]



VIEW D[4]



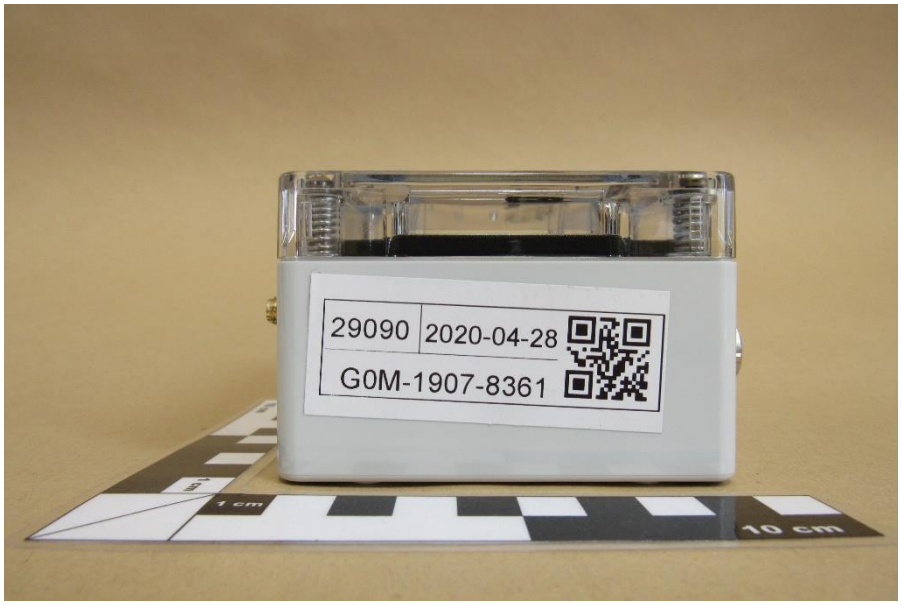
[3]EUT measurement position VERTICAL, antenna 0°
[4]EUT measurement position VERTICAL, antenna 90°

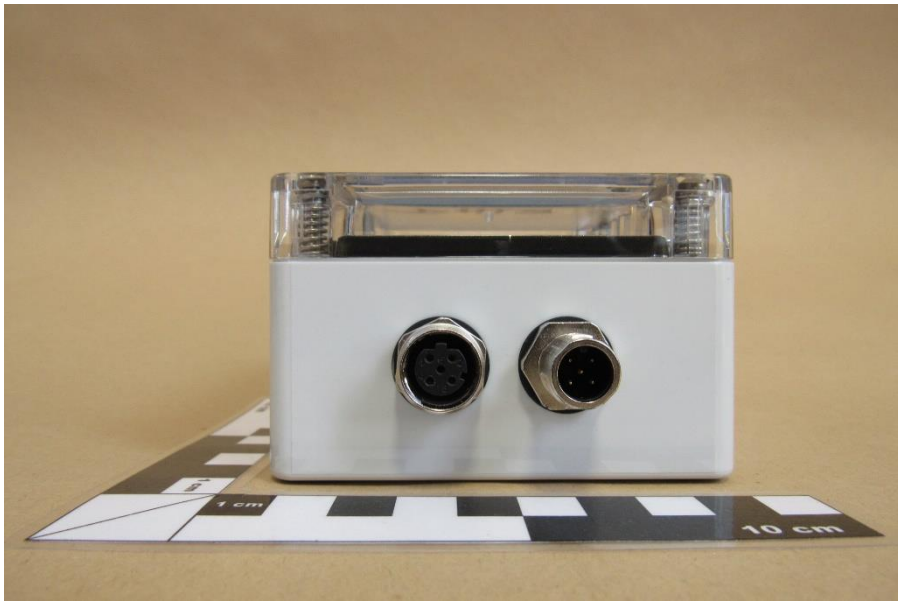
VIEW E

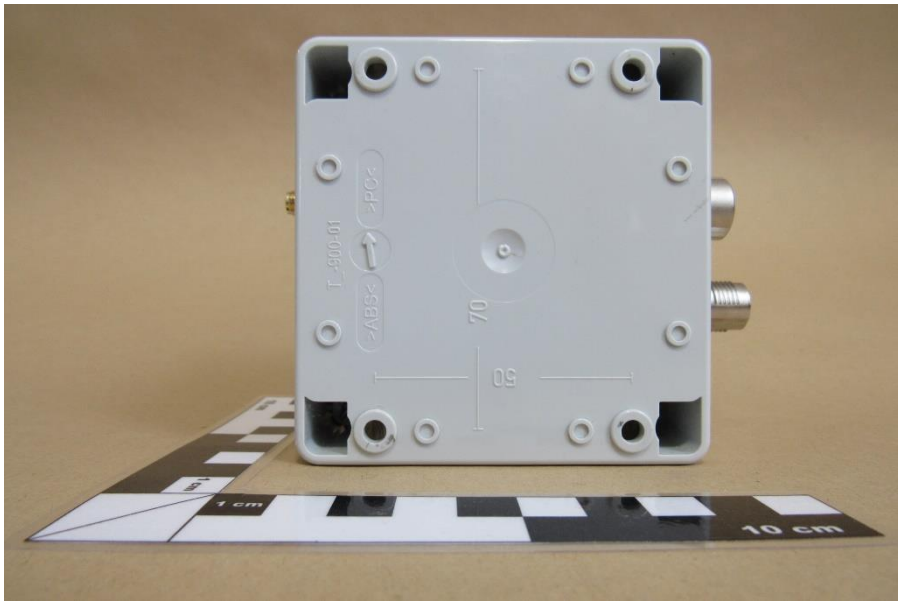
ECHORING™
Ethernet Bridge
Art. Nr: ER-EB 1000M
S/N: 00 00 00 04
CE
R3 - Reliable Realtime Radio
Communications GmbH
Bismarckstr. 10-12
D-10625 Berlin
www.echoring.de
IP65
look into manual
MADE IN GERMANY
1 cm
10 cm

VIEW F

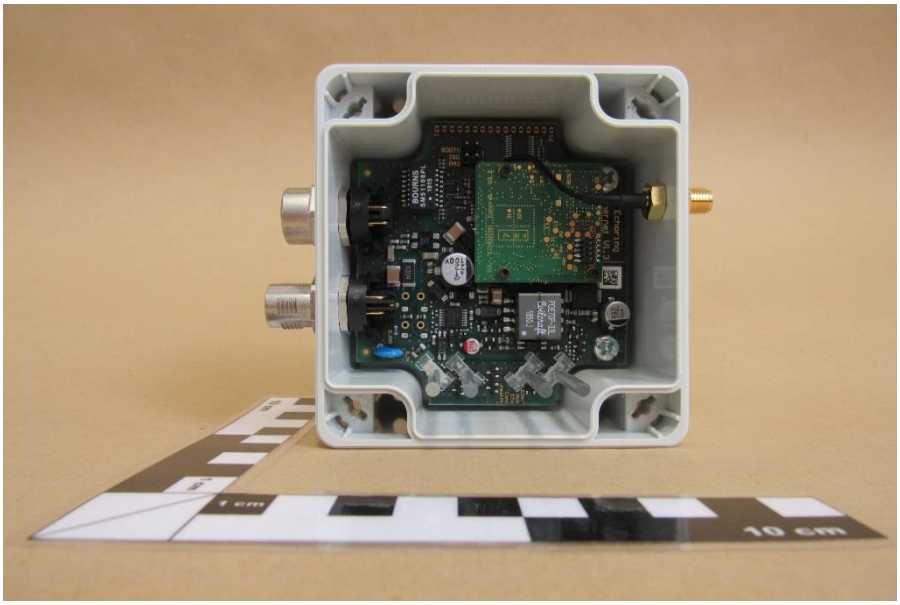
1 cm
10 cm

VIEW G


VIEW H


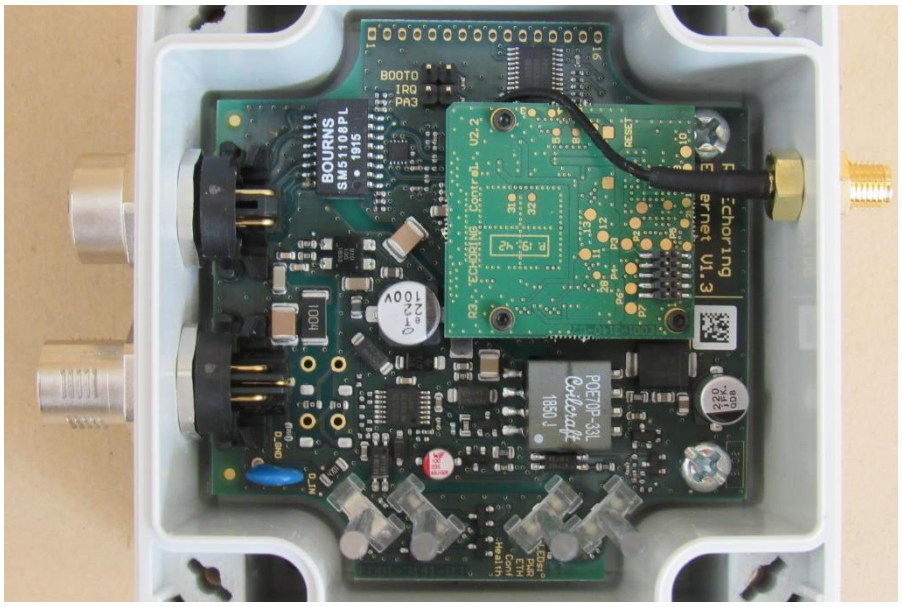
VIEW I


VIEW J

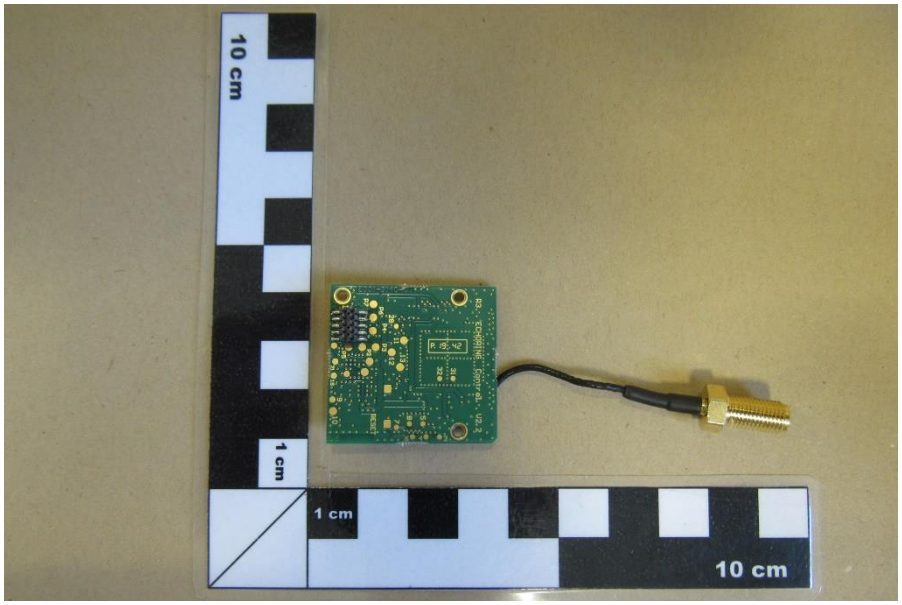
VIEW K


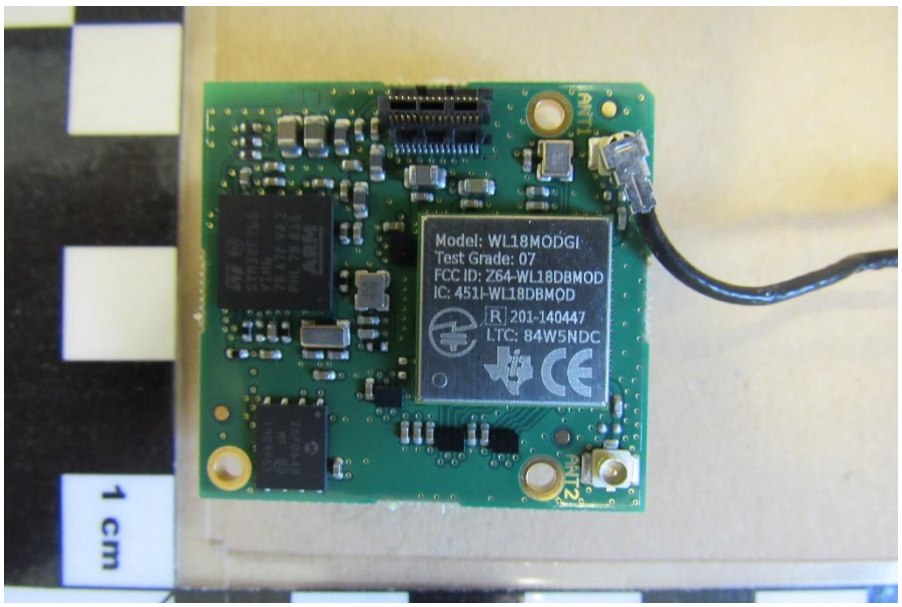
1.2 Photos – Equipment Internal

VIEW A



VIEW B

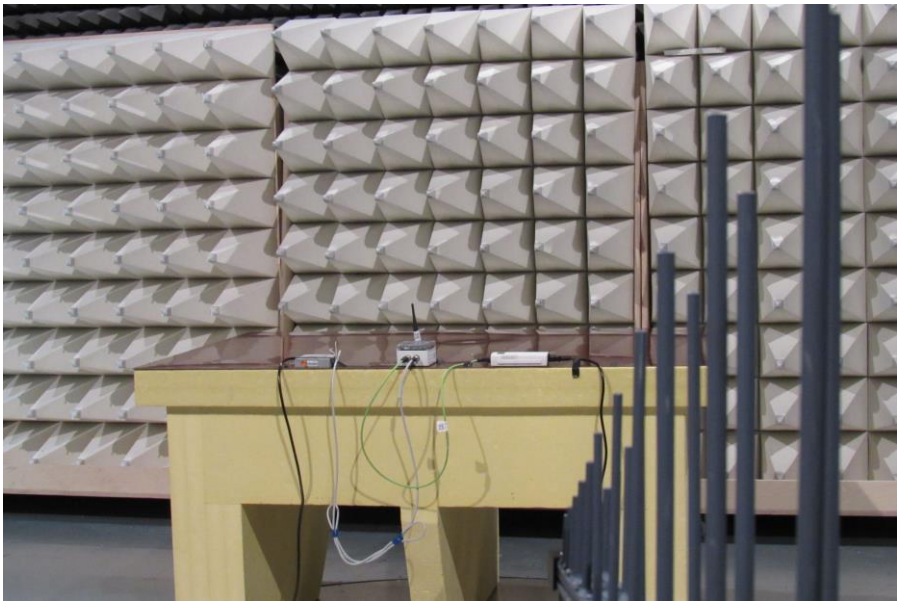


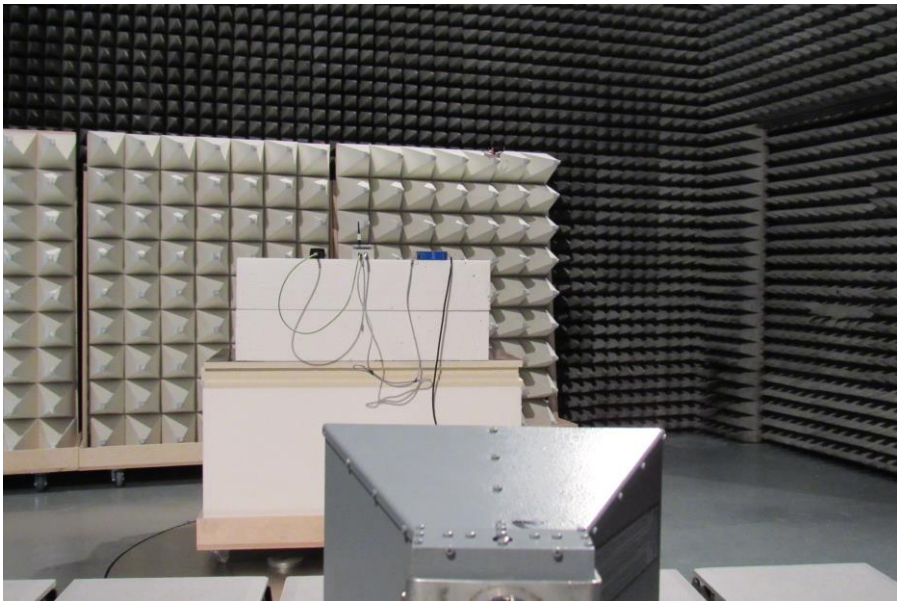
VIEW C


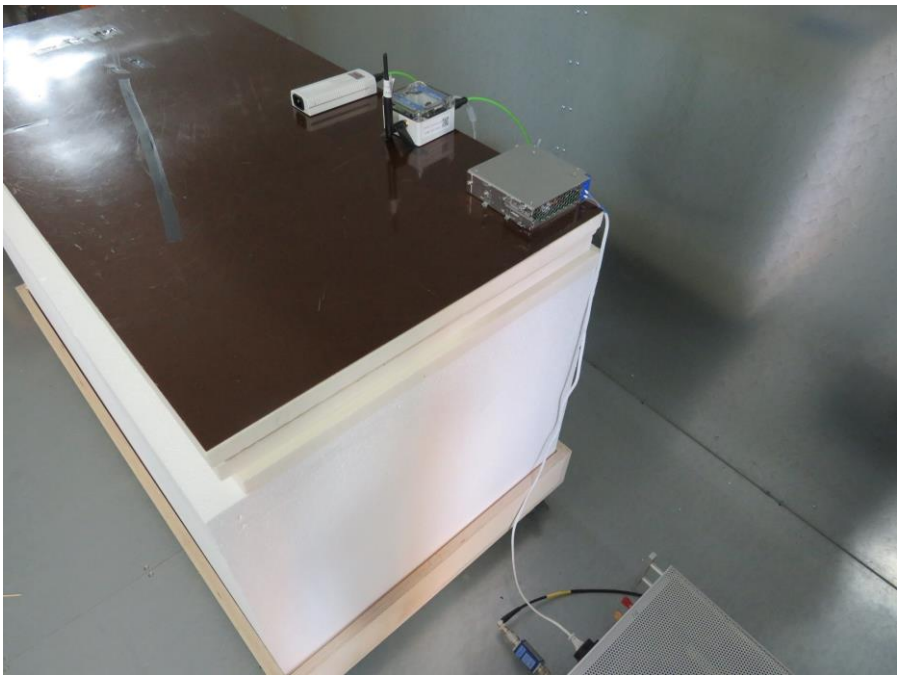
Model: WL18MODGI
Test Grade: 07
FCC ID: Z64-WL18DBMOD
IC: 451I-WL18DBMOD
R 201-140447
LTC: 84W5NDC
1 cm

1.3 Photos – Test Setup

View C1

View C2


View C3


View C4


1.4 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
AE1	Notebook	Lenovo	E590	Serial number PF-1ZNAPR 19/10
AE2	Power Supply AC Adapter	Lenovo	ADLX65YCC3D	MFG Date 2019/09
AE3	Power Supply AC Adapter	TDK Lambda	DRB120-24-1	Power Supply EUT – Test Sample ID 28891
CBL	M12 Eth Cable	LEONI protec cable systems GmbH	Not specified	Industrial Ethernet – Test Sample ID 26531
Description:				
AE1 – AE3	Auxiliary Equipment			
SIM	Simulator			
CBL	Connecting Cable			
SFT	Software			
Comment: None.				

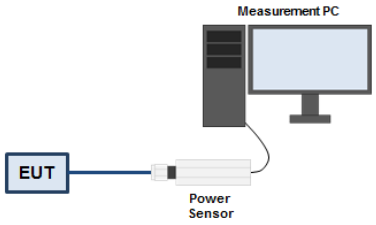
1.5 Test mode data rate evaluation

1.5.1 Information

Test Information	
Measurement Method	KDB 789033 E

1.5.2 Setup

Test Setup



1.5.3 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Power Sensor	ETS-Lindgren	7002-006	EF00935	2020-04	2021-04

1.5.4 Procedure

Test Procedure

1. EUT set to test mode on the first supported channel for each modulation and data rate
2. The conducted power is measured with a wide band power sensor
3. The power is measured for all data rates/modulations supported by the EUT
4. The data rate with the highest output power is selected for test mode

1.5.5 Results

Test Results

Frequency [MHz]	Output power [dBm]						
	6 Mbps	9 Mbps	12 Mbps	18 Mbps	24 Mbps	36 Mbps	48 Mbps
5180	16.8	16.9	17.0	**17.0**[1]	16.0	14.9	14.1
5200	16.7	16.9	17.0	**17.0**[1]	15.8	14.7	14.1
5240	17.0	16.9	16.9	**17.0**[1]	15.7	14.9	14.1
5745	16.1	16.3	16.3	**16.4**	15.2	14.3	13.5
5785	16.3	16.3	16.3	**16.4**	15.2	14.3	13.5
5825	16.3	16.3	16.3	**16.6**	15.1	14.1	13.5

Comment: [1]A higher duty cycle correction applies.

1.6 Test mode duty cycle evaluation

1.6.1 Information

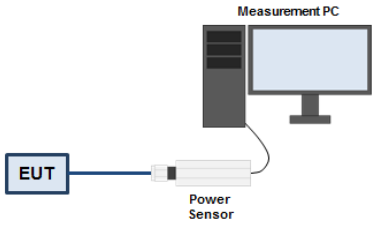
Test Information	
Measurement Method	ANSI C63.10 12.2

1.6.2 Requirements

Requirements	
Duty cycle	Duty cycle correction
≥ 98 %	No correction required
< 98 %	Correction required (10 x Log_{10}(1/DC))

1.6.3 Setup

Test Setup



1.6.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Power Sensor	ETS-Lindgren	7002-006	EF00935	2020-04	2021-04

1.6.5 Procedure

Test Procedure

1. EUT set to test mode
2. Sweep time is set long enough to capture at least 5 bursts
3. The maximum burst duration TON is measured
4. The minimum idle duration TOFF is measured
5. The duty cycle is calculated by DC = T_{ON} / (T_{ON} + T_{OFF})
6. The duty cycle correction is calculated by DC = 10 x Log_{10}(T_{ON} / (T_{ON} + T_{OFF}))

1.6.6 Results

Test Results							
Frequency [MHz]	Duty Cycle [%]						
	6 Mbps	9 Mbps	12 Mbps	18 Mbps	24 Mbps	36 Mbps	48 Mbps
5180	98.2	96.6	97.2	96.2	95.1	94.0	92.0
5200	96.1	98.0	97.2	96.2	95.7	93.6	92.0
5240	96.1	96.6	97.2	95.5	95.7	93.6	92.1
5745	96.1	96.7	97.2	96.2	95.2	93.7	92.1
5785	98.2	98.1	97.2	96.2	95.2	93.7	92.1
5825	98.2	96.7	97.2	96.2	95.2	93.7	92.1

Duty Cycle Results			
Channel [MHz]	Data rate	Duty Cycle [%]	Correction Factor [dB]
5180	18 Mbps	96.2	0.17
5200	18 Mbps	96.2	0.17
5240	18 Mbps	95.5	0.20
5745	18 Mbps	96.2	0.17
5785	18 Mbps	96.2	0.17
5825	18 Mbps	96.2	0.17

1.7 Test Modes

Mode	Description
Proprietary 1 (OFDM)	Mode = Transmit Modulation = QPSK 3/4 Spreading = OFDM Bandwidth = 20 MHz Duty cycle = 96.2 % Power setting = 18 Mbps (software setting for provided test software) Data rate = 18 Mbps
Proprietary 2 (OFDM)	Mode = Transmit Modulation = QPSK 3/4 Spreading = OFDM Bandwidth = 20 MHz Duty cycle = 95.5 % Power setting = 18 Mbps (software setting for provided test software) Data rate = 18 Mbps
Receive	Mode = Receive (Scan)
Comment: The above settings were found as worst case during pre-tests.	

1.8 Test Frequencies

Designator	Mode	Channel[1]	Frequency [MHz]
F1	Tx / Rx	36	5180
F2	Tx / Rx	40	5200
F3	Tx / Rx	48	5240
F4	Tx / Rx	149	5745
F5	Tx / Rx	157	5785
F6	Tx / Rx	165	5825
Comment: [1]Equivalent to the dedicated channel of the IEEE 802.11 standard.			

1.9 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

1.10 Normative References

References	
Designator	Reference
KDB 789033	KDB 789033 D02 v02r01
ANSI C63.10	ANSI C63.10:2013

2 Result Summary

FCC 47 CFR Part 15E				
Product Standard Reference	**Requirement**	**Reference Method**	**Result**	**Remarks**
FCC 15.407(e)	6 dB bandwidth	KDB 789033 C.2	PASS	Only required in 5725-5850 MHz band.
FCC 15.407(a)(2),(a)(5),(h)(2)	26 dB bandwidth	KDB 789033 C.1	PASS	No limit. Basis for other measurements.
FCC 15.407(a)	Maximum output power	KDB 789033 E	PASS	
FCC 15.407(a)	Transmit power control	KDB 789033 E	N/R	Required in 5250-5350 and 5470-5725 MHz bands. Not required for EIRP < 500 mW.
FCC 15.407(a)	Power spectral density	KDB 789033 F	PASS	
FCC 15.407(g)	Frequency stability	ANSI C63.10 6.8	PASS	
FCC 15.207	AC power line conducted emissions	ANSI C63.10 6.2	PASS	
FCC 15.407(b)	Transmitter radiated emissions	KDB 789033 G	PASS	
FCC 15.407(a)	Radiation pattern	KDB 789033 H	N/R	5150-5250 MHz band only with EIRP > 21 dBm
Comment: None.				

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

3 Test Conditions and Results

3.1 Test Conditions and Results - 6 dB bandwidth

3.1.1 Information

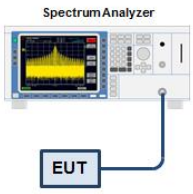
Test Information	
Reference	FCC 15.407(e)
Measurement Method	KDB 789033 C.2
Operator	Abdullah Al Jamal
Date	2020-05-08
Measurement uncertainty	±1.26 %

3.1.2 Limits

Limits
≥ 500 kHz

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 43	EF01631	2019-12	2020-12
Cable	Gigalane	SMS111B	EF00779 CAAAZ	2018-10	2020-10

3.1.5 Procedure

Test Procedure

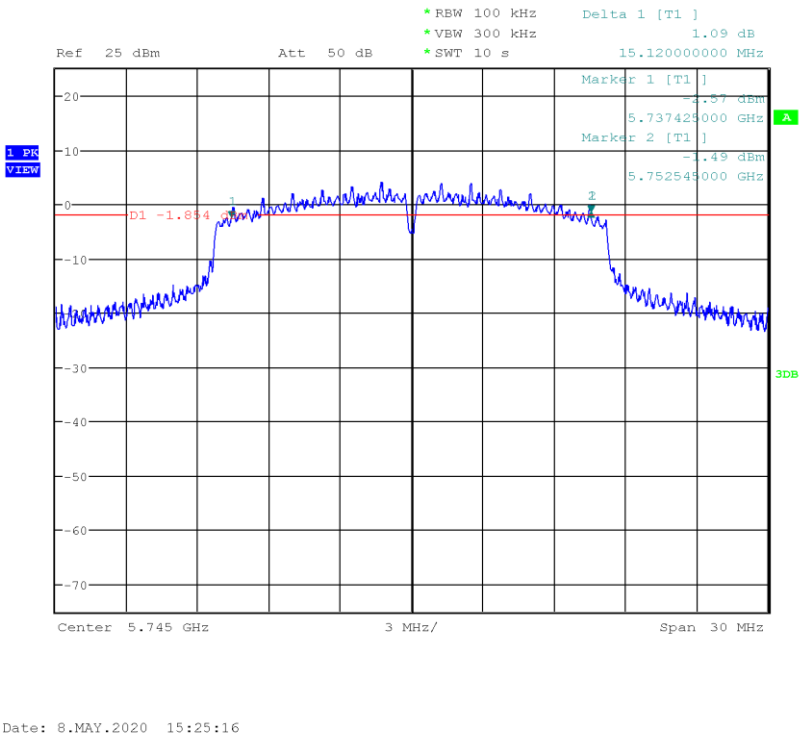
1. EUT transmitter is activated in test mode under normal conditions
2. The spectrum analyzer is set to peak detection and maximum hold with a span twice the nominal channel bandwidth
3. The resolution bandwidth is set to 100 kHz and video bandwidth ≥ 3 x RBW
4. The peak of the emission spectrum is determined
5. The left most frequency that corresponds to an emission level 6 dB below the maximum is determined
6. The right most frequency that corresponds to an emission level 6 dB below the maximum is determined
7. The 6 dB bandwidth is calculated from the two edge frequencies

3.1.6 Results

Test Results - 5725 - 5850 MHz					
Mode	Channel	Frequency [MHz]	Nominal BW [MHz]	BW [kHz]	Verdict
OFDM	149	5745	20	15120.0	PASS
OFDM	157	5785	20	15120.0	PASS
OFDM	165	5825	20	15120.0	PASS

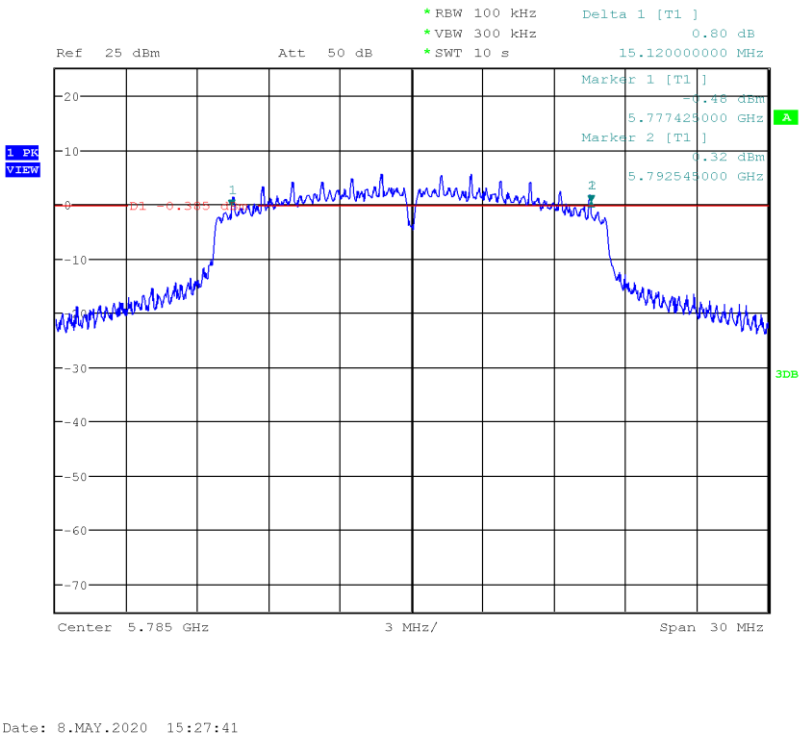
DTS (6 dB) Bandwidth

Project Number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
Model Description:	EchoRing Ethernet Bridge
Model:	ER-EB 1001M
Test Sample ID:	29090
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	Proprietary, Channel: 149, 5745 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Abdullah Al Jamal
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-05-08
Antenna Port:	1
Lower Frequency [MHz]:	5737.425
Upper Frequency [MHz]:	5752.545
6 dB Bandwidth [kHz]:	15120.0



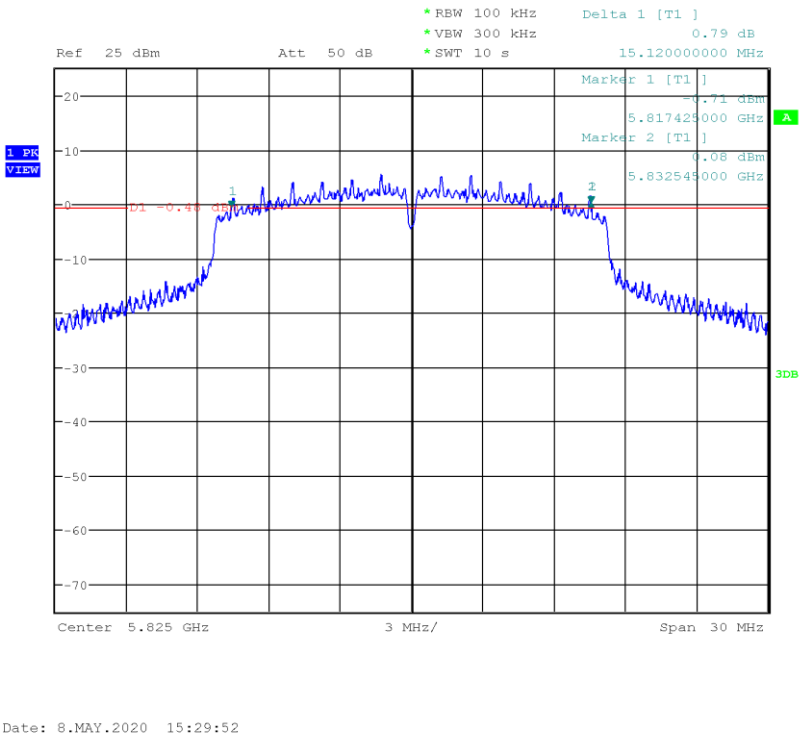
DTS (6 dB) Bandwidth

Project Number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
Model Description:	EchoRing Ethernet Bridge
Model:	ER-EB 1001M
Test Sample ID:	29090
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	Proprietary, Channel: 157, 5785 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Abdullah Al Jamal
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-05-08
Antenna Port:	1
Lower Frequency [MHz]:	5777.425
Upper Frequency [MHz]:	5792.545
6 dB Bandwidth [kHz]:	15120.0



DTS (6 dB) Bandwidth

Project Number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
Model Description:	EchoRing Ethernet Bridge
Model:	ER-EB 1001M
Test Sample ID:	29090
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	Proprietary, Channel: 165, 5825 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Abdullah Al Jamal
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-05-08
Antenna Port:	1
Lower Frequency [MHz]:	5817.425
Upper Frequency [MHz]:	5832.545
6 dB Bandwidth [kHz]:	15120.0



3.2 Test Conditions and Results - 26 dB emission bandwidth

3.2.1 Information

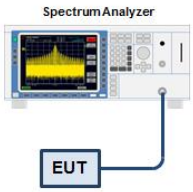
Test Information	
Reference	FCC 15.407(a)(2),(a)(5),(h)(2)
Measurement Method	KDB 789033 C.1
Operator	Abdullah Al Jamal
Date	2020-05-08
Measurement uncertainty	±1.26 %

3.2.2 Limits

Limits
None, used to determine power limit and necessary DFS functionality

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 43	EF01631	2019-12	2020-12
Cable	Gigalane	SMS111B	EF00779 CAAAZ	2018-10	2020-10

3.2.5 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 nominal channel bandwidth
3. The resolution bandwidth is set to approximately 1% of the emission bandwidth and video bandwidth ≥ RBW
4. The peak of the emission spectrum is determined
5. The left most frequency that corresponds to an emission level 26 dB below the maximum is determined
6. The right most frequency that corresponds to an emission level 26 dB below the maximum is determined
7. The 26 dB bandwidth is calculated from the two edge frequencies
8. The RBW is corrected and the measurement is repeated if needed

3.2.6 Results

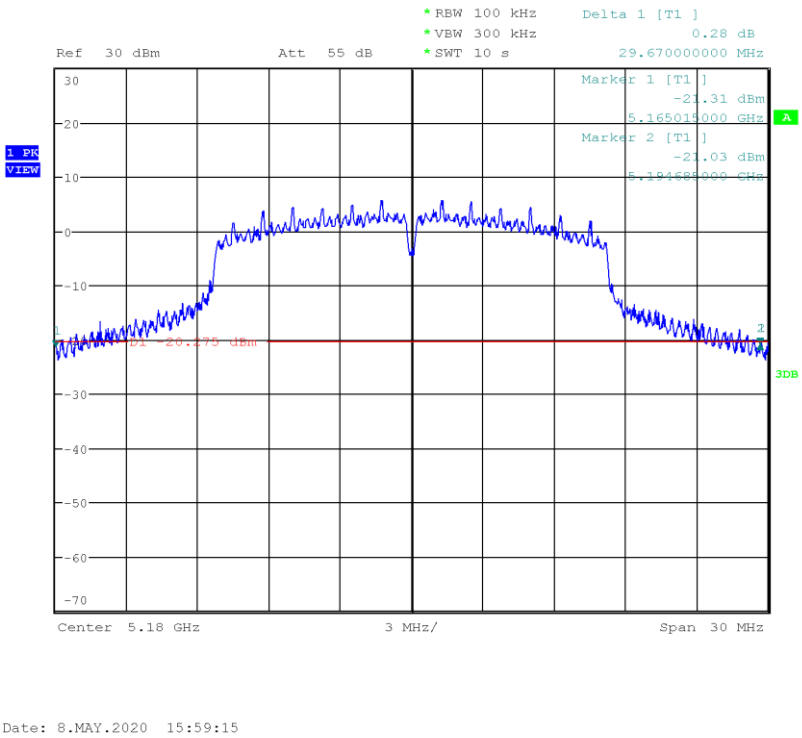
Test Results - 5150 - 5250 MHz					
Mode	Channel	Frequency [MHz]	Nominal BW [MHz]	BW Upper Edge [MHz]	BW [MHz]
OFDM	36	5180	20	5194.685	29.670
OFDM	40	5200	20	5214.700	29.385
OFDM	48	5240	20	5254.970	29.955

Test Results - 5150 - 5250 MHz - 99% BW					
Mode	Channel	Frequency [MHz]	Nominal BW [MHz]	BW Upper Edge [MHz]	BW [MHz]
OFDM	48	5240	20	5249.620	19.140
If the Emission Bandwidth (26 dB) does not fall entirely in the band, Occupied Bandwidth (99%) can be used instead to determine whether DFS testing is required for this band					

Test Results - 5725 - 5850 MHz					
Mode	Channel	Frequency [MHz]	Nominal BW [MHz]	BW Lower Edge [MHz]	BW [MHz]
OFDM	149	5745	20	5730.030	29.625
OFDM	157	5785	20	5770.015	29.700
OFDM	165	5825	20	5810.510	29.175

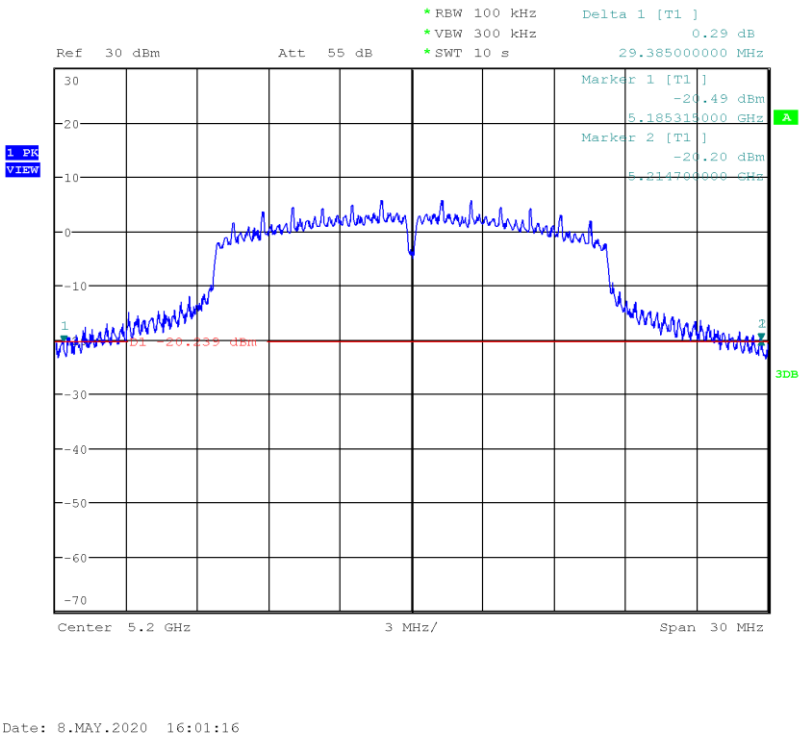
26 dB Bandwidth

Project Number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
Model Description:	EchoRing Ethernet Bridge
Model:	ER-EB 1001M
Test Sample ID:	29090
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	Proprietary, Channel: 36, 5180 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Abdullah Al Jamal
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-05-08
Antenna Port:	1
Lower Frequency [MHz]:	5165.015
Upper Frequency [MHz]:	5194.685
26 dB Bandwidth [MHz]:	29.670



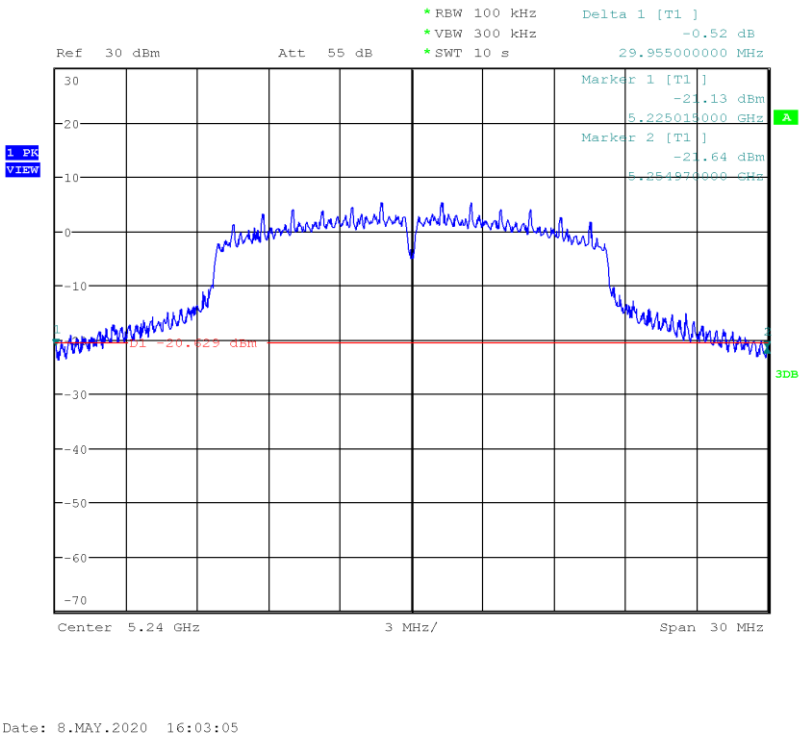
26 dB Bandwidth

Project Number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
Model Description:	EchoRing Ethernet Bridge
Model:	ER-EB 1001M
Test Sample ID:	29090
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	Proprietary, Channel: 40, 5200 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Abdullah Al Jamal
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-05-08
Antenna Port:	1
Lower Frequency [MHz]:	5185.315
Upper Frequency [MHz]:	5214.700
26 dB Bandwidth [MHz]:	29.385



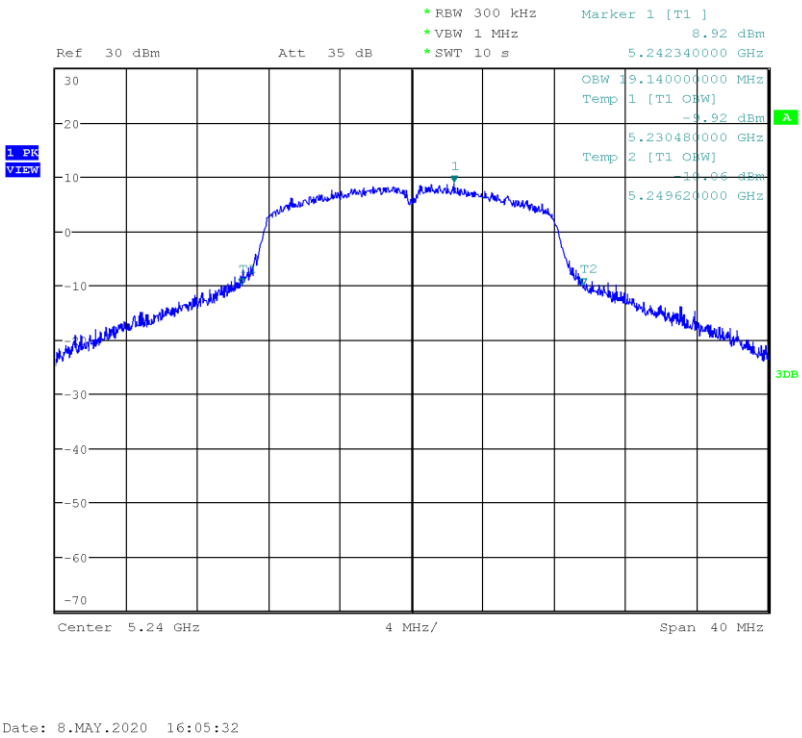
26 dB Bandwidth

Project Number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
Model Description:	EchoRing Ethernet Bridge
Model:	ER-EB 1001M
Test Sample ID:	29090
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	Proprietary, Channel: 48, 5240 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Abdullah Al Jamal
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-05-08
Antenna Port:	1
Lower Frequency [MHz]:	5225.015
Upper Frequency [MHz]:	5254.970
26 dB Bandwidth [MHz]:	29.955



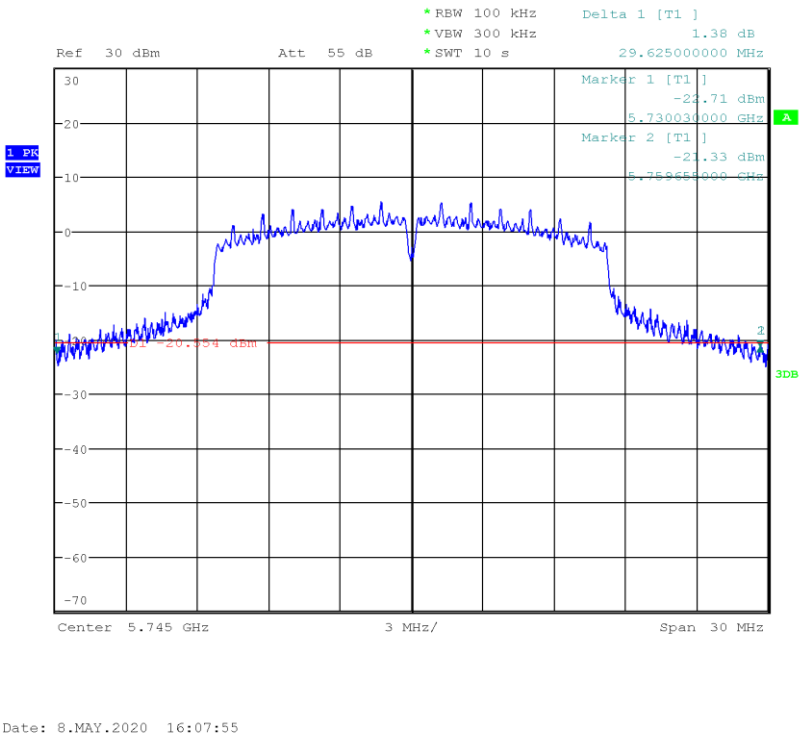
Occupied Bandwidth

Project Number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
Model Description:	EchoRing Ethernet Bridge
Model:	ER-EB 1001M
Test Sample ID:	29090
Reference Standards:	RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	Proprietary, Channel: 48, 5240 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Abdullah Al Jamal
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-05-08
Antenna Port:	1
Occ. Bandwidth Lower Edge [MHz]:	5230.480
Occ. Bandwidth Upper Edge [MHz]:	5249.620
Occupied Bandwidth [MHz]:	19.140



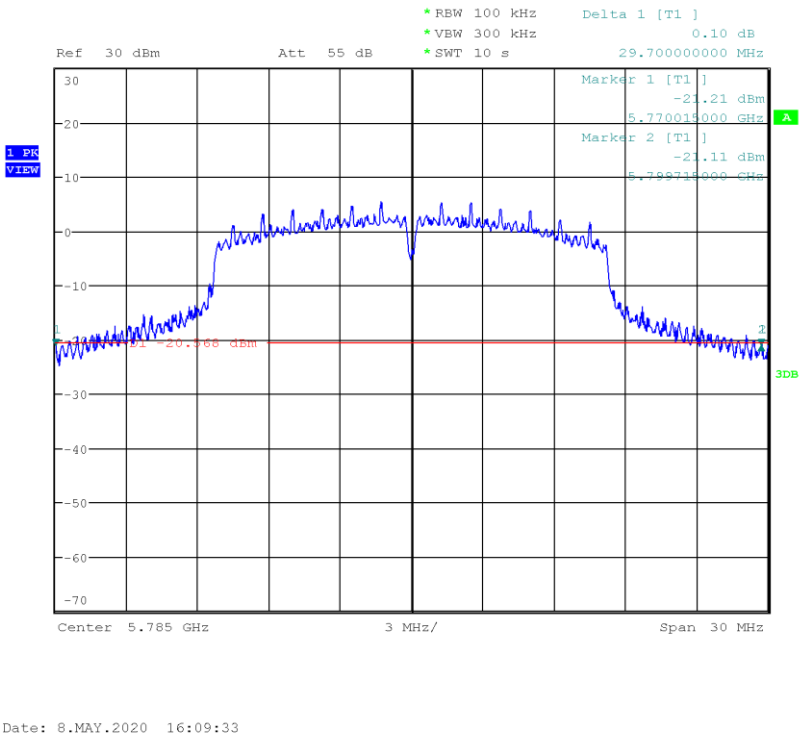
26 dB Bandwidth

Project Number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
Model Description:	EchoRing Ethernet Bridge
Model:	ER-EB 1001M
Test Sample ID:	29090
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	Proprietary, Channel: 149, 5745 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Abdullah Al Jamal
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-05-08
Antenna Port:	1
Lower Frequency [MHz]:	5730.030
Upper Frequency [MHz]:	5759.655
26 dB Bandwidth [MHz]:	29.625



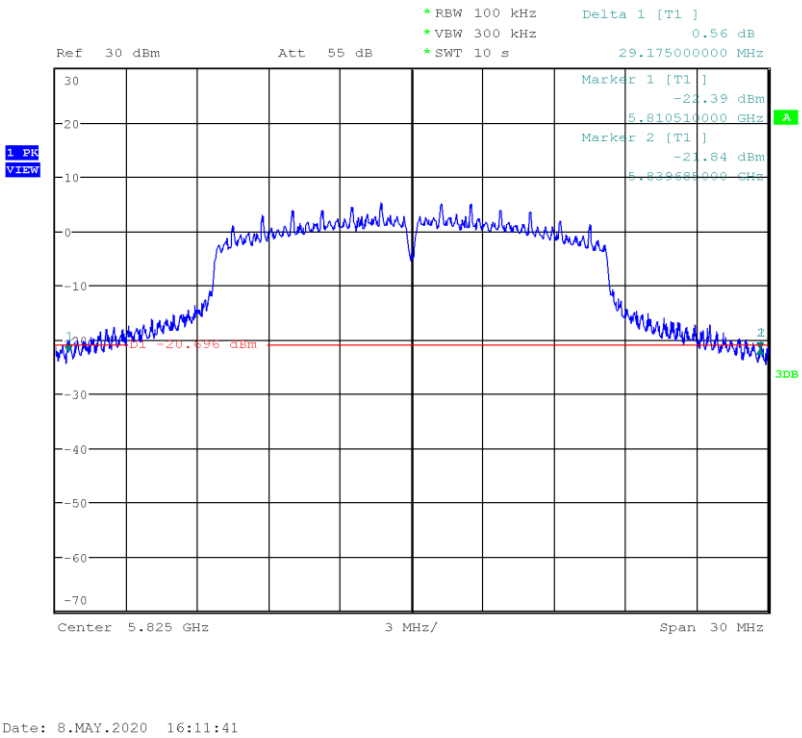
26 dB Bandwidth

Project Number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
Model Description:	EchoRing Ethernet Bridge
Model:	ER-EB 1001M
Test Sample ID:	29090
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	Proprietary, Channel: 157, 5785 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Abdullah Al Jamal
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-05-08
Antenna Port:	1
Lower Frequency [MHz]:	5770.015
Upper Frequency [MHz]:	5799.715
26 dB Bandwidth [MHz]:	29.700



26 dB Bandwidth

Project Number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
Model Description:	EchoRing Ethernet Bridge
Model:	ER-EB 1001M
Test Sample ID:	29090
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	Proprietary, Channel: 165, 5825 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Abdullah Al Jamal
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-05-08
Antenna Port:	1
Lower Frequency [MHz]:	5810.510
Upper Frequency [MHz]:	5839.685
26 dB Bandwidth [MHz]:	29.175



3.3 Test Conditions and Results - Maximum output power

3.3.1 Information

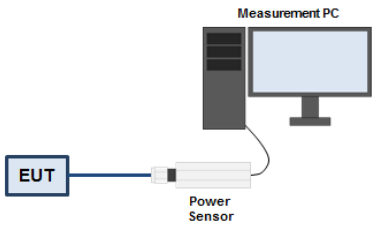
Test Information	
Reference	FCC 15.407(a)
Measurement Method	KDB 789033 E
Operator	Abdullah Al Jamal
Date	2020-05-08
Test Sample ID	29090
Measurement uncertainty	±1.59 %

3.3.2 Limits

Limits			
Frequency band	Condition	Power limit	Maximum antenna gain[1]
5150 - 5250 MHz	Access point, indoor	1 W/30 dBm	6 dBi
5150 - 5250 MHz	Access point, outdoor	1 W/30 dBm	6 dBi
5150 - 5250 MHz	Access point, fixed point to point	1 W/30 dBm	23 dBi
5150 - 5250 MHz	Client	250 mW/24 dBm	6 dBi
5250 - 5350 MHz	-	Minimum of 250 mW/24 dBm or 11 dBm + 10*Log_{10}(BW[3])	6 dBi
5470 - 5725 MHz	-	Minimum of 250 mW/24 dBm or 11 dBm + 10*Log_{10}(BW[3])	6 dBi
5725 - 5850 MHz	-	1 W/30 dBm[2]	6 dBi
Note 1: The maximum output power must be reduced by the amount in dB that the gain exceeds the maximum allowed gain Note 2: Fixed point to point applications are excluded from power reduction according to Note 1 Note 3: BW is the 26 dB bandwidth in MHz			

3.3.3 Setup

Test Setup



3.3.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Power sensor	ETS-Lindgren	7002-006	EF00935	2020-04	2021-04
Cable	Gigalane	SMS111B	EF00779 CAAAZ	2018-10	2020-10

Test Software			
Description	Manufacturer	Name	Version
EMC Software	DARE Instruments	RadiMation	2018.2.7

3.3.5 Procedure

Test Procedure
1. One wide band power sensor is connected to each antenna port of the EUT
1. EUT transmitter is activated in test mode under normal conditions
2. The output power is measured simultaneously at all antenna ports
3. The maximum power level is determined

3.3.6 Results

Test Results - 5150 - 5250 MHz						
Mode	Channel	Frequency [MHz]	Nominal BW [MHz]	Power [dBm]	Limit [dBm]	Verdict
OFDM	36	5180	20	17.0	30.0	PASS
OFDM	40	5200	20	17.0	30.0	PASS
OFDM	48	5240	20	17.0	30.0	PASS

Test Results - 5725 - 5850 MHz						
Mode	Channel	Frequency [MHz]	Nominal BW [MHz]	Power [dBm]	Limit [dBm]	Verdict
OFDM	149	5745	20	16.4	30.0	PASS
OFDM	157	5785	20	16.4	30.0	PASS
OFDM	165	5825	20	16.4	30.0	PASS

3.4 Test Conditions and Results - Power spectral density

3.4.1 Information

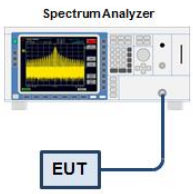
Test Information	
Reference	FCC 15.407(a)
Measurement Method	KDB 789033 F
Operator	Abdullah Al Jamal
Date	2020-05-08
Test Sample ID	29090
Measurement uncertainty	±2.86 %

3.4.2 Limits

Limits			
Frequency band	Condition	PSD limit	Maximum antenna gain[1]
5150 - 5250 MHz	Access point, indoor	17 dBm/MHz	6 dBi
5150 - 5250 MHz	Access point, outdoor	17 dBm/MHz	6 dBi
5150 - 5250 MHz	Access point, fixed point to point	17 dBm/MHz	23 dBi
5150 - 5250 MHz	Client	11 dBm/MHz	6 dBi
5250 - 5350 MHz	All devices	11 dBm/MHz	6 dBi
5470 - 5725 MHz	All devices	11 dBm/MHz	6 dBi
5725 - 5850 MHz	All devices	30 dBm/500 kHz	6 dBi
Note 1: The power density limit must be reduced by the amount in dB that the gain exceeds the maximum allowed gain			

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 43	EF01631	2019-12	2020-12
Cable	Gigalane	SMS111B	EF00779 CAAAZ	2018-10	2020-10

3.4.5 Procedure

Test Procedure
1. EUT transmitter is activated in test mode under normal conditions
2. The spectrum analyzer is set to rms detection with a span over the emission bandwidth
3. The resolution bandwidth is set to 1 MHz / 500 kHz and video bandwidth to ≥ 3 MHz
4. The number of sweep points is set ≥ 2 x span / RBW and the sweep time is set to auto
5. Trace averaging is set to 100
6. The maximum of the emission envelope is determined
7. The duty cycle (10 x Log_{10}(1/duty cycle)) correction is added to the measurement result

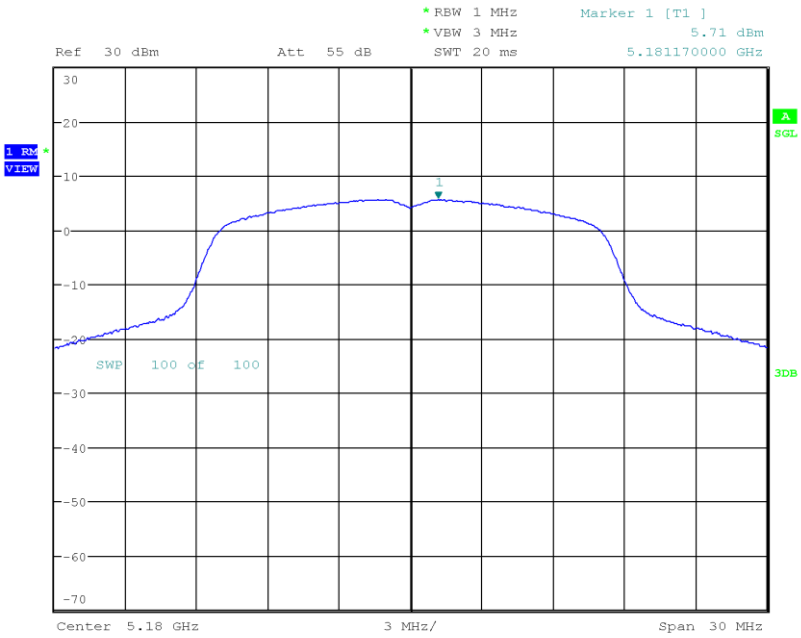
3.4.6 Results

Test Results - 5150 - 5250 MHz						
Mode	Channel	Frequency [MHz]	Nominal BW [MHz]	PSD [dBm/RBW]	Limit	Verdict
OFDM	36	5180	20	5.707	17 dBm/MHz	PASS
OFDM	40	5200	20	5.711	17 dBm/MHz	PASS
OFDM	48	5240	20	5.355	17 dBm/MHz	PASS

Test Results - 5725 - 5850 MHz						
Mode	Channel	Frequency [MHz]	Nominal BW [MHz]	PSD [dBm/RBW]	Limit	Verdict
OFDM	149	5745	20	2.453	30 dBm/500 kHz	PASS
OFDM	157	5785	20	2.333	30 dBm/500 kHz	PASS
OFDM	165	5825	20	2.363	30 dBm/500 kHz	PASS

Maximum Power Spectral Density

Project Number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
Model Description:	EchoRing Ethernet Bridge
Model:	ER-EB 1001M
Test Sample ID:	29090
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 12.5; KDB 789033 v02r02, Section F
Operational Mode:	Proprietary, Channel: 36, 5180 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Abdullah Al Jamal
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-05-08
Number of Antenna Ports:	1
Antenna Port(s):	N/A
Maximum Frequency [MHz]:	5181.170
Spectral Density [dBm/RBW]:	5.707
Resolution Bandwidth [MHz]:	1



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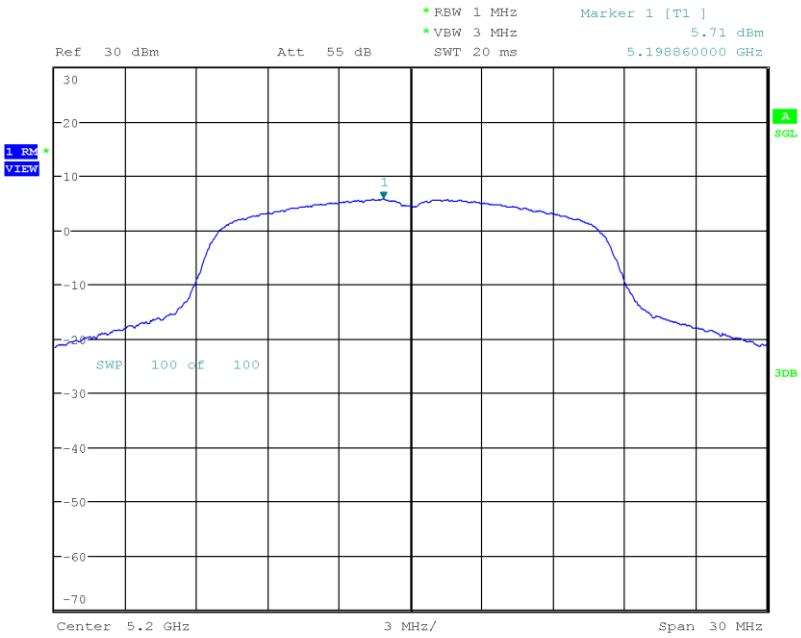
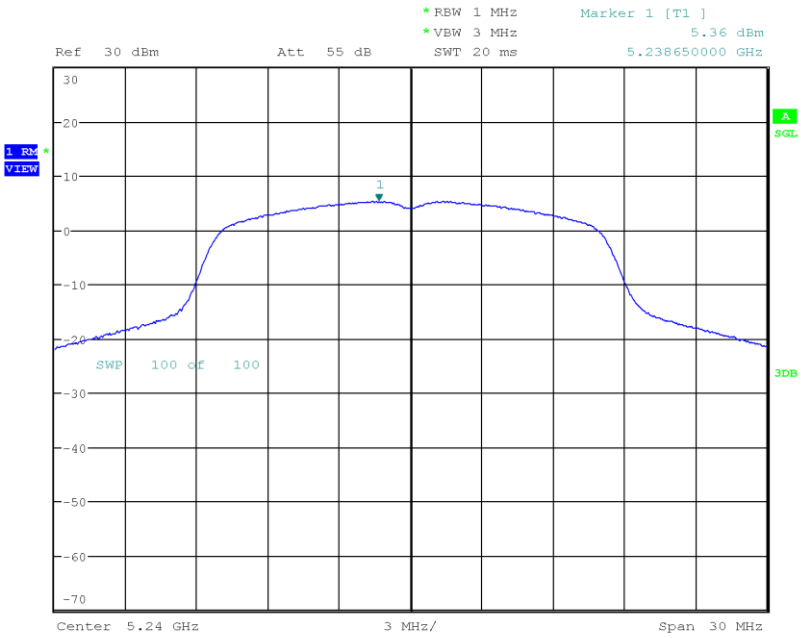
Maximum Power Spectral Density

Project Number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
Model Description:	EchoRing Ethernet Bridge
Model:	ER-EB 1001M
Test Sample ID:	29090
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 12.5; KDB 789033 v02r02, Section F
Operational Mode:	Proprietary, Channel: 40, 5200 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Abdullah Al Jamal
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-05-08
Number of Antenna Ports:	1
Antenna Port(s):	N/A
Maximum Frequency [MHz]:	5198.860
Spectral Density [dBm/RBW]:	5.711
Resolution Bandwidth [MHz]:	1



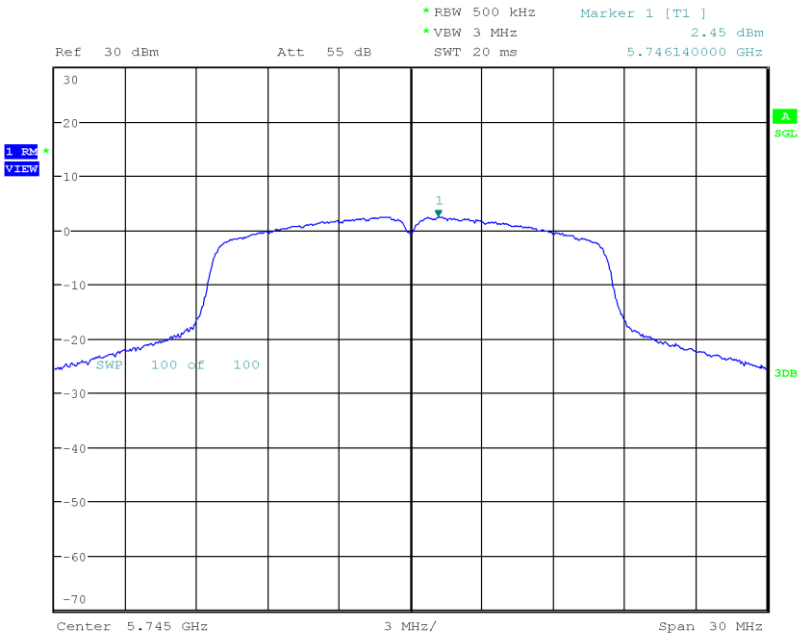
Maximum Power Spectral Density

Project Number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
Model Description:	EchoRing Ethernet Bridge
Model:	ER-EB 1001M
Test Sample ID:	29090
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 12.5; KDB 789033 v02r02, Section F
Operational Mode:	Proprietary, Channel: 48, 5240 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Abdullah Al Jamal
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-05-08
Number of Antenna Ports:	1
Antenna Port(s):	N/A
Maximum Frequency [MHz]:	5238.650
Spectral Density [dBm/RBW]:	5.355
Resolution Bandwidth [MHz]:	1



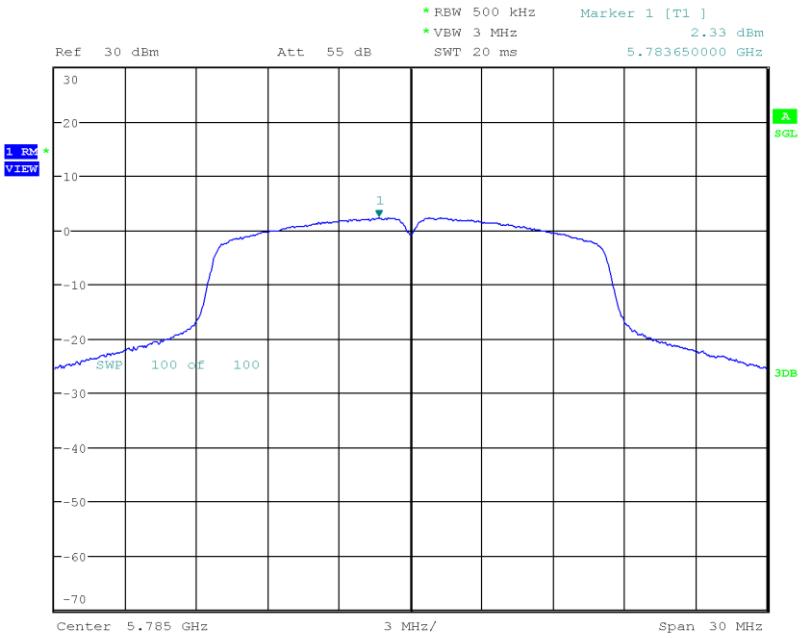
Maximum Power Spectral Density

Project Number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
Model Description:	EchoRing Ethernet Bridge
Model:	ER-EB 1001M
Test Sample ID:	29090
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 12.5; KDB 789033 v02r02, Section F
Operational Mode:	Proprietary, Channel: 149, 5745 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Abdullah Al Jamal
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-05-08
Number of Antenna Ports:	1
Antenna Port(s):	N/A
Maximum Frequency [MHz]:	5746.140
Spectral Density [dBm/RBW]:	2.453
Resolution Bandwidth [MHz]:	0.5



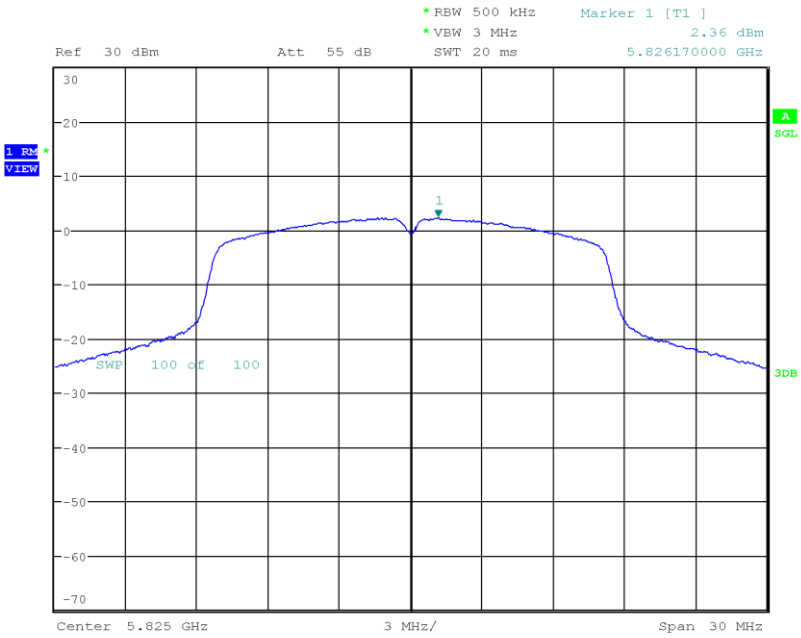
Maximum Power Spectral Density

Project Number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
Model Description:	EchoRing Ethernet Bridge
Model:	ER-EB 1001M
Test Sample ID:	29090
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 12.5; KDB 789033 v02r02, Section F
Operational Mode:	Proprietary, Channel: 157, 5785 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Abdullah Al Jamal
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-05-08
Number of Antenna Ports:	1
Antenna Port(s):	N/A
Maximum Frequency [MHz]:	5783.650
Spectral Density [dBm/RBW]:	2.333
Resolution Bandwidth [MHz]:	0.5



Maximum Power Spectral Density

Project Number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
Model Description:	EchoRing Ethernet Bridge
Model:	ER-EB 1001M
Test Sample ID:	29090
Reference Standards:	FCC 15.407, RSS-247
Reference Method:	ANSI C63.10:2013, Section 12.5; KDB 789033 v02r02, Section F
Operational Mode:	Proprietary, Channel: 165, 5825 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Abdullah Al Jamal
Test Site:	Eurofins Product Service GmbH
Test Date:	2020-05-08
Number of Antenna Ports:	1
Antenna Port(s):	N/A
Maximum Frequency [MHz]:	5826.170
Spectral Density [dBm/RBW]:	2.363
Resolution Bandwidth [MHz]:	0.5



3.5 Test Conditions and Results - Frequency stability

3.5.1 Information

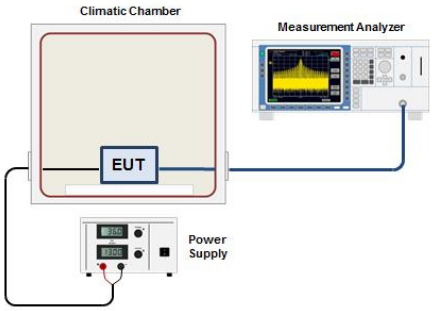
Test Information	
Reference	FCC 15.407(g), KDB 789033 A.3
Measurement Method	ANSI C63.10 6.8
Operator	Abdullah Al Jamal
Date	2020-05-11
Test Sample ID	29090
Measurement uncertainty	±0.06 ppm

3.5.2 Limits

Limits
Emission is maintained within the band of operation under all conditions of normal operation; The frequency deviation combined with the 26 dB bandwidth edges must be within the assigned frequency band

3.5.3 Setup

Test Setup



3.5.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSU 43	EF01631	2019-12	2020-12
Climatic chamber	Vötsch	VT 4010	EF00134	2019-08	2020-08
Cable	Gigalane	SMS111B	EF00779 CAAAZ	2018-10	2020-10

3.5.5 Procedure

Test Procedure with respect to ambient temperature

1. The EUT is turned off and placed inside the temperature chamber
2. The temperature chamber is set to the highest operating temperature
3. The EUT is turned on at nominal supply voltage and the carrier frequency is measured at startup, at 2 minutes, 5 minutes and 10 minutes after EUT is energized
4. The EUT is turned off again
5. The temperature of the chamber is lowered by 10 °C
6. The carrier frequency measurement is repeated after temperature has stabilized
7. The procedure is repeated until the lowest operating temperature is reached

Test Procedure when varying supply voltage
1. The EUT is supplied with nominal supply voltage or a fully charged battery at room temperature (15 to 25 °C) 2. The carrier frequency is measured 3. The procedure is repeated at 85 % and 115 % of the nominal supply voltage or at the battery endpoint for battery operated equipment

Test Procedure of carrier frequency measurement
1. The emission spectrum is measured using a resolution band width of 100 kHz with peak detection and maximum hold 2. The peak of the emission spectrum is determined 3. The left most frequency f_1 10 dB below the peak emission is searched 4. The right most frequency f_2 10 dB below the peak emission is searched 5. The center frequency is calculated from $f_c = (f_1+f_2)/2$ 6. The center frequency and the deviation from the nominal center frequency are recorded

3.5.6 Results

Test Results - 5180 MHz - Variation of supply voltage					
Channel	Nominal Frequency [MHz]	Voltage[1] [VDC]	Temperature [°C]	Frequency [MHz]	Deviation [kHz]
36	5180	24.0	20	5179.993250	-6.750
36	5180	26.4	20	5179.995950	-4.050
36	5180	21.6	20	5180.000300	0.300

Test Results - 5180 MHz - Variation of ambient temperature						
Channel	Nominal Frequency [MHz]	Voltage[1] [VDC]	Temperature [°C]	Time after activation	Frequency [MHz]	Deviation [kHz]
36	5180	24.0	65	0	5179.996600	-3.400
36	5180	24.0	65	2	5179.992250	-7.750
36	5180	24.0	65	5	5179.998800	-1.200
36	5180	24.0	65	10	5179.992700	-7.300
36	5180	24.0	60	0	5179.995200	-4.800
36	5180	24.0	60	2	5179.997100	-2.900
36	5180	24.0	60	5	5180.003500	3.500
36	5180	24.0	60	10	5179.994000	-6.000
36	5180	24.0	50	0	5179.993500	-6.500
36	5180	24.0	50	2	5179.995300	-4.700
36	5180	24.0	50	5	5180.003500	3.500
36	5180	24.0	50	10	5180.002100	2.100
36	5180	24.0	40	0	5179.992350	-7.650
36	5180	24.0	40	2	5179.999650	-0.350
36	5180	24.0	40	5	5179.994200	-5.800
36	5180	24.0	40	10	5179.997100	-2.900
36	5180	24.0	30	0	5179.992300	-7.700
36	5180	24.0	30	2	5179.999100	-0.900
36	5180	24.0	30	5	5179.996050	-3.950
36	5180	24.0	30	10	5179.993000	-7.000
36	5180	24.0	20	0	5179.994800	-5.200
36	5180	24.0	20	2	5179.998050	-1.950
36	5180	24.0	20	5	5180.001650	1.650
36	5180	24.0	20	10	5179.998950	-1.050
36	5180	24.0	10	0	5179.994600	-5.400
36	5180	24.0	10	2	5179.996350	-3.650
36	5180	24.0	10	5	5180.003200	3.200
36	5180	24.0	10	10	5179.998300	-1.700
36	5180	24.0	0	0	5179.994500	-5.500
36	5180	24.0	0	2	5179.996450	-3.550
36	5180	24.0	0	5	5179.994150	-5.850
36	5180	24.0	0	10	5179.992500	-7.500
36	5180	24.0	-10	0	5179.994750	-5.250
36	5180	24.0	-10	2	5180.005150	5.150
36	5180	24.0	-10	5	5179.995950	-4.050
36	5180	24.0	-10	10	5179.997900	-2.100
36	5180	24.0	-20	0	5180.001500	1.500
36	5180	24.0	-20	2	5180.003000	3.000
36	5180	24.0	-20	5	5179.998200	-1.800
36	5180	24.0	-20	10	5179.997650	-2.350

3.6 Test Conditions and Results - AC power line conducted emissions

3.6.1 Information

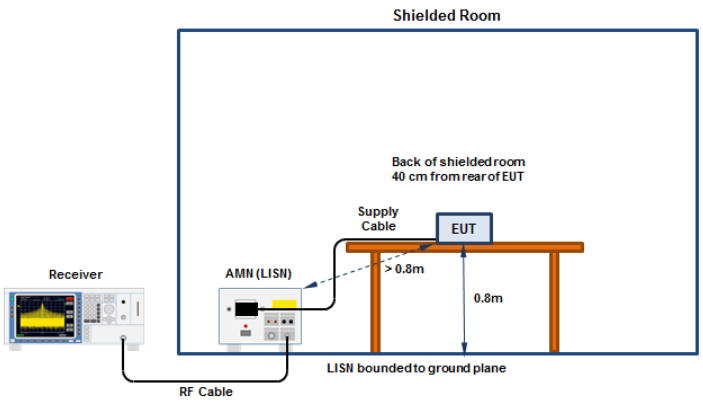
Test Information	
Reference	FCC 15.207
Measurement Method	ANSI C63.10 6.2
Operator	Abdullah Al Jamal
Date	2020-05-15
Test Sample ID	29090
Measurement uncertainty	±3.82 %

3.6.2 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		

3.6.3 Setup

Test Setup



3.6.4 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 Receiver	R&S	ESU 26	EF00241	2019-07	2021-07
LISN	Schwarzbeck	NSLK 8127 RC	EF01592	2019-10	2020-10

Conducted emissions at the mains power port according to FCC part 15 C

Project Number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
Model Description:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Date:	2020-05-15
Operating Conditions:	ambient temperature: 25°C power input: 24 VDC
LISN:	Schwarzbeck NSLK 8127 RC L
Mode:	CH36 – AC/DC-adapter – Test Sample ID 29090

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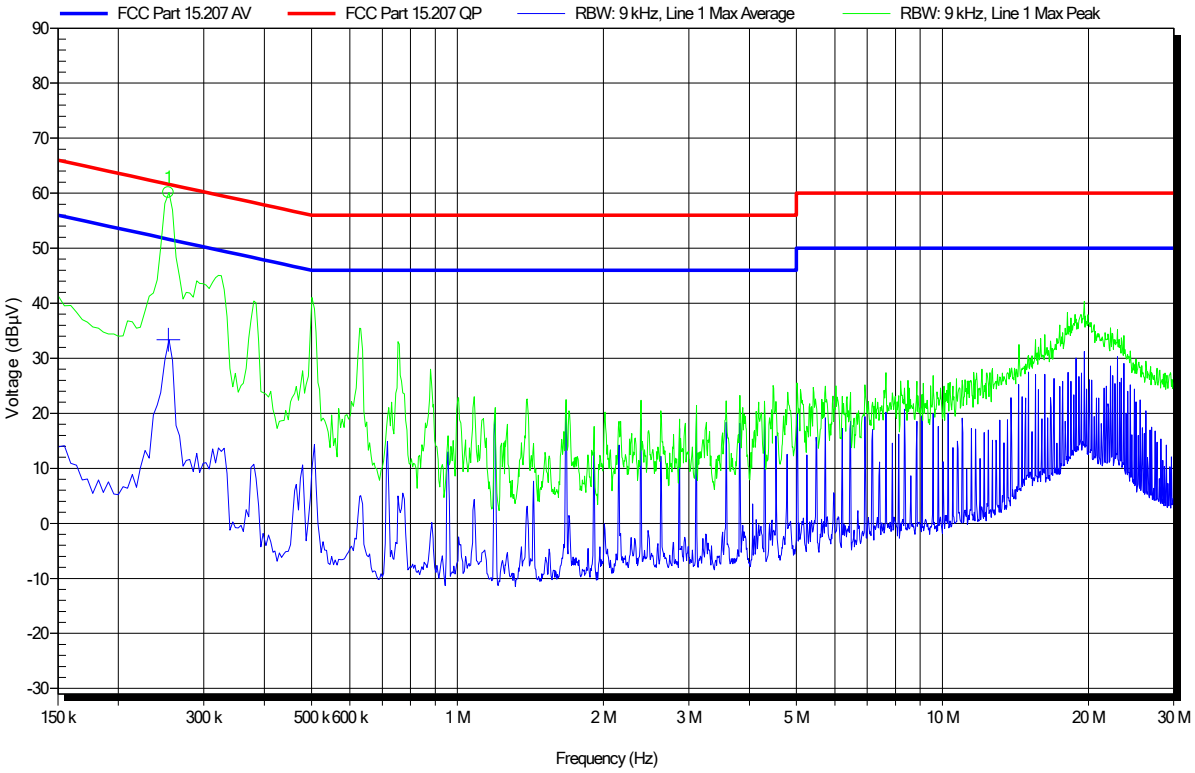

Peak Number	Frequency	LISN
1	253.5 kHz	Line 1

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	253.5 kHz	33.35 dBµV	51.64 dBµV	-18.29 dB	Pass	Line 1

Conducted emissions at the mains power port according to FCC part 15 C

Project Number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
Model Description:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Date:	2020-05-15
Operating Conditions:	ambient temperature: 25°C power input: 24 VDC
LISN:	Schwarzbeck NSLK 8127 RC N
Mode:	CH36 – AC/DC-adapter – Test Sample ID 29090

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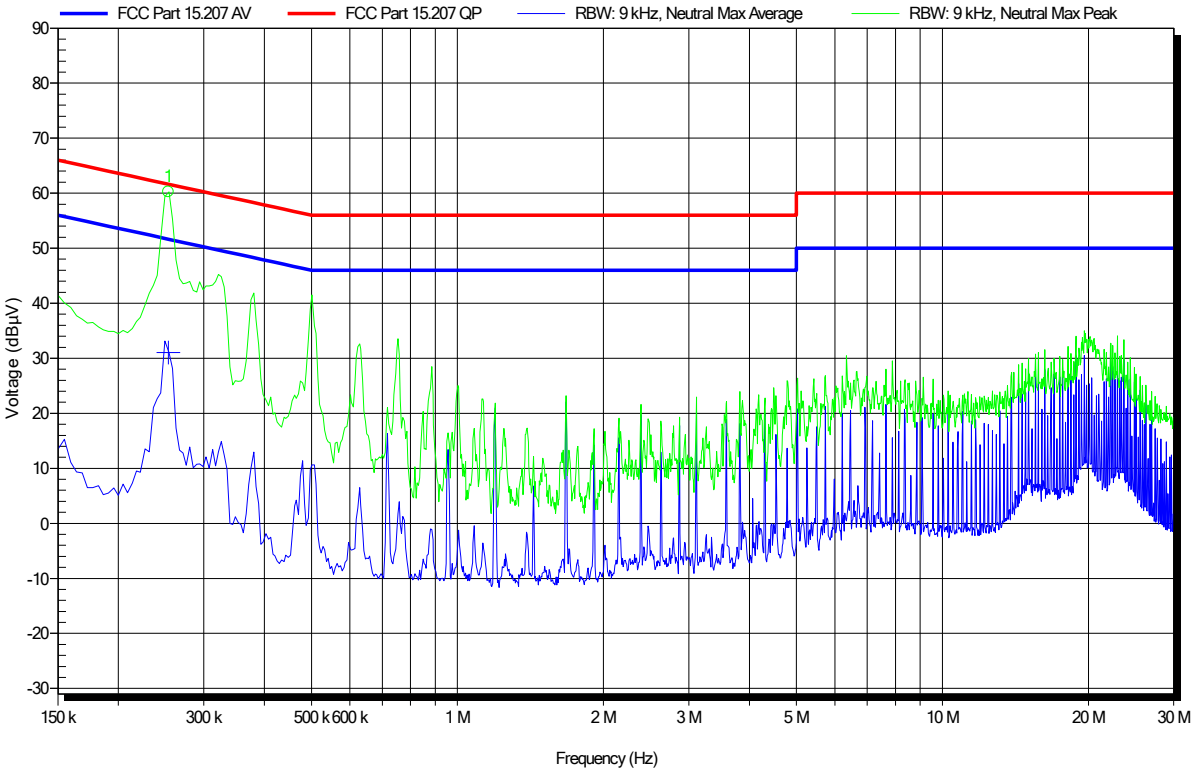


Peak Number	Frequency	LISN
1	253.5 kHz	Neutral

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	253.5 kHz	31.03 dBµV	51.64 dBµV	-20.61 dB	Pass	Neutral

3.7 Test Conditions and Results - Transmitter radiated emissions

3.7.1 Information

Test Information	
Reference	FCC 15.407(b)
Measurement Method	KDB 789033 G
Operator	Abdullah Al Jamal
Date	2020-04-28 2020-05-11 2020-05-12
Test Sample ID	29090
Measurement note	Measurement plots not listed in this test report (related to the frequency range to be measured) contain noise floor only. No significant emissions could be measured in these measurement ranges. An evaluation was performed manually with the spectrum analyser.
Measurement uncertainty	±5.1 %

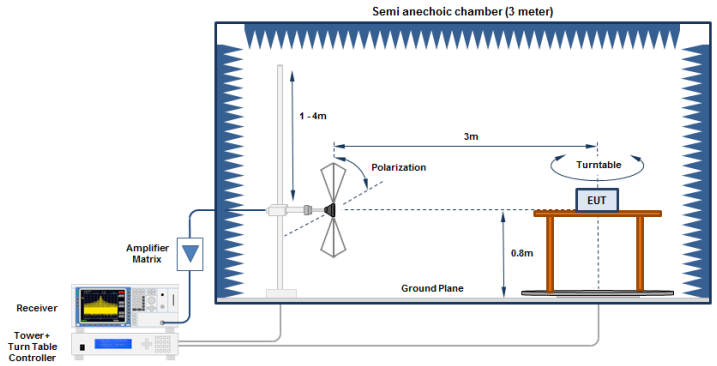
3.7.2 Limits

Limits - Restricted frequency bands and below 1 GHz			
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

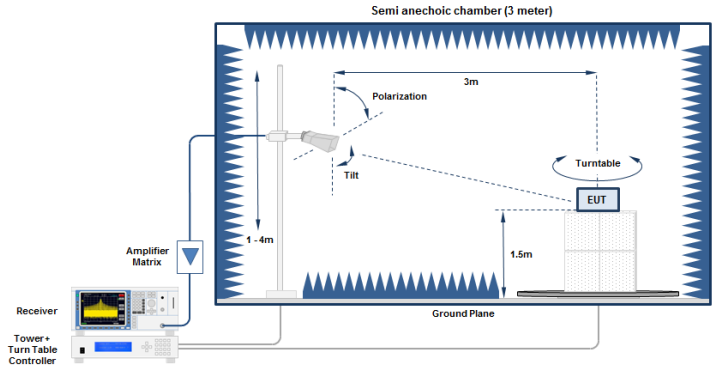
Limits - Outside restricted frequency bands above 1 GHz			
Frequency band [MHz]	Power limit [dBm EIRP]	Field strength limit [dBµV/m]	Measurement distance [m]
5150 - 5250	-27 dBm/MHz	68.2	3
5250 - 5350	-27 dBm/MHz	68.2	3
5470 - 5725	-27 dBm/MHz	68.2	3
5725 - 5850	-27 dBm/MHz – @ ±75 MHz from band edge	68.2	3
5725 - 5850	10 to -27 dBm/MHz – @ ±25 to ±75 MHz from band edge	105.2 to 68.2	3
5725 - 5850	15.6 to 10 dBm/MHz – @ ±5 to ±25 MHz from band edge	110.8 to 105.2	3
5725 - 5850	27 to 15.6 dBm/MHz – @ ±0 to ±5 MHz from band edge	122.2 to 110.8	3

3.7.3 Setup

Test Setup 30 - 1000 MHz



Test Setup > 1 GHz



3.7.4 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
Measurement Receiver	Agilent	N9038A-526/WXP	EF01070	2019-09	2020-09
Antenna	R&S	HK 116	EF00203	2018-06	2020-06
Antenna	R&S	HL 223	EF00013	2018-06	2020-06

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	2019-09	2020-09
Antenna	Schwarzbeck	BBHA 9120D	EF00018	2019-10	2022-10
Antenna	Amplifier Research	AT4560	EF01152	2018-10	2020-10
Antenna	Flann Microwave Ltd	22240-25 Amp. CBL26402075	EF00301	2019-12	2022-12

3.7.5 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

3.7.6 Results

Test Results						
Channel	Emission [MHz]	Level [dBµV/m]	Det.	Pol.	Limit [dBµV/m]	Margin [dB]
CH36	73.1109	35.90	pk	hor	40.00	-04.08
CH36	73.1109	24.60	qpk	hor	40.00	-15.45
CH36	73.3064	37.60	pk	ver	40.00	-02.45
CH36	73.3064	25.30	qpk	ver	40.00	-14.66
CH36	73.6719	36.10	pk	ver	40.00	-03.85
CH36	73.6719	24.60	qpk	ver	40.00	-15.42
CH36	74.0799	36.40	pk	hor	40.00	-03.56
CH36	74.0799	25.50	qpk	hor	40.00	-14.54
CH36	74.2796	39.10	pk	ver	40.00	-00.88
CH36	74.2796	27.90	qpk	ver	40.00	-12.11
CH36	74.9426	29.00	pk	hor	40.00	-11.05
CH36	74.9766	44.20	pk	ver	40.00	04.18
CH36	74.9766	28.50	qpk	ver	40.00	-11.52
CH36	5149	64.44	pk	hor	54.00	10.44
CH36	5149	53.63	RMS	hor	54.00	-00.37
CH40	73.6209	37.60	pk	ver	40.00	-02.36
CH40	73.6209	24.70	qpk	ver	40.00	-15.29
CH40	74.3349	31.40	pk	hor	40.00	-08.65
CH40	74.3349	20.30	qpk	hor	40.00	-19.70
CH40	74.3901	47.20	pk	ver	40.00	07.15
CH40	74.3901	28.20	qpk	ver	40.00	-11.80
CH40	74.8831	39.10	pk	ver	40.00	-00.90

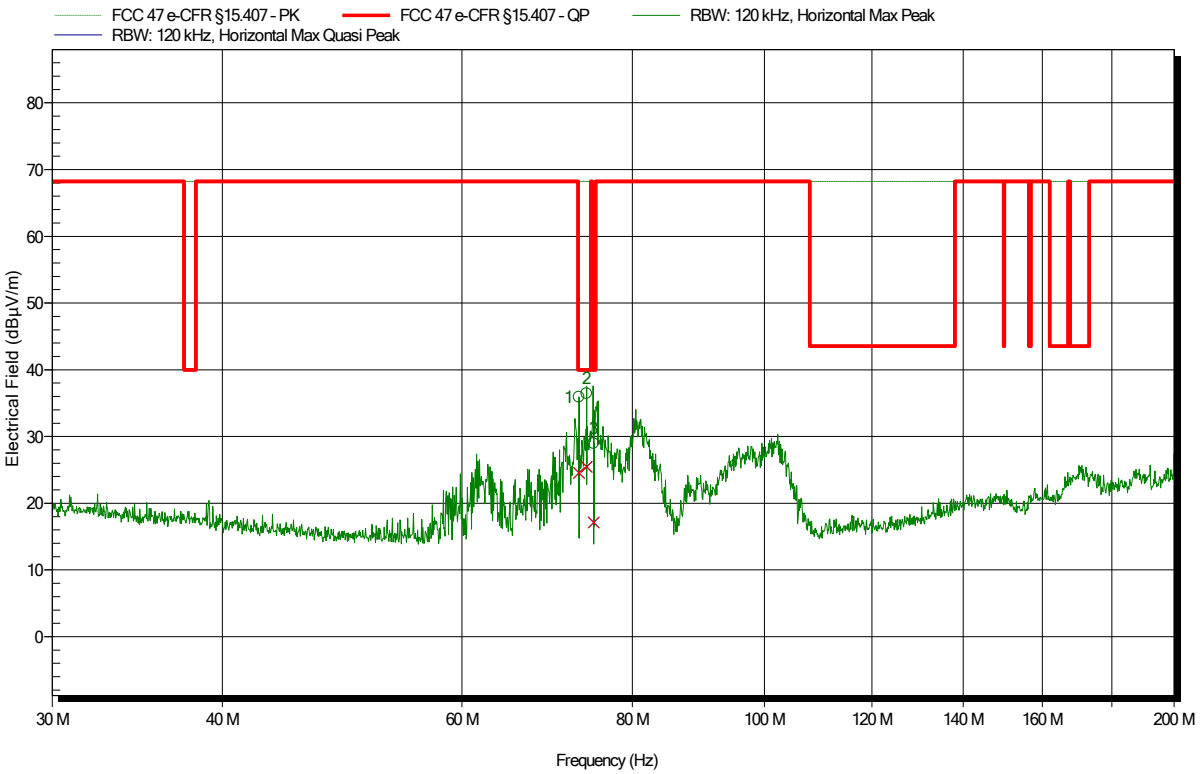
CH40	74.8831	28.80	qpk	ver	40.00	-11.17
CH40	75.0574	37.10	pk	hor	40.00	-02.87
CH40	75.0574	26.80	qpk	hor	40.00	-13.22
CH40	135.0064	35.80	pk	hor	43.50	-07.70
CH40	4936	40.97	pk	ver	54.00	-13.03
CH40	5450	39.93	pk	ver	54.00	-14.07
CH48	73.6124	33.90	pk	hor	40.00	-06.09
CH48	73.6804	37.40	pk	ver	40.00	-02.55
CH48	73.6804	26.60	qpk	ver	40.00	-13.35
CH48	74.2371	37.70	pk	hor	40.00	-02.33
CH48	74.2371	26.80	qpk	hor	40.00	-13.20
CH48	74.3646	40.50	pk	ver	40.00	00.52
CH48	74.3646	29.60	qpk	ver	40.00	-10.44
CH48	74.9894	37.50	pk	hor	40.00	-02.50
CH48	74.9894	26.90	qpk	hor	40.00	-13.06
CH149	73.9779	38.40	pk	ver	40.00	-01.63
CH149	73.9779	27.50	qpk	ver	40.00	-12.52
CH149	74.9001	34.10	pk	hor	40.00	-05.91
CH149	74.9001	23.10	qpk	hor	40.00	-16.95
CH149	74.9341	38.70	pk	ver	40.00	-01.32
CH149	74.9341	28.50	qpk	ver	40.00	-11.54
CH157	73.9057	38.70	pk	ver	40.00	-01.30
CH157	73.9057	27.50	qpk	ver	40.00	-12.46
CH157	73.9184	29.70	pk	hor	40.00	-10.26
CH157	74.9554	37.30	pk	hor	40.00	-02.70
CH157	74.9554	26.60	qpk	hor	40.00	-13.42
CH157	75.0956	40.30	pk	ver	40.00	00.32
CH157	75.0956	30.00	qpk	ver	40.00	-10.04
CH157	3861	37.02	pk	hor	54.00	-16.98
CH157	3861	38.96	pk	ver	54.00	-15.04
CH157	3861	37.06	pk	hor	54.00	-16.94
CH157	3861	37.85	pk	hor	54.00	-16.15
CH165	74.3009	39.10	pk	hor	40.00	-00.90
CH165	74.3009	28.00	qpk	hor	40.00	-11.99
CH165	75.0446	36.00	pk	hor	40.00	-04.02
CH165	75.0446	25.10	qpk	hor	40.00	-14.91
CH165	75.0489	40.70	pk	ver	40.00	00.69
CH165	75.0489	30.00	qpk	ver	40.00	-09.97
CH165	3885	40.52	pk	ver	54.00	-13.48

ANNEX A Transmitter spurious emissions

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 23.9°C, Vnom: 24.0 VDC (AC/DC-adapter) and 48.0 VDC PoE
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	TX; CH36 – Test Sample ID 29090
Test Date:	2020-04-28
Note:	

Index 1



Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Height
73.1109 MHz	35.9 dBµV/m	40 dBµV/m	-4.08 dB	Pass	3.35 m
74.0799 MHz	36.4 dBµV/m	40 dBµV/m	-3.56 dB	Pass	3 m
74.9426 MHz	29 dBµV/m	40 dBµV/m	-11.05 dB	Pass	1.1 m

Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Height
73.1109 MHz	24.6 dBµV/m	40 dBµV/m	-15.45 dB	Pass	3.35 m
74.0799 MHz	25.5 dBµV/m	40 dBµV/m	-14.54 dB	Pass	3 m
74.9426 MHz	17.1 dBµV/m	40 dBµV/m	-22.88 dB	Pass	1.1 m

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 23.9°C, Vnom: 24.0 VDC (AC/DC-adapter) and 48.0 VDC PoE
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	TX; CH36 – Test Sample ID 29090
Test Date:	2020-04-28
Note:	

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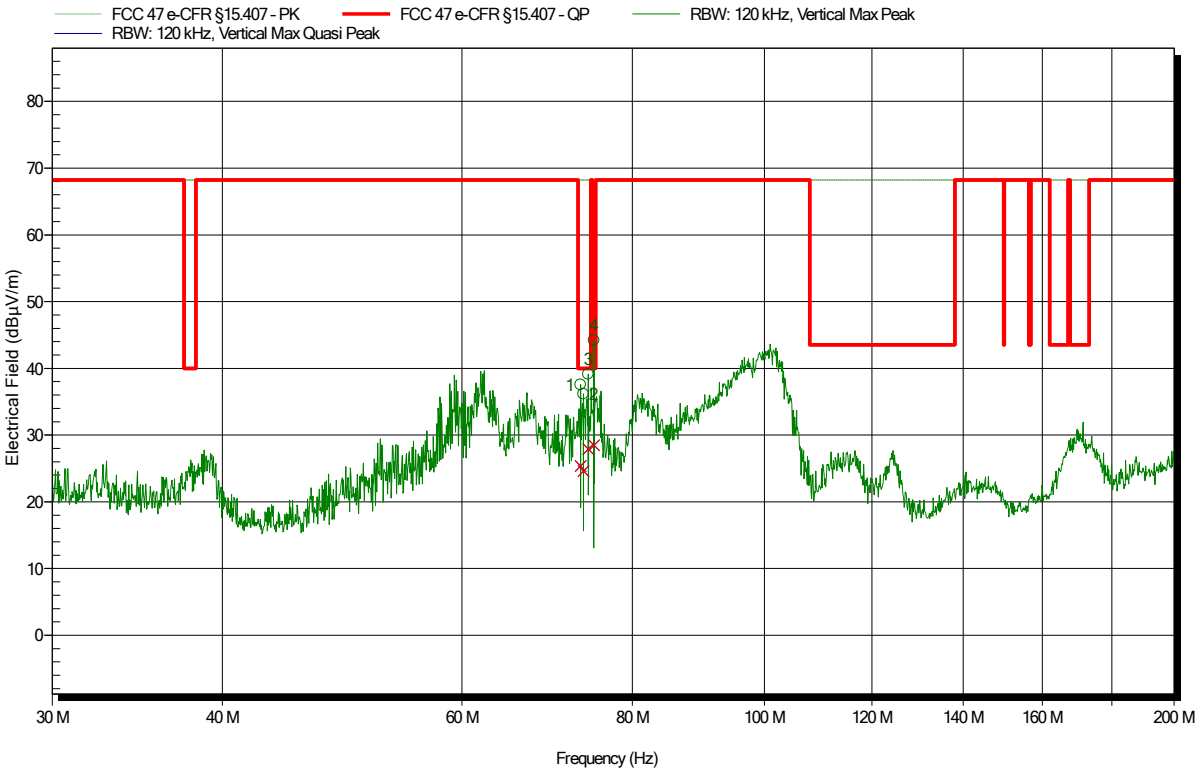

Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Height
73.3064 MHz	37.6 dBµV/m	40 dBµV/m	-2.45 dB	Pass	1.85 m
73.6719 MHz	36.1 dBµV/m	40 dBµV/m	-3.85 dB	Pass	1 m
74.2796 MHz	39.1 dBµV/m	40 dBµV/m	-0.88 dB	Pass	1.5 m
74.9766 MHz	44.2 dBµV/m	40 dBµV/m	4.18 dB	Fail	1.75 m

Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Height
73.3064 MHz	25.3 dBµV/m	40 dBµV/m	-14.66 dB	Pass	1.85 m
73.6719 MHz	24.6 dBµV/m	40 dBµV/m	-15.42 dB	Pass	1 m
74.2796 MHz	27.9 dBµV/m	40 dBµV/m	-12.11 dB	Pass	1.5 m
74.9766 MHz	28.5 dBµV/m	40 dBµV/m	-11.52 dB	Pass	1.75 m

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 23.9°C, Vnom: 24.0 VDC (AC/DC-adapter) and 48.0 VDC PoE
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	TX; CH36 – Test Sample ID 29090
Test Date:	2020-04-28
Note:	

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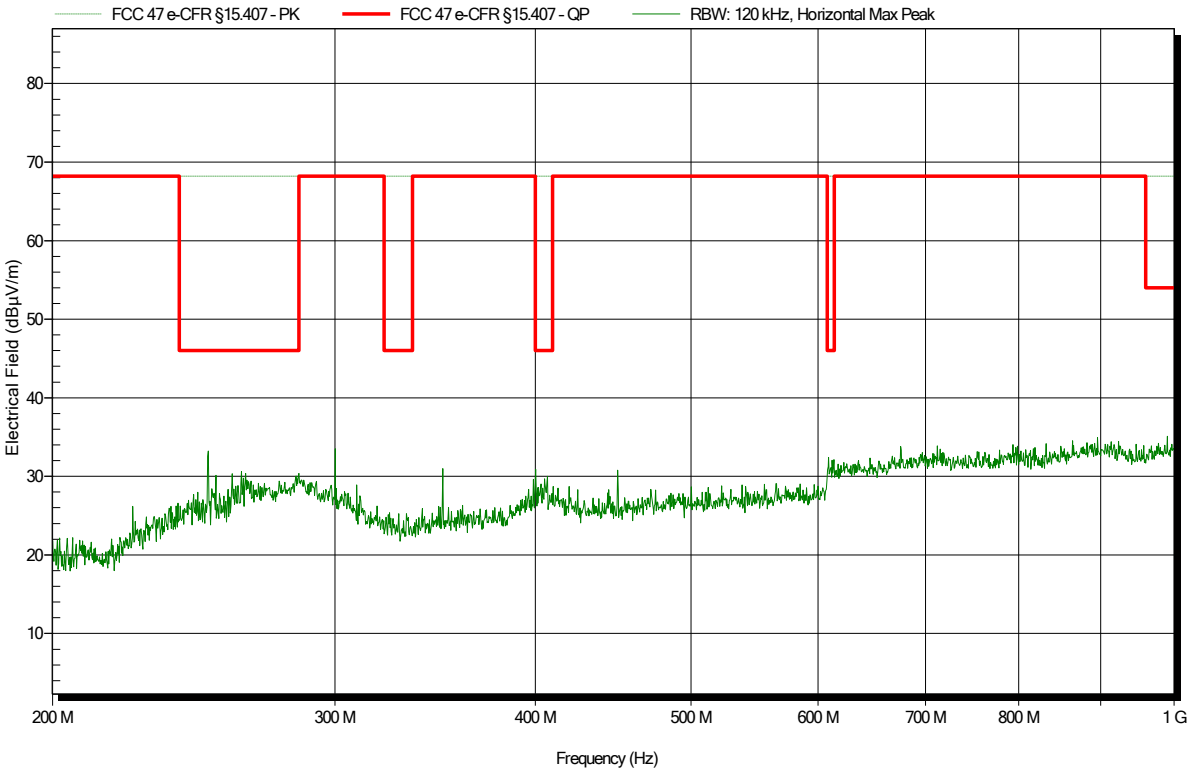

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 23.9°C, Vnom: 24.0 VDC (AC/DC-adapter) and 48.0 VDC PoE
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	TX; CH36 – Test Sample ID 29090
Test Date:	2020-04-28
Note:	

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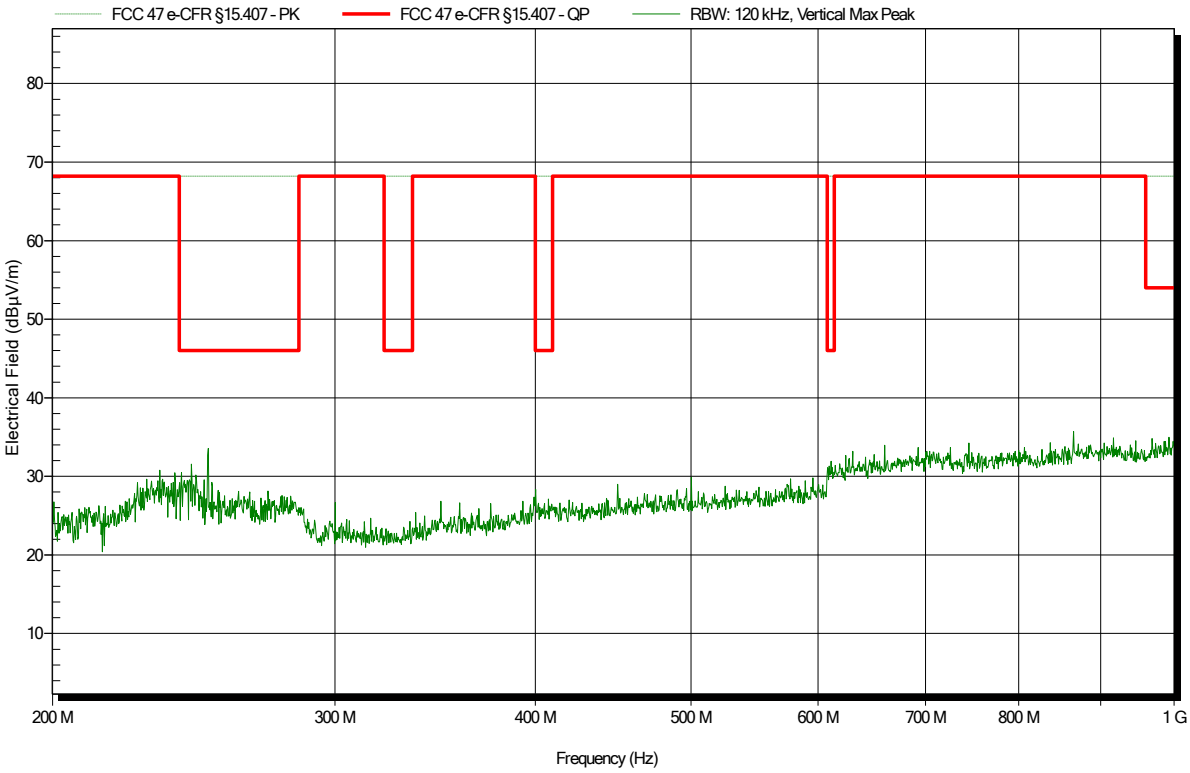
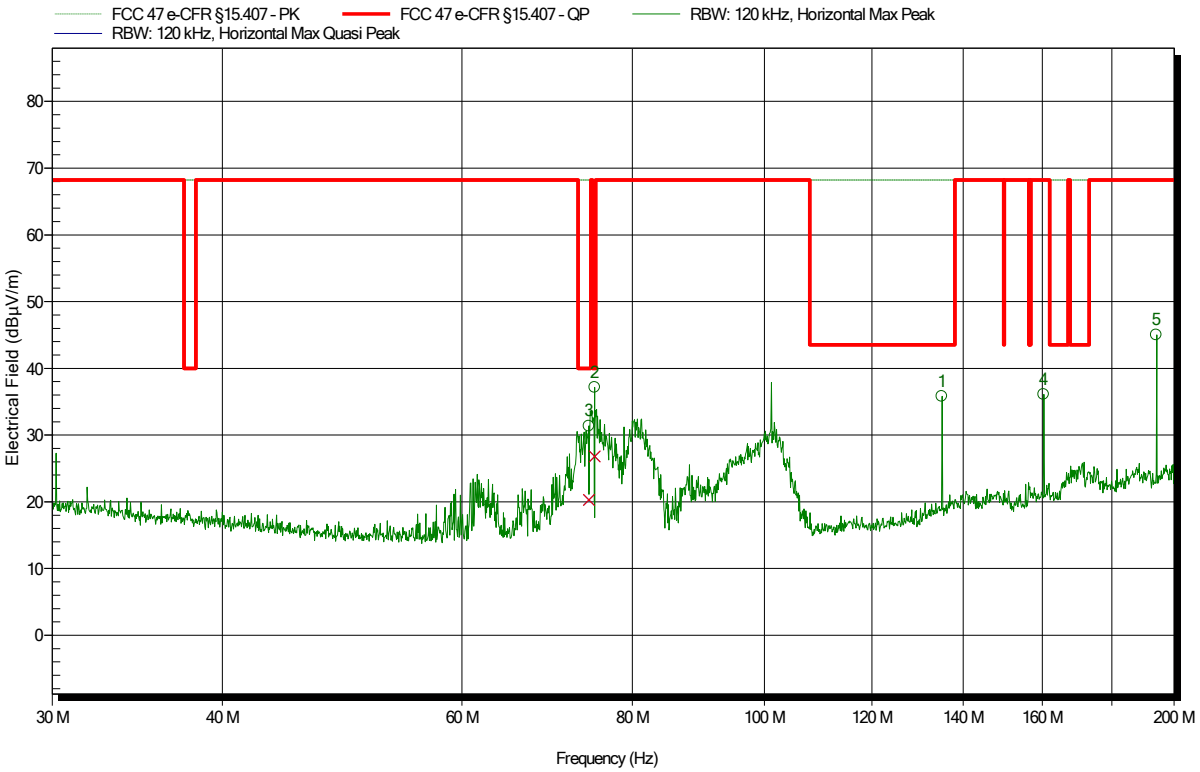


Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 23.9°C, Vnom: 24.0 VDC (AC/DC-adapter) and 48.0 VDC PoE
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	TX; CH40 – Test Sample ID 29090
Test Date:	2020-04-28
Note:	

Index 3



Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Height
74.3349 MHz	31.4 dBµV/m	40 dBµV/m	-8.65 dB	Pass	3.05 m
75.0574 MHz	37.1 dBµV/m	40 dBµV/m	-2.87 dB	Pass	2.75 m
135.0064 MHz	35.8 dBµV/m	43.5 dBµV/m	-7.7 dB	Pass	4 m
160.3485 MHz	36.1 dBµV/m	68.2 dBµV/m	-32.1 dB	Pass	4 m
194.0119 MHz	45 dBµV/m	68.2 dBµV/m	-23.16 dB	Pass	4 m

Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Height
74.3349 MHz	20.3 dBµV/m	40 dBµV/m	-19.7 dB	Pass	3.05 m
75.0574 MHz	26.8 dBµV/m	40 dBµV/m	-13.22 dB	Pass	2.75 m

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 23.9°C, Vnom: 24.0 VDC (AC/DC-adapter) and 48.0 VDC PoE
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	TX; CH40 – Test Sample ID 29090
Test Date:	2020-04-28
Note:	

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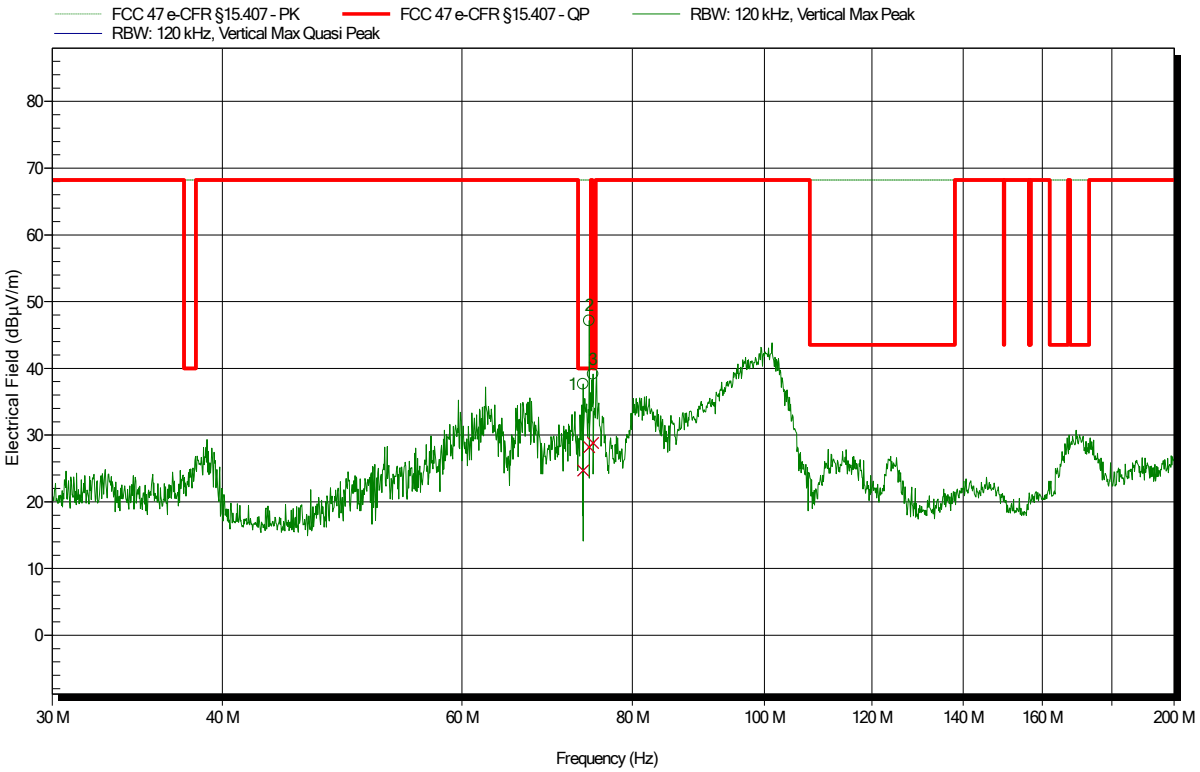

Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Height
73.6209 MHz	37.6 dBµV/m	40 dBµV/m	-2.36 dB	Pass	3.15 m
74.3901 MHz	47.2 dBµV/m	40 dBµV/m	7.15 dB	Fail	1.25 m
74.8831 MHz	39.1 dBµV/m	40 dBµV/m	-0.9 dB	Pass	1.55 m

Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Height
73.6209 MHz	24.7 dBµV/m	40 dBµV/m	-15.29 dB	Pass	3.15 m
74.3901 MHz	28.2 dBµV/m	40 dBµV/m	-11.8 dB	Pass	1.25 m
74.8831 MHz	28.8 dBµV/m	40 dBµV/m	-11.17 dB	Pass	1.55 m

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 23.9°C, Vnom: 24.0 VDC (AC/DC-adapter) and 48.0 VDC PoE
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	TX; CH40 – Test Sample ID 29090
Test Date:	2020-04-28
Note:	

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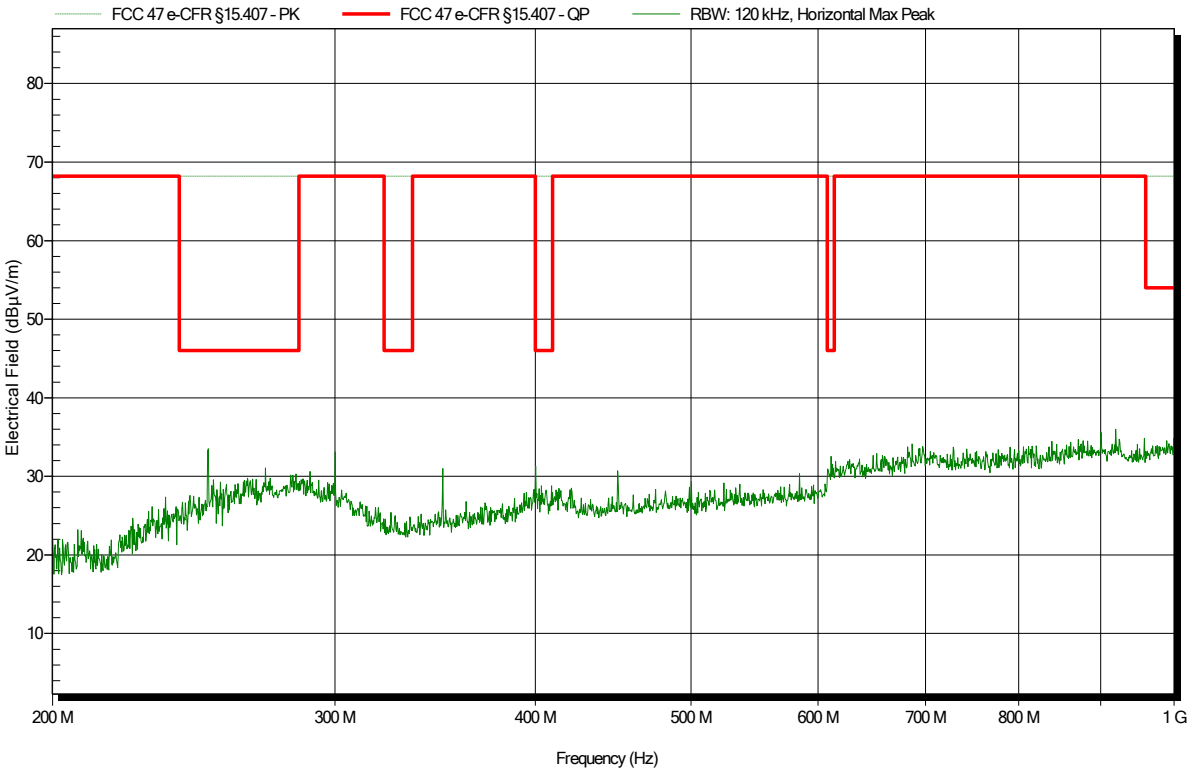

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 23.9°C, Vnom: 24.0 VDC (AC/DC-adapter) and 48.0 VDC PoE
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	TX; CH40 – Test Sample ID 29090
Test Date:	2020-04-28
Note:	

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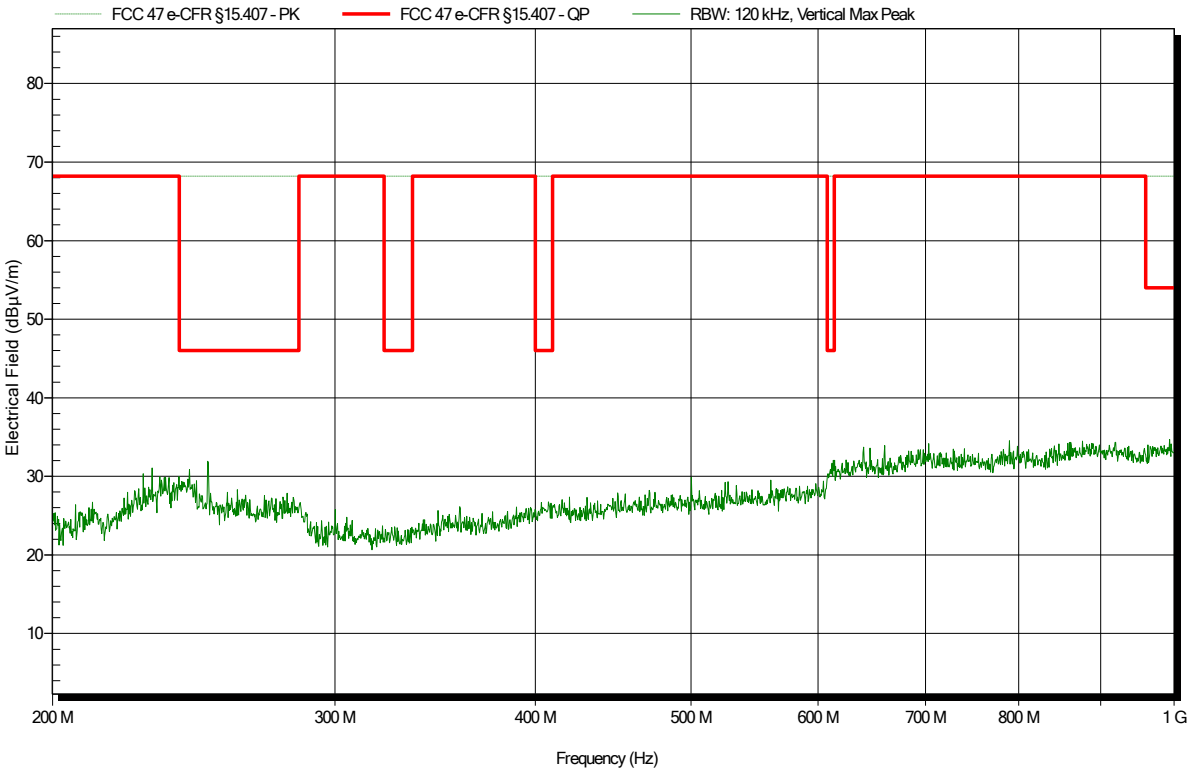

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 23.9°C, Vnom: 24.0 VDC (AC/DC-adapter) and 48.0 VDC PoE
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	TX; CH48 – Test Sample ID 29090
Test Date:	2020-04-28
Note:	

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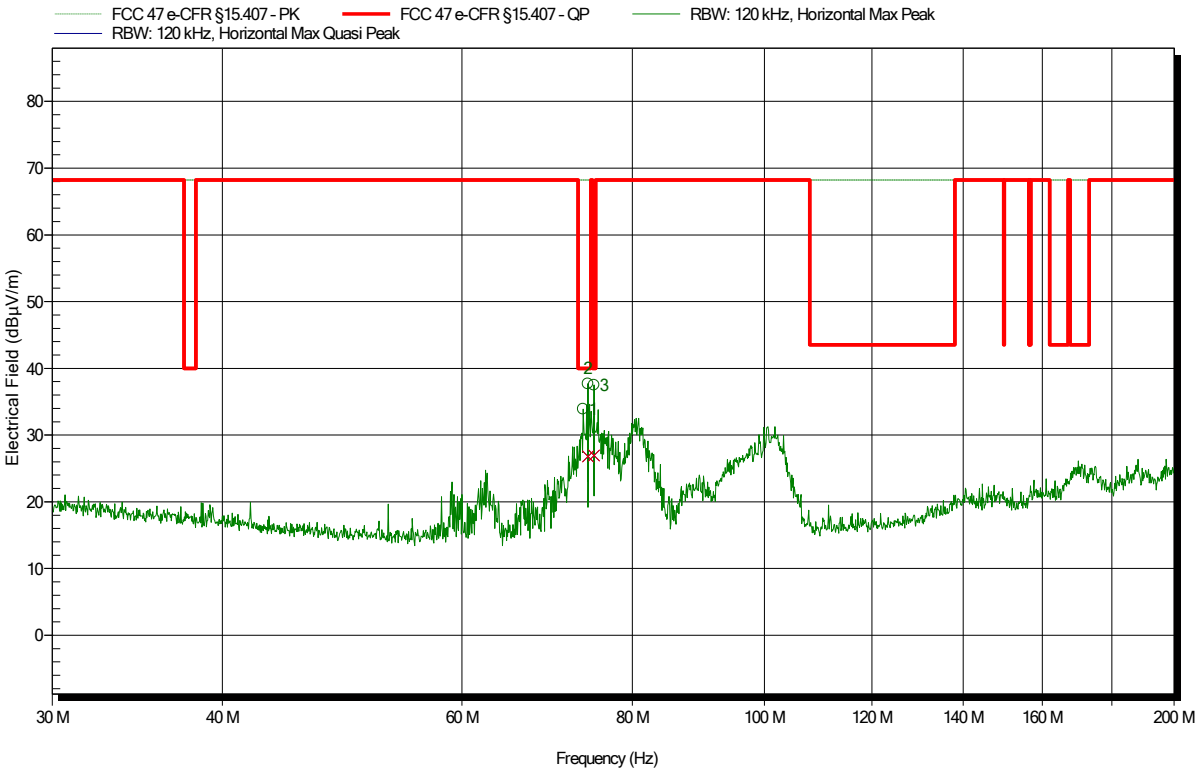

Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Height
73.6124 MHz	33.9 dBµV/m	40 dBµV/m	-6.09 dB	Pass	3.25 m
74.2371 MHz	37.7 dBµV/m	40 dBµV/m	-2.33 dB	Pass	2.7 m
74.9894 MHz	37.5 dBµV/m	40 dBµV/m	-2.5 dB	Pass	2.75 m

Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Height
74.2371 MHz	26.8 dBµV/m	40 dBµV/m	-13.2 dB	Pass	2.7 m
74.9894 MHz	26.9 dBµV/m	40 dBµV/m	-13.06 dB	Pass	2.75 m

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 23.9°C, Vnom: 24.0 VDC (AC/DC-adapter) and 48.0 VDC PoE
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	TX; CH48 – Test Sample ID 29090
Test Date:	2020-04-28
Note:	

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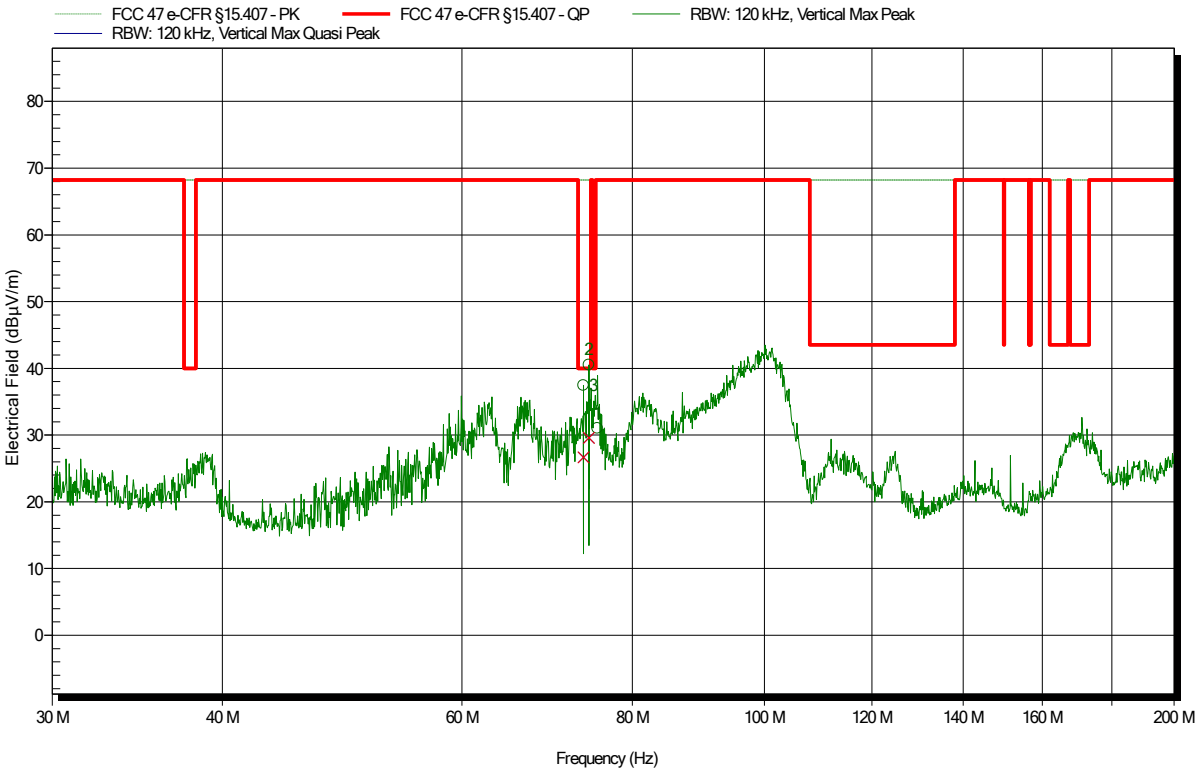

Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Height
73.6804 MHz	37.4 dBµV/m	40 dBµV/m	-2.55 dB	Pass	1.1 m
74.3646 MHz	40.5 dBµV/m	40 dBµV/m	0.52 dB	Fail	1.1 m
75.4271 MHz	31 dBµV/m	68.2 dBµV/m	-37.19 dB	Pass	3.25 m

Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Height
73.6804 MHz	26.6 dBµV/m	40 dBµV/m	-13.35 dB	Pass	1.1 m
74.3646 MHz	29.6 dBµV/m	40 dBµV/m	-10.44 dB	Pass	1.1 m

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 23.9°C, Vnom: 24.0 VDC (AC/DC-adapter) and 48.0 VDC PoE
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	TX; CH48 – Test Sample ID 29090
Test Date:	2020-04-28
Note:	

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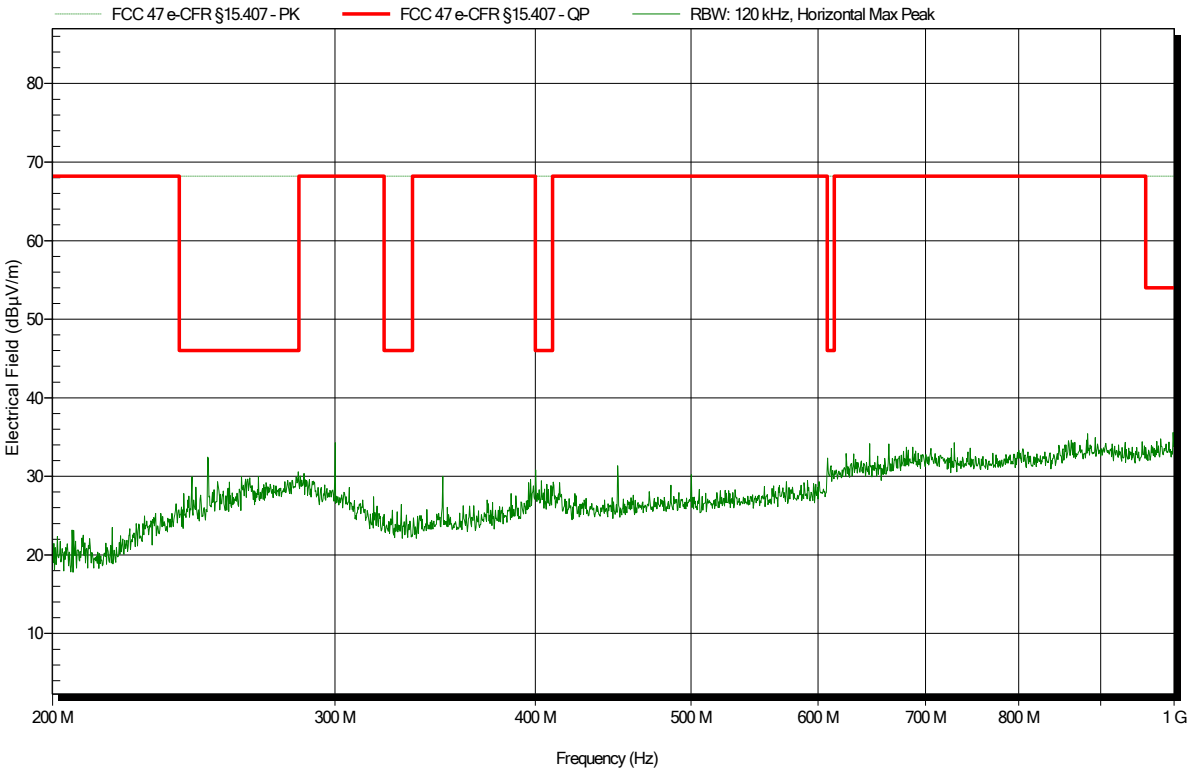

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 23.9°C, Vnom: 24.0 VDC (AC/DC-adapter) and 48.0 VDC PoE
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	TX; CH48 – Test Sample ID 29090
Test Date:	2020-04-28
Note:	

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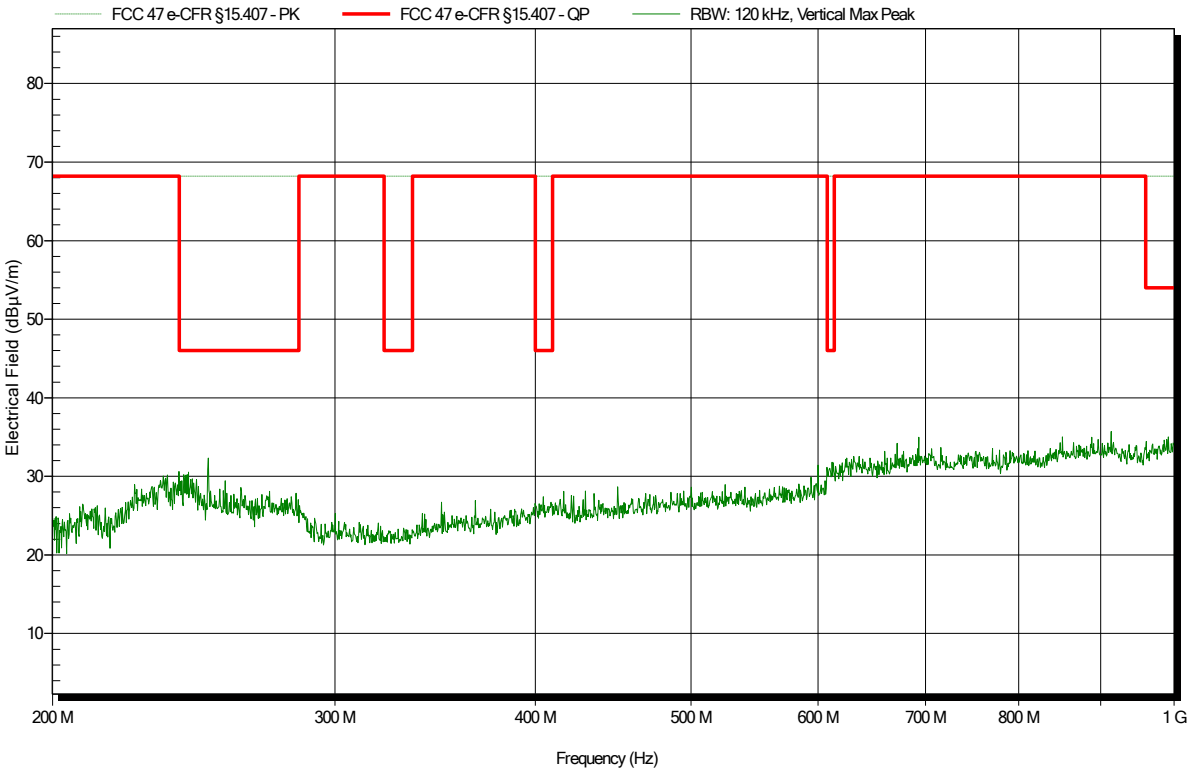

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 23.9°C, Vnom: 24.0 VDC (AC/DC-adapter) and 48.0 VDC PoE
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	TX; CH149 – Test Sample ID 29090
Test Date:	2020-04-28
Note:	

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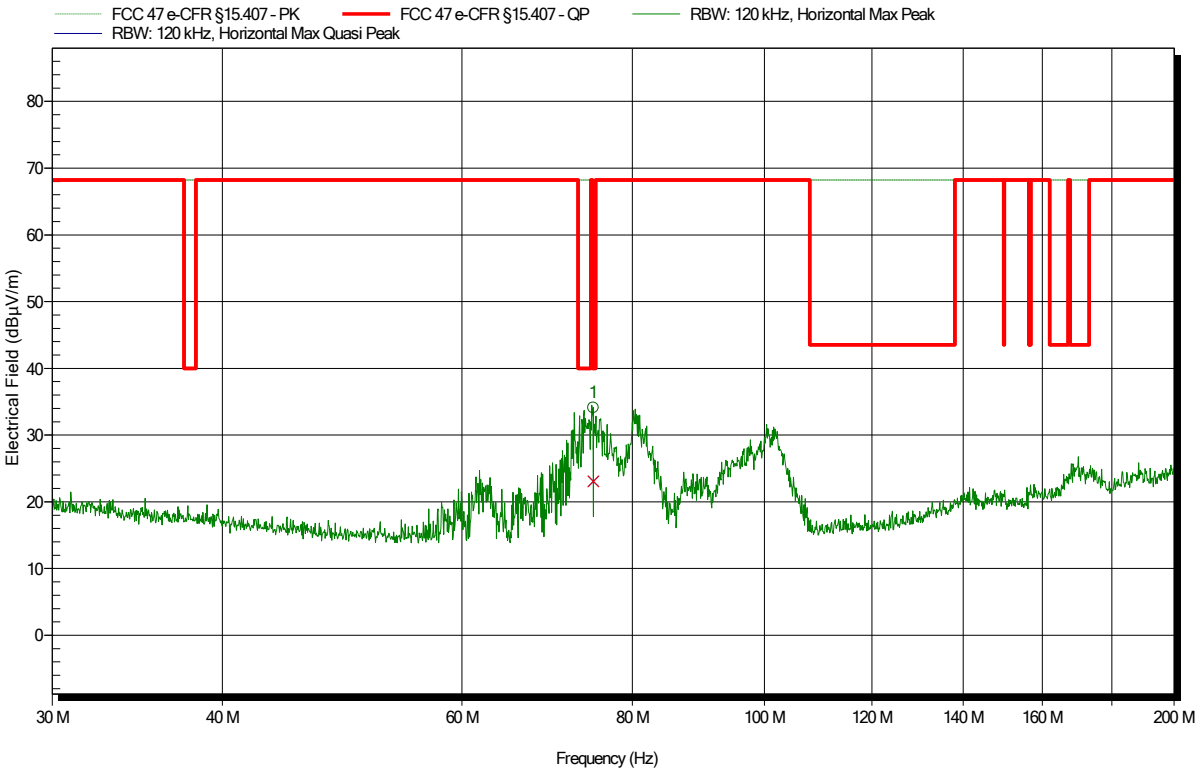

Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Height
74.9001 MHz	34.1 dBµV/m	40 dBµV/m	-5.91 dB	Pass	3.75 m

Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Height
74.9001 MHz	23.1 dBµV/m	40 dBµV/m	-16.95 dB	Pass	3.75 m

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 23.9°C, Vnom: 24.0 VDC (AC/DC-adapter) and 48.0 VDC PoE
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	TX; CH149 – Test Sample ID 29090
Test Date:	2020-04-28
Note:	

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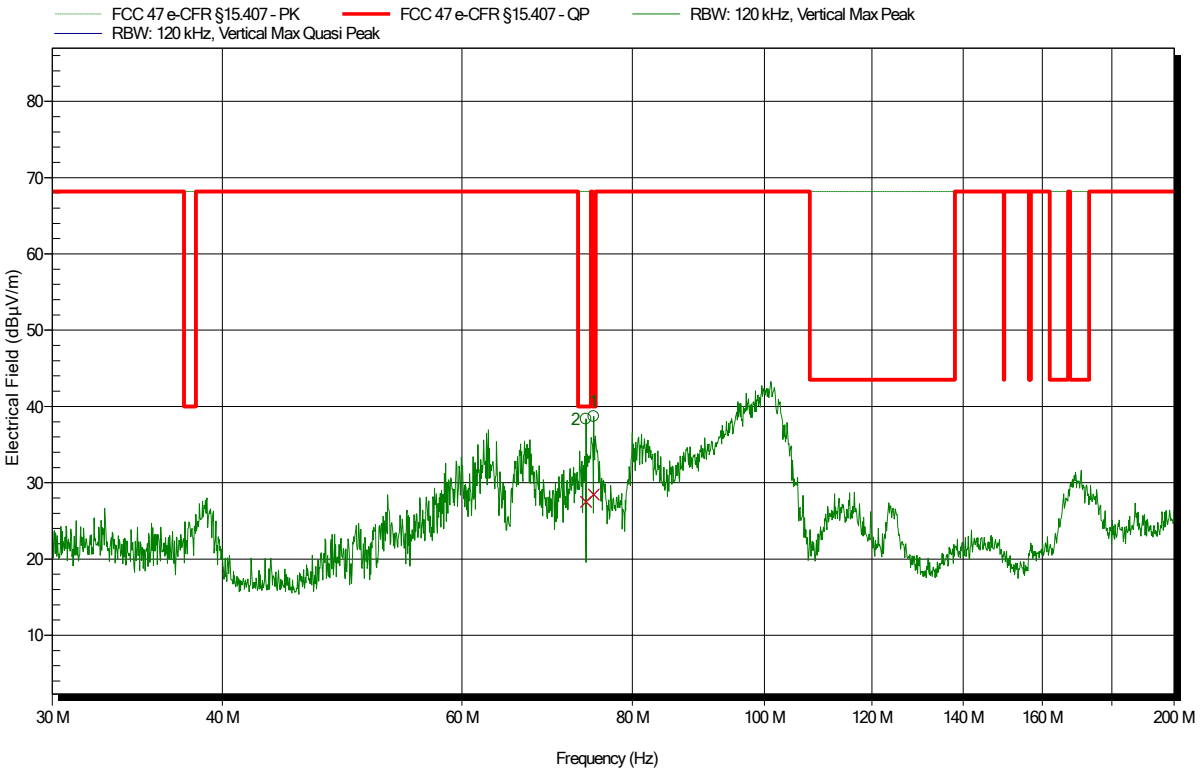

Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Height
73.9779 MHz	38.4 dBµV/m	40 dBµV/m	-1.63 dB	Pass	1.55 m
74.9341 MHz	38.7 dBµV/m	40 dBµV/m	-1.32 dB	Pass	1.1 m

Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Height
73.9779 MHz	27.5 dBµV/m	40 dBµV/m	-12.52 dB	Pass	1.55 m
74.9341 MHz	28.5 dBµV/m	40 dBµV/m	-11.54 dB	Pass	1.1 m

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 23.9°C, Vnom: 24.0 VDC (AC/DC-adapter) and 48.0 VDC PoE
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	TX; CH149 – Test Sample ID 29090
Test Date:	2020-04-28
Note:	

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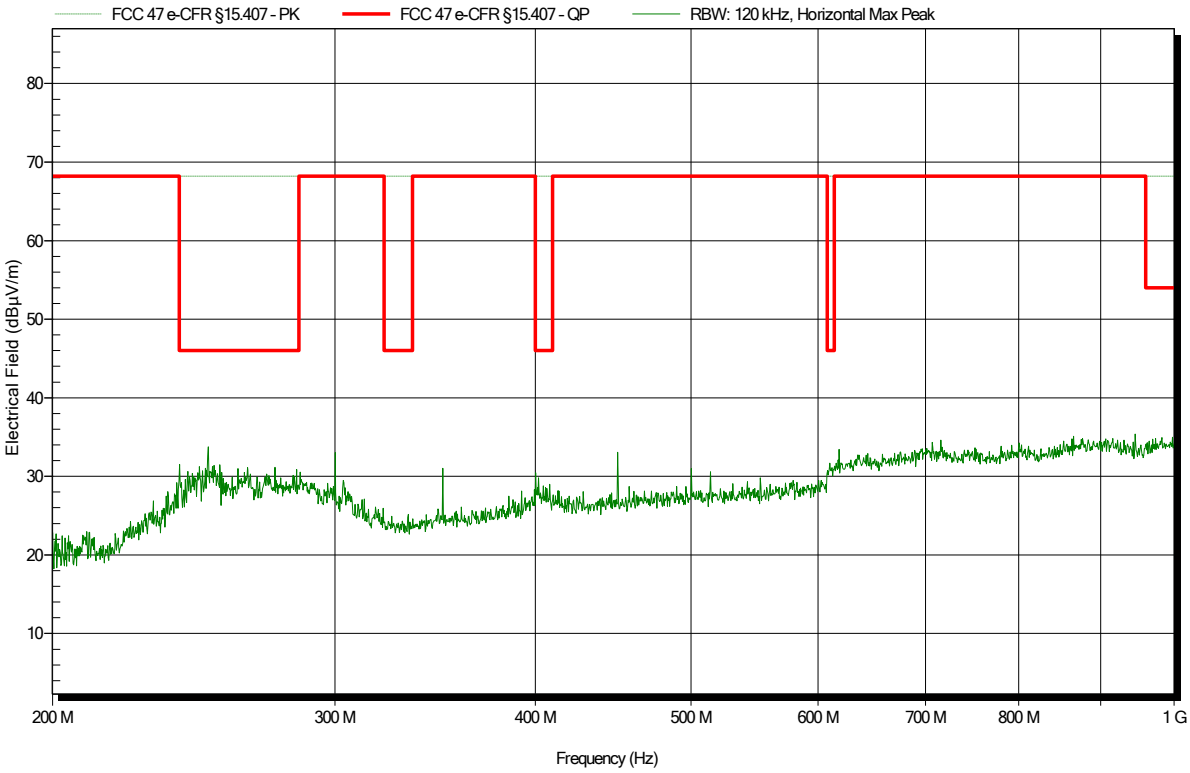

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 23.9°C, Vnom: 24.0 VDC (AC/DC-adapter) and 48.0 VDC PoE
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	TX; CH149 – Test Sample ID 29090
Test Date:	2020-04-28
Note:	

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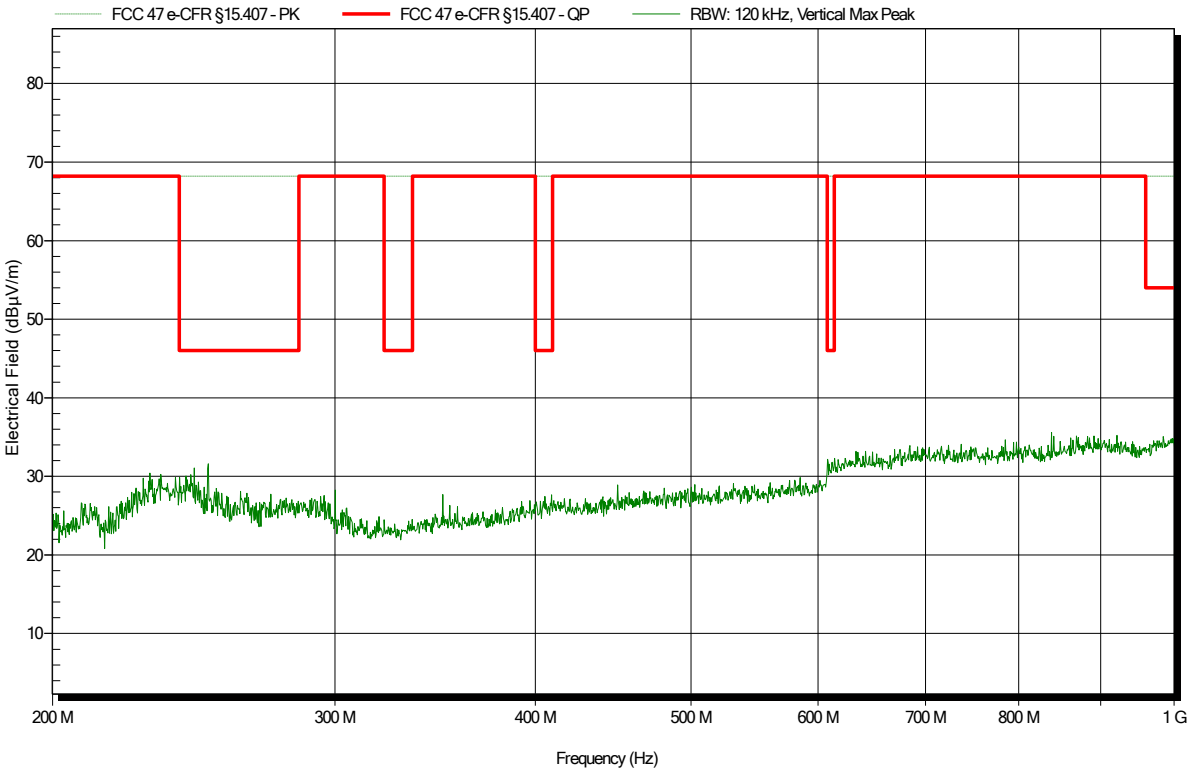

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 23.9°C, Vnom: 24.0 VDC (AC/DC-adapter) and 48.0 VDC PoE
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	TX; CH157 – Test Sample ID 29090
Test Date:	2020-04-28
Note:	

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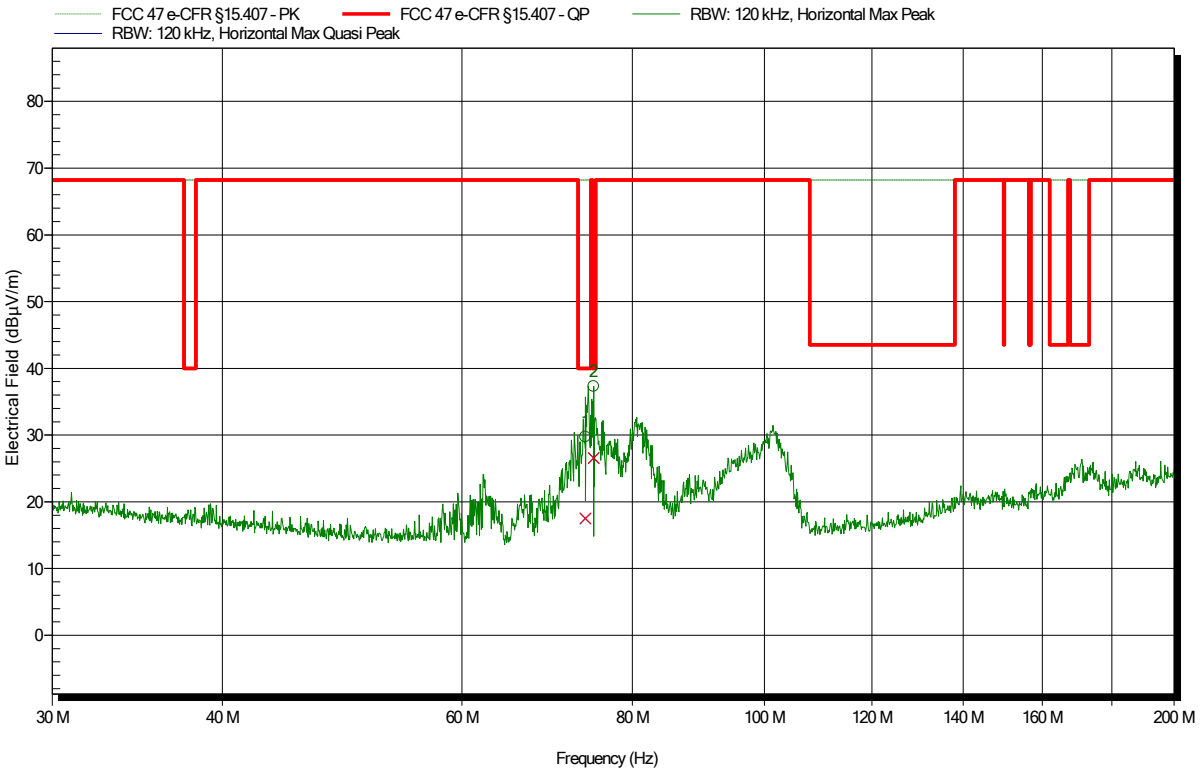

Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Height
73.9184 MHz	29.7 dBµV/m	40 dBµV/m	-10.26 dB	Pass	2.4 m
74.9554 MHz	37.3 dBµV/m	40 dBµV/m	-2.7 dB	Pass	2.75 m

Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Height
73.9184 MHz	17.5 dBµV/m	40 dBµV/m	-22.52 dB	Pass	2.4 m
74.9554 MHz	26.6 dBµV/m	40 dBµV/m	-13.42 dB	Pass	2.75 m

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 23.9°C, Vnom: 24.0 VDC (AC/DC-adapter) and 48.0 VDC PoE
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	TX; CH157 – Test Sample ID 29090
Test Date:	2020-04-28
Note:	

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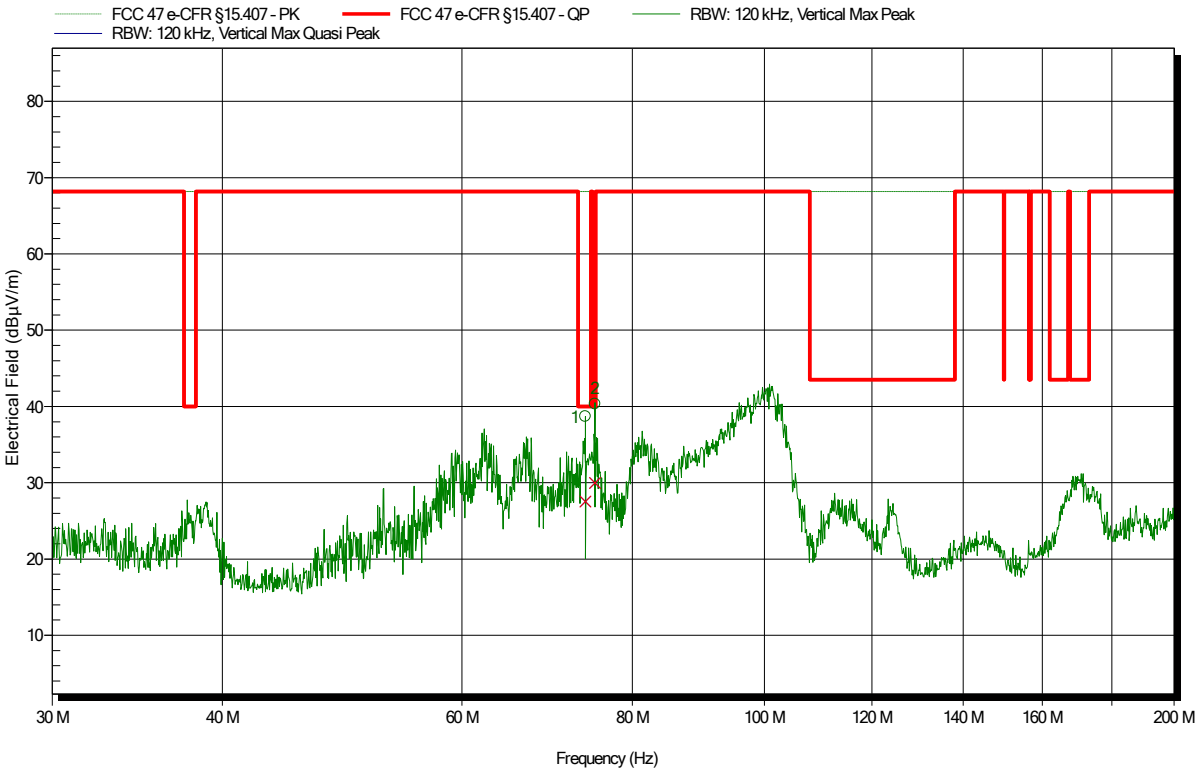

Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Height
73.9057 MHz	38.7 dBµV/m	40 dBµV/m	-1.3 dB	Pass	1.2 m
75.0956 MHz	40.3 dBµV/m	40 dBµV/m	0.32 dB	Fail	1.2 m

Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Height
73.9057 MHz	27.5 dBµV/m	40 dBµV/m	-12.46 dB	Pass	1.2 m
75.0956 MHz	30 dBµV/m	40 dBµV/m	-10.04 dB	Pass	1.2 m

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 23.9°C, Vnom: 24.0 VDC (AC/DC-adapter) and 48.0 VDC PoE
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	TX; CH157 – Test Sample ID 29090
Test Date:	2020-04-28
Note:	

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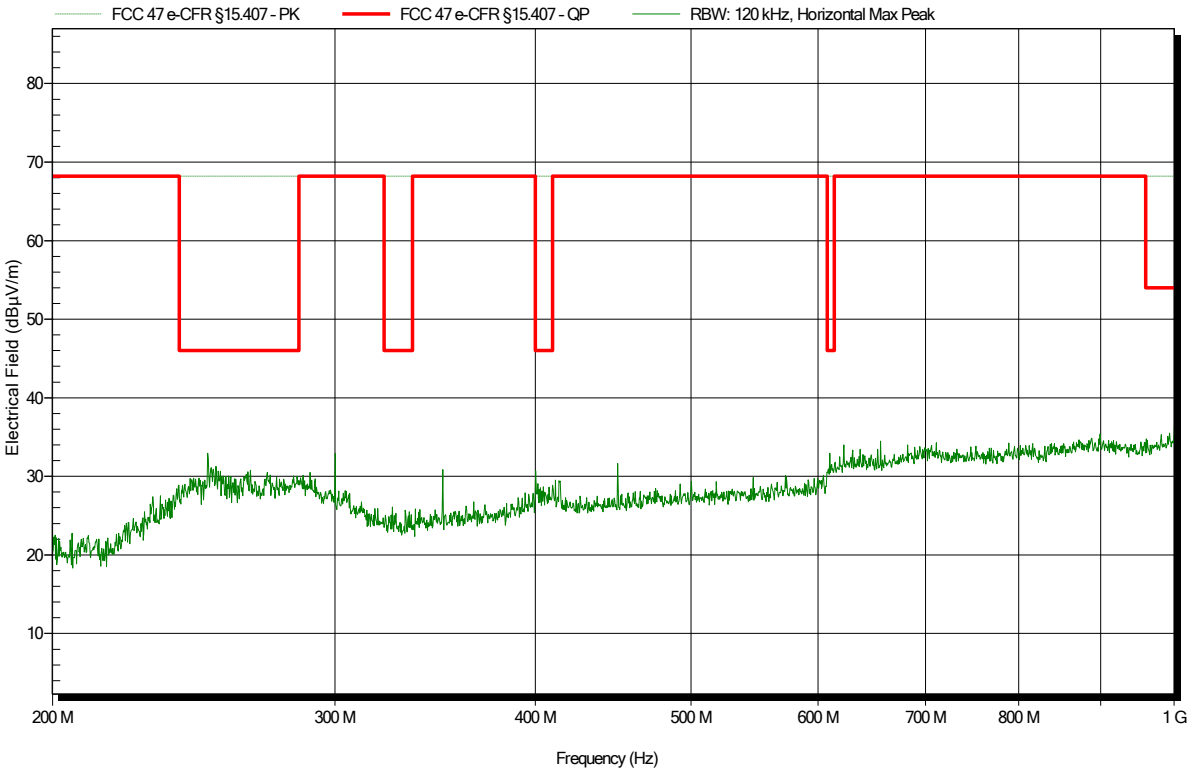

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 23.9°C, Vnom: 24.0 VDC (AC/DC-adapter) and 48.0 VDC PoE
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	TX; CH157 – Test Sample ID 29090
Test Date:	2020-04-28
Note:	

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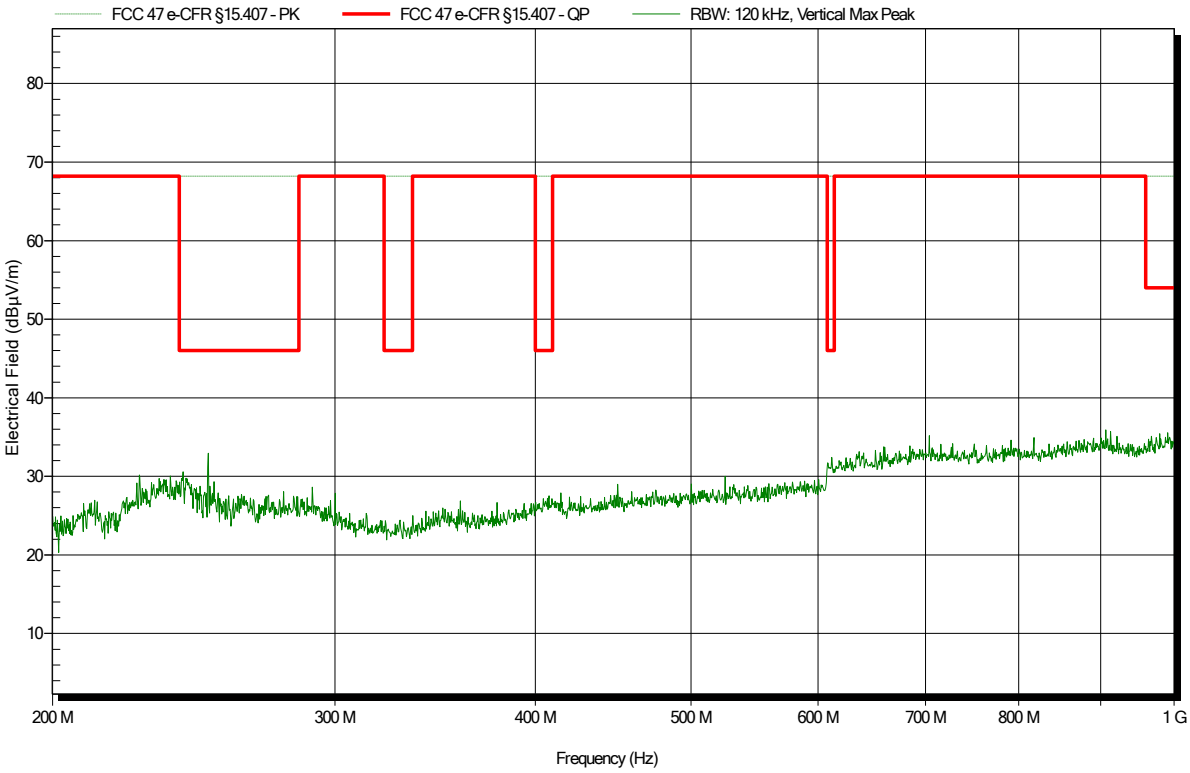

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 23.9°C, Vnom: 24.0 VDC (AC/DC-adapter) and 48.0 VDC PoE
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	TX; CH165 – Test Sample ID 29090
Test Date:	2020-04-28
Note:	

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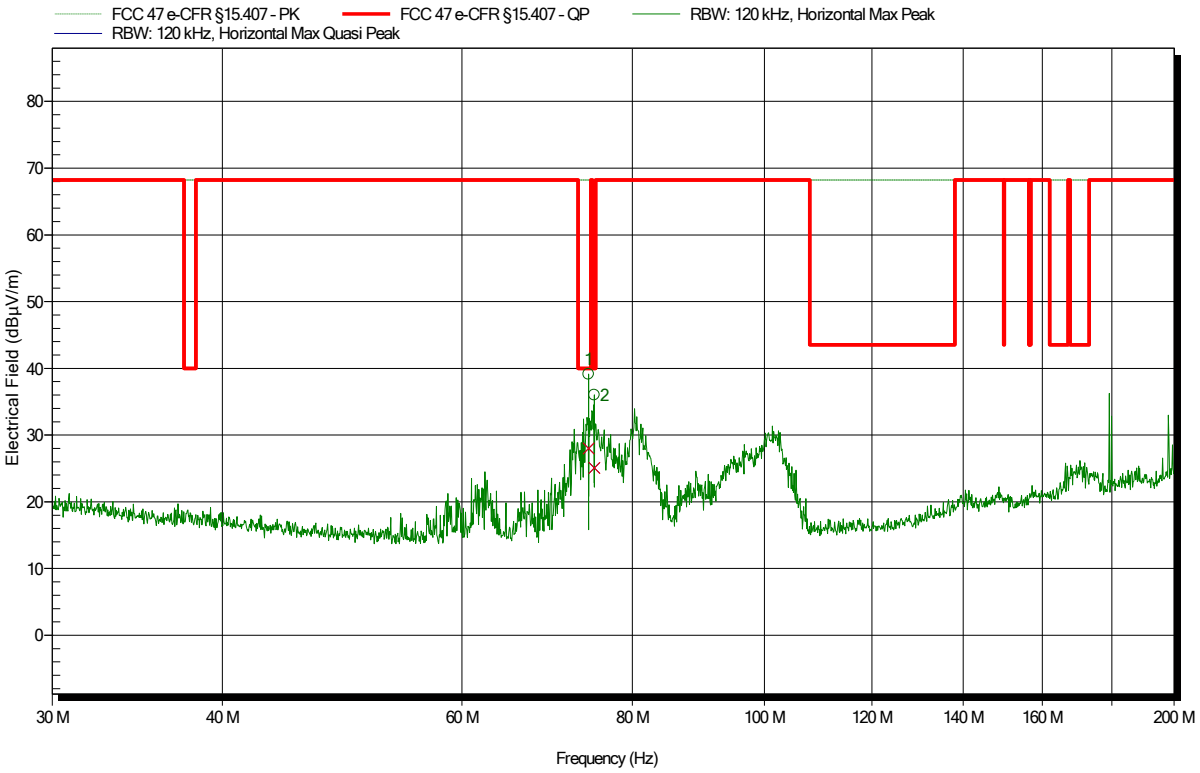

Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Height
74.3009 MHz	39.1 dBµV/m	40 dBµV/m	-0.9 dB	Pass	2.8 m
75.0446 MHz	36 dBµV/m	40 dBµV/m	-4.02 dB	Pass	3.8 m

Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Height
74.3009 MHz	28 dBµV/m	40 dBµV/m	-11.99 dB	Pass	2.8 m
75.0446 MHz	25.1 dBµV/m	40 dBµV/m	-14.91 dB	Pass	3.8 m

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 23.9°C, Vnom: 24.0 VDC (AC/DC-adapter) and 48.0 VDC PoE
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	TX; CH165 – Test Sample ID 29090
Test Date:	2020-04-28
Note:	

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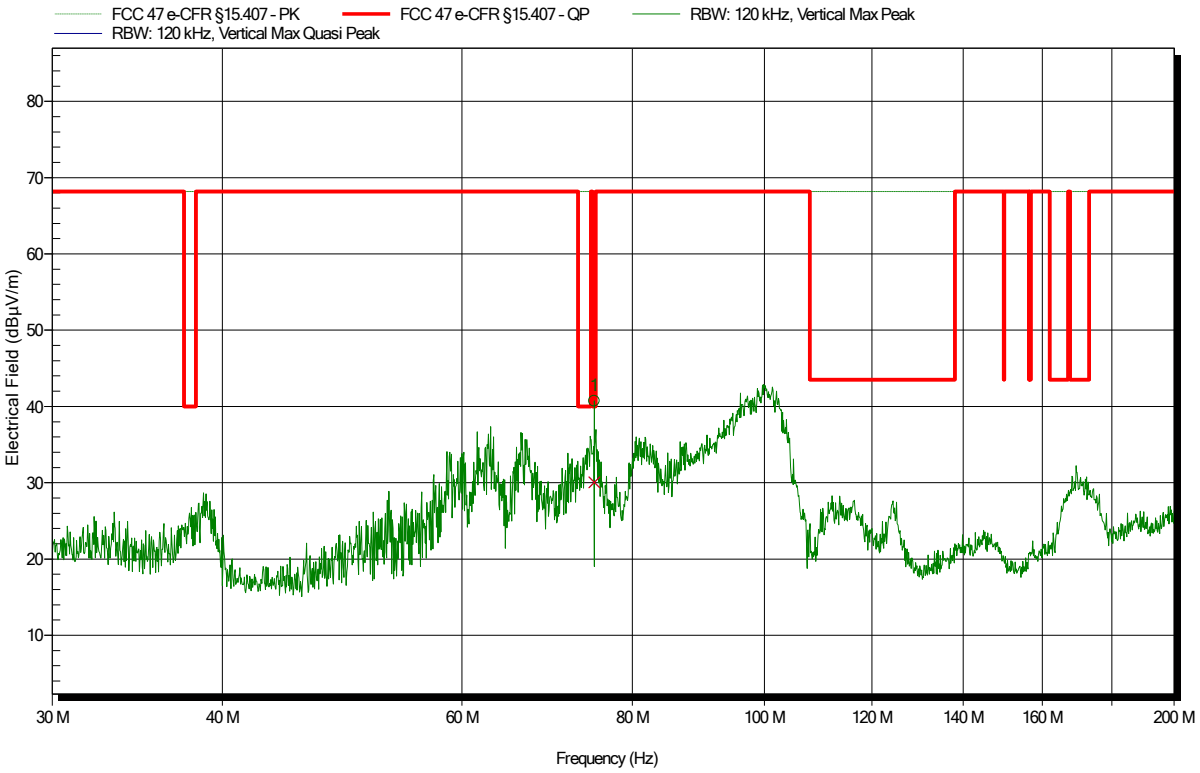

Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Height
75.0489 MHz	40.7 dBµV/m	40 dBµV/m	0.69 dB	Fail	1 m

Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Height
75.0489 MHz	30 dBµV/m	40 dBµV/m	-9.97 dB	Pass	1 m

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 23.9°C, Vnom: 24.0 VDC (AC/DC-adapter) and 48.0 VDC PoE
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	TX; CH165 – Test Sample ID 29090
Test Date:	2020-04-28
Note:	

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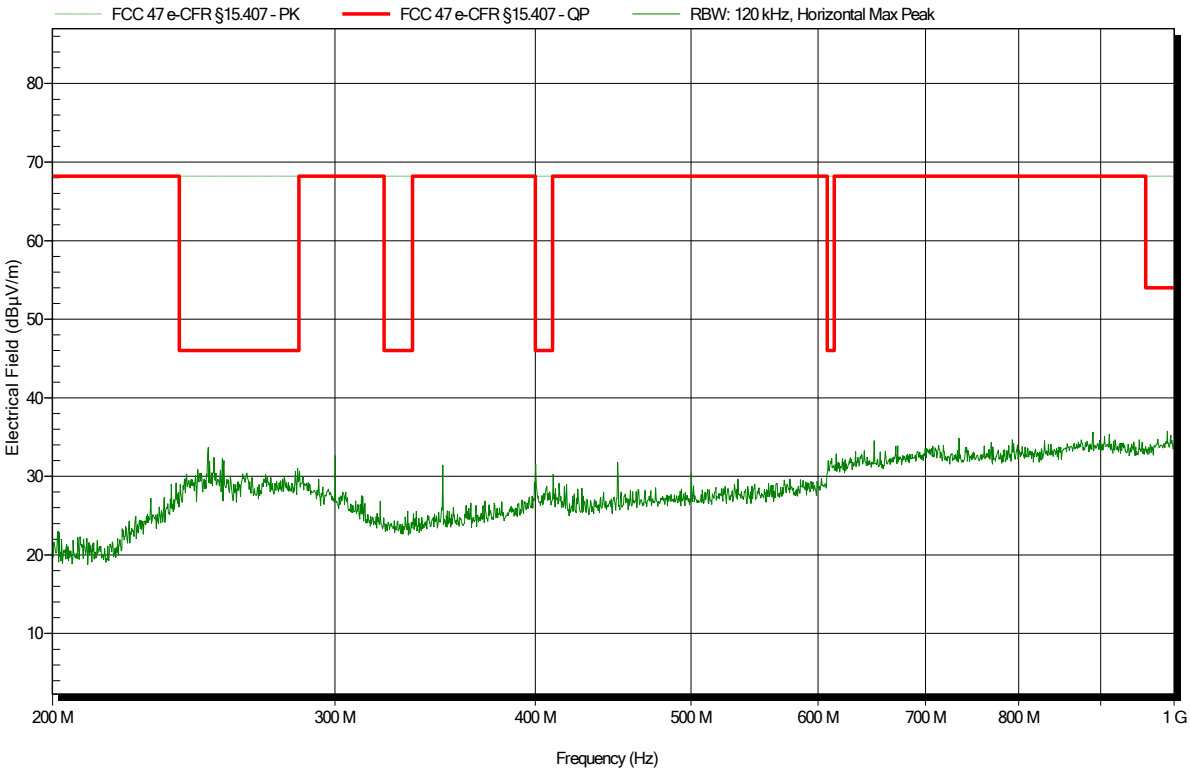

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Measurement software:	RadiMation, version 2016.1.10
Test Conditions:	Tnom: 23.9°C, Vnom: 24.0 VDC (AC/DC-adapter) and 48.0 VDC PoE
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	TX; CH165 – Test Sample ID 29090
Test Date:	2020-04-28
Note:	

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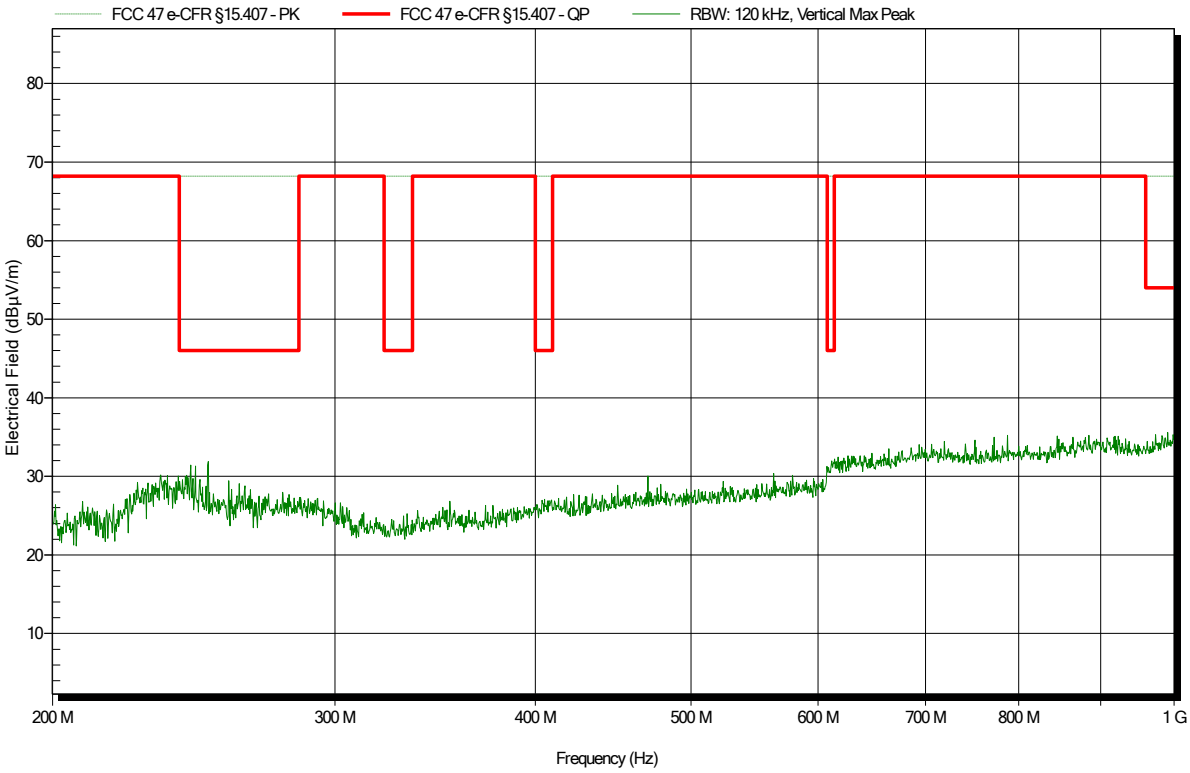

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 24.8°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	3 m
Mode:	TX; CH36 – EUT horizontal (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-11
Note:	lower band area

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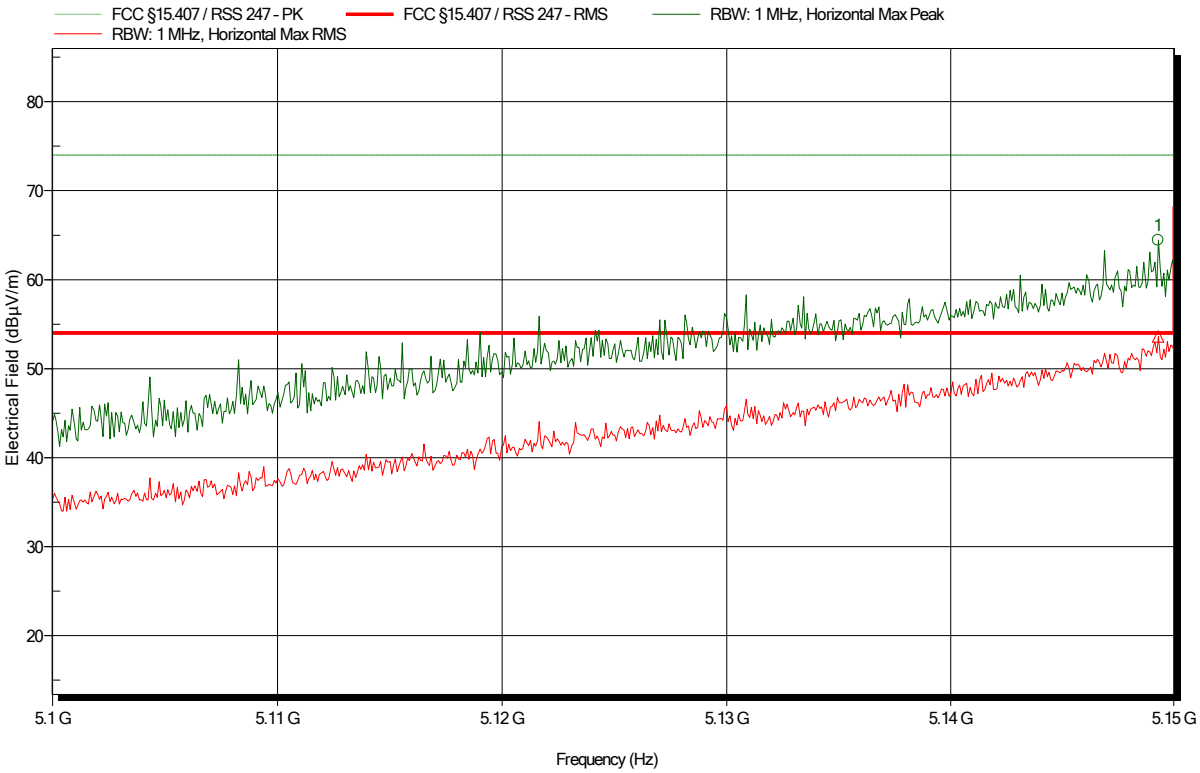

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
5.149 GHz	64.44 dBµV/m	54 dBµV/m	10.44 dB	Fail

Frequency	RMS	RMS Limit	RMS Difference	RMS Status
5.149 GHz	53.63 dBµV/m	54 dBµV/m	-0.37 dB	Pass

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 24.8°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	3 m
Mode:	TX; CH36 – EUT horizontal (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-11
Note:	lower band area

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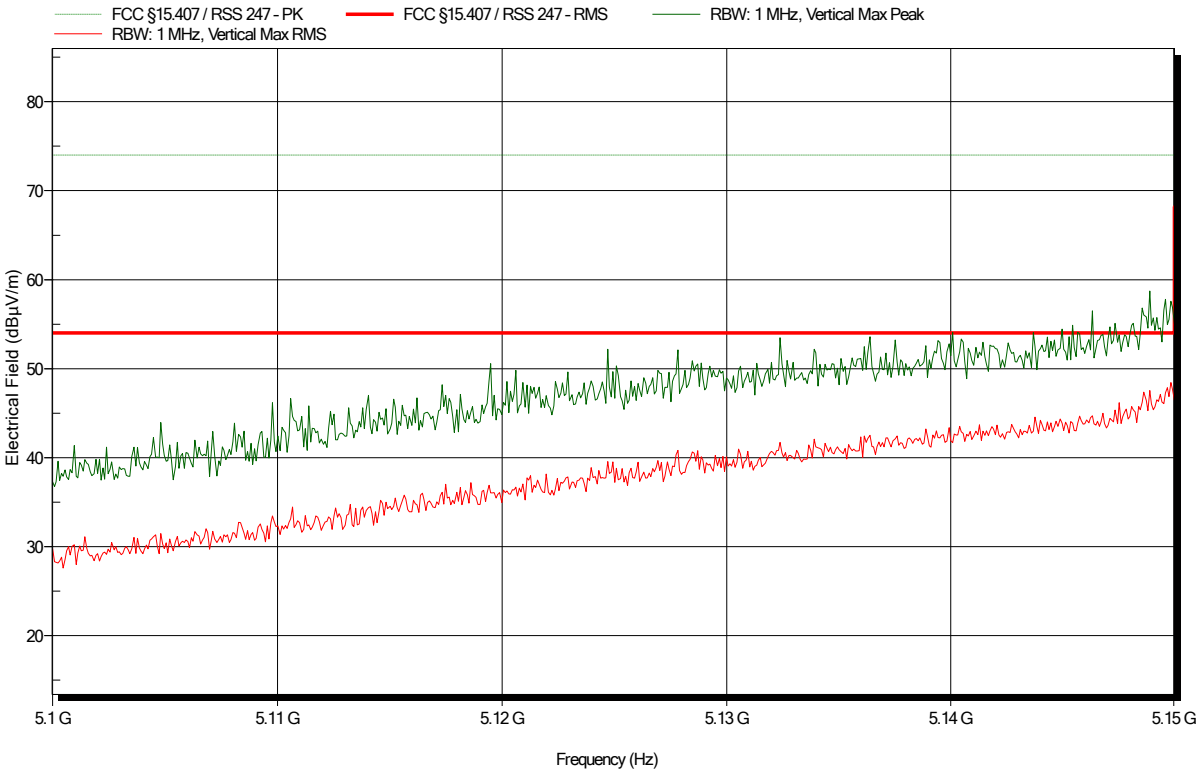

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 24.8°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; CH36 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-11
Note:	

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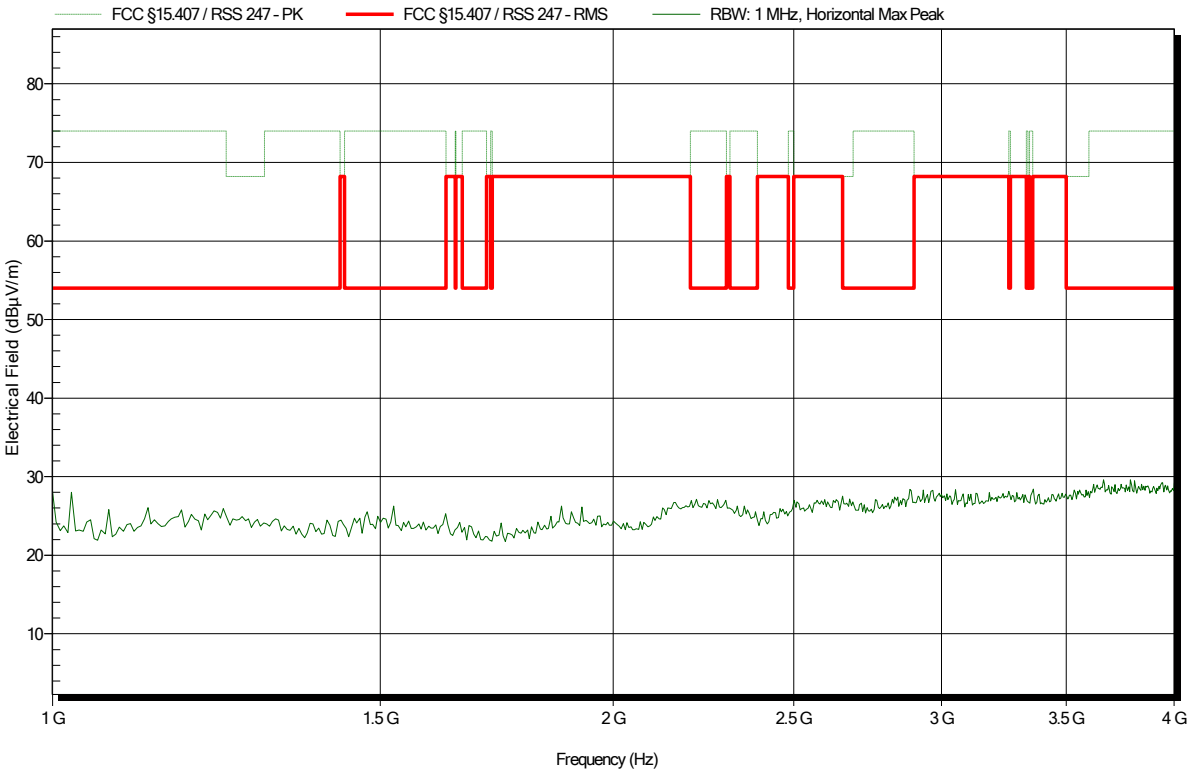

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 24.8°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH36 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-11
Note:	

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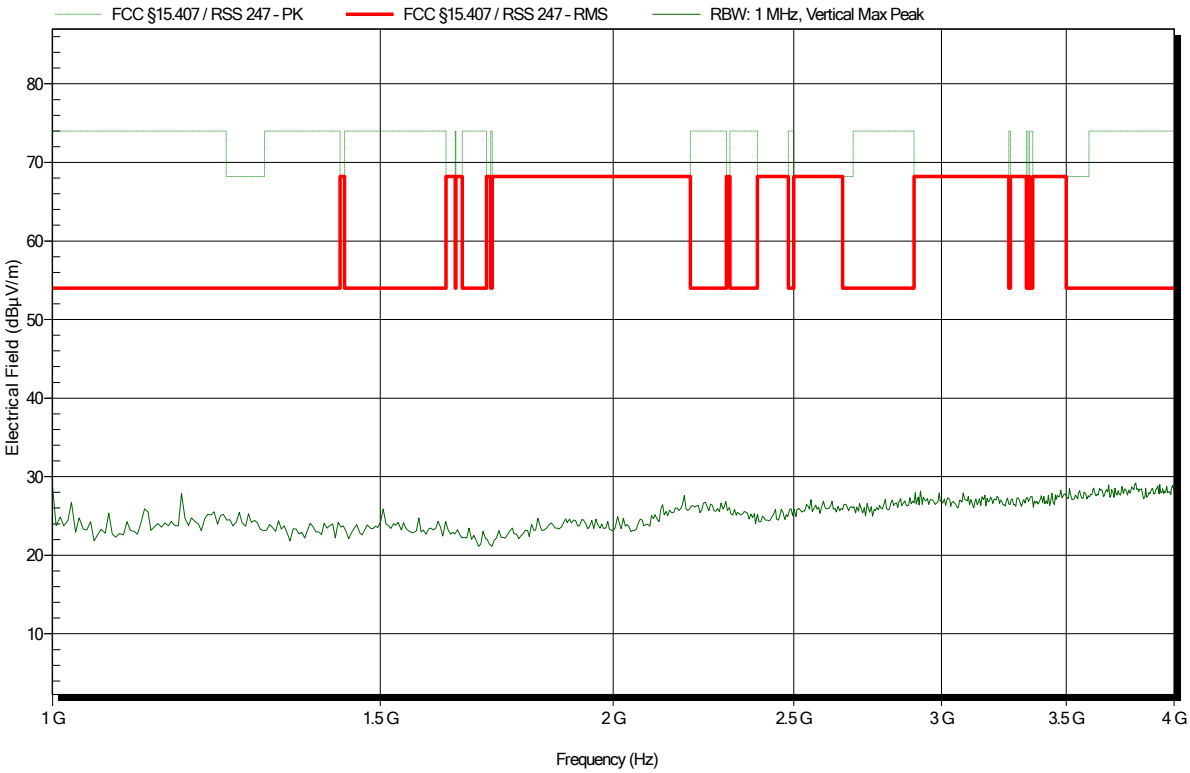

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 24.8°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; CH36 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-11
Note:	

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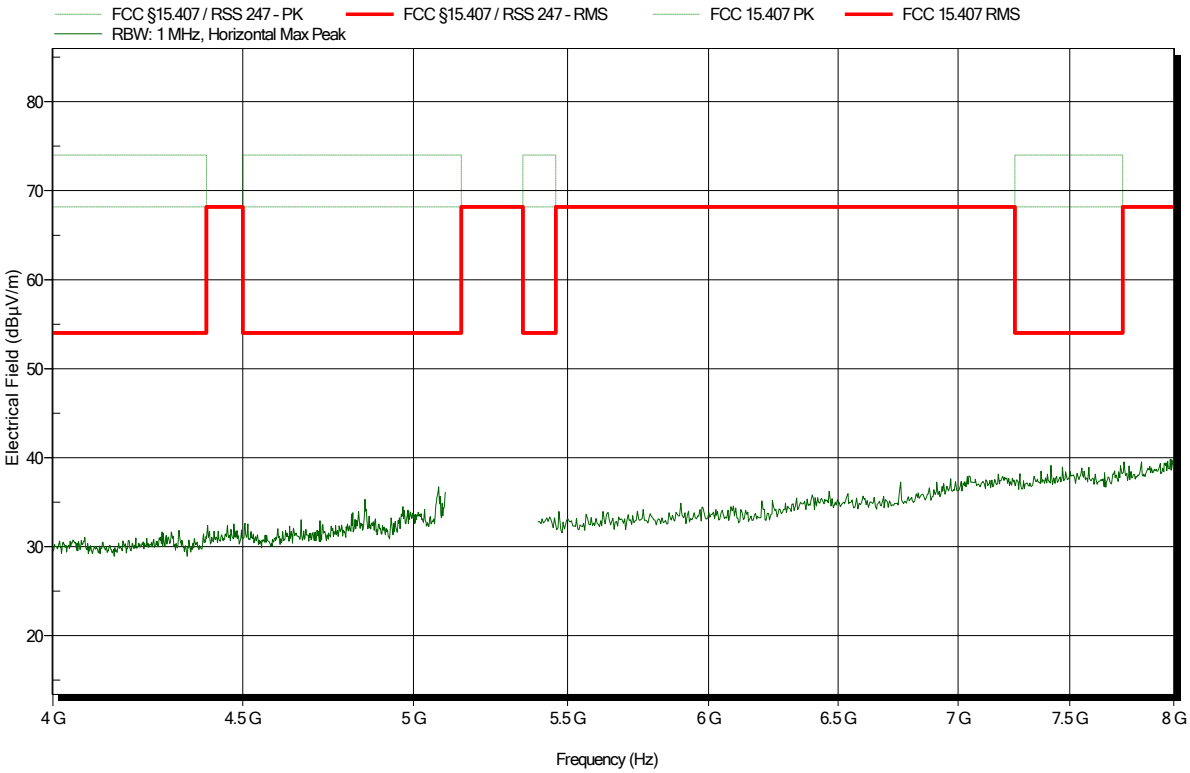

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 24.8°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH36 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-11
Note:	

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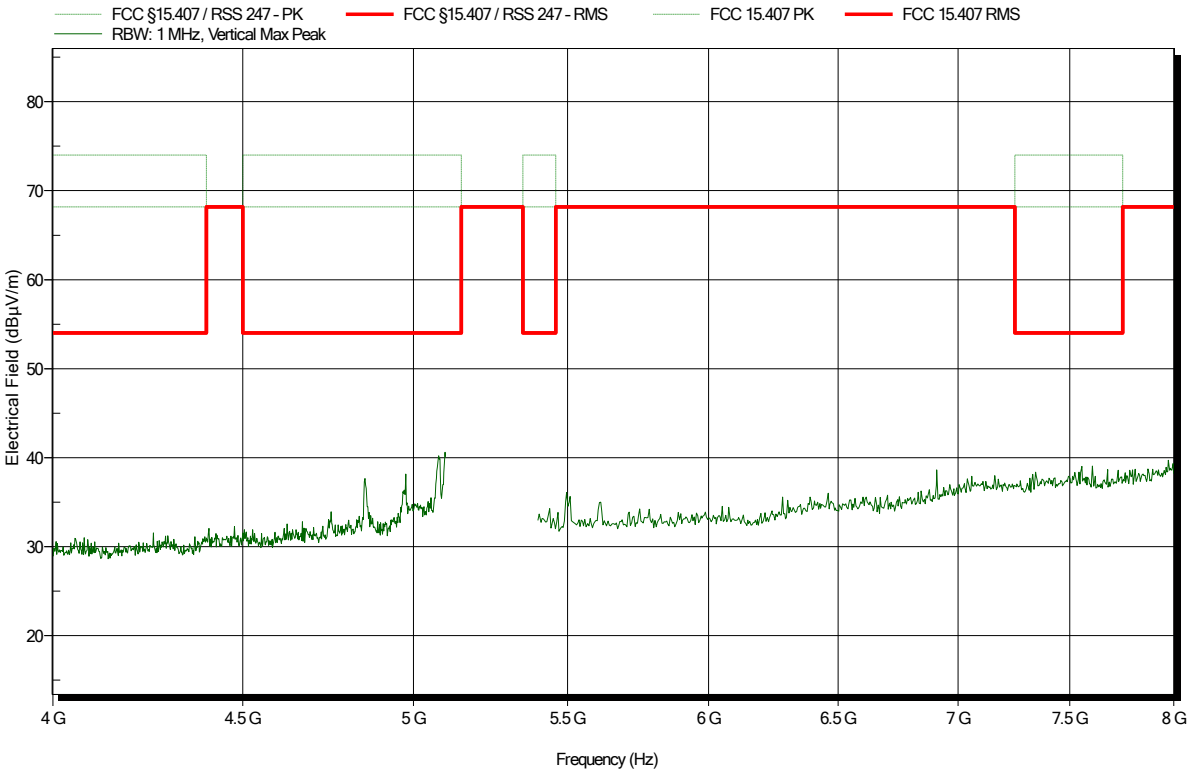

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 24.8°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; CH36 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-11
Note:	

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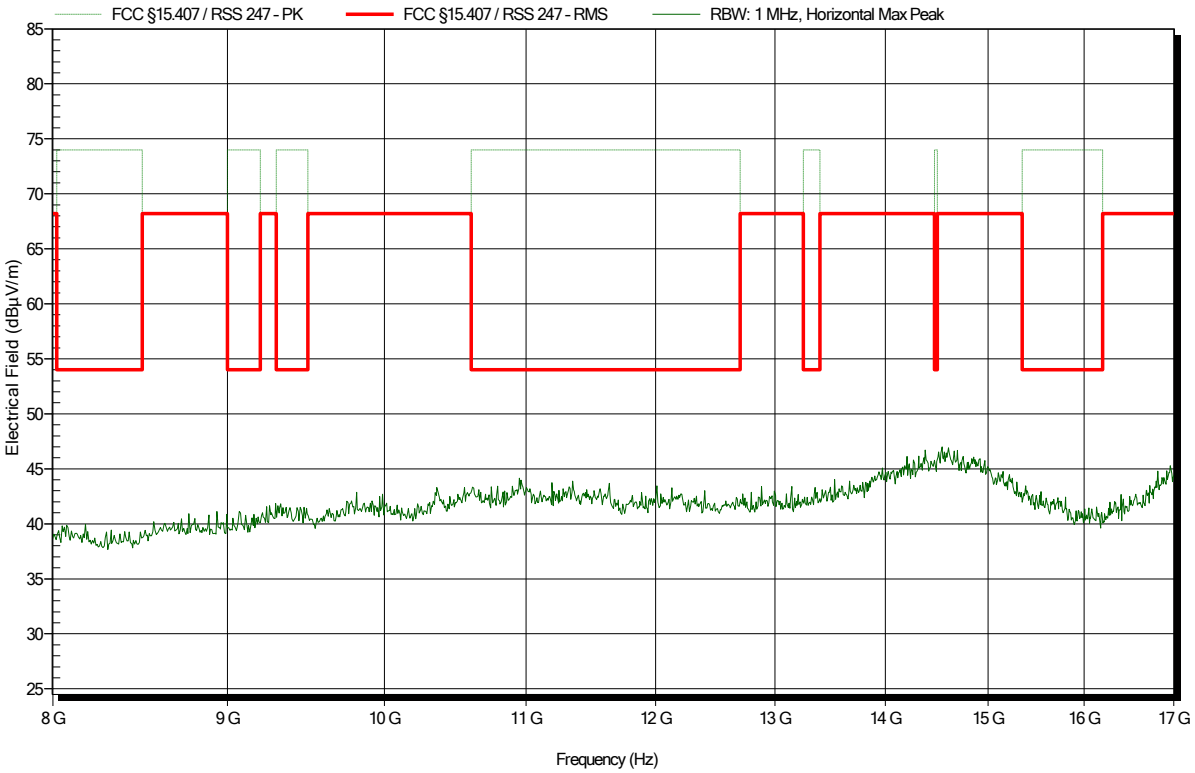

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 24.8°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH36 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-11
Note:	

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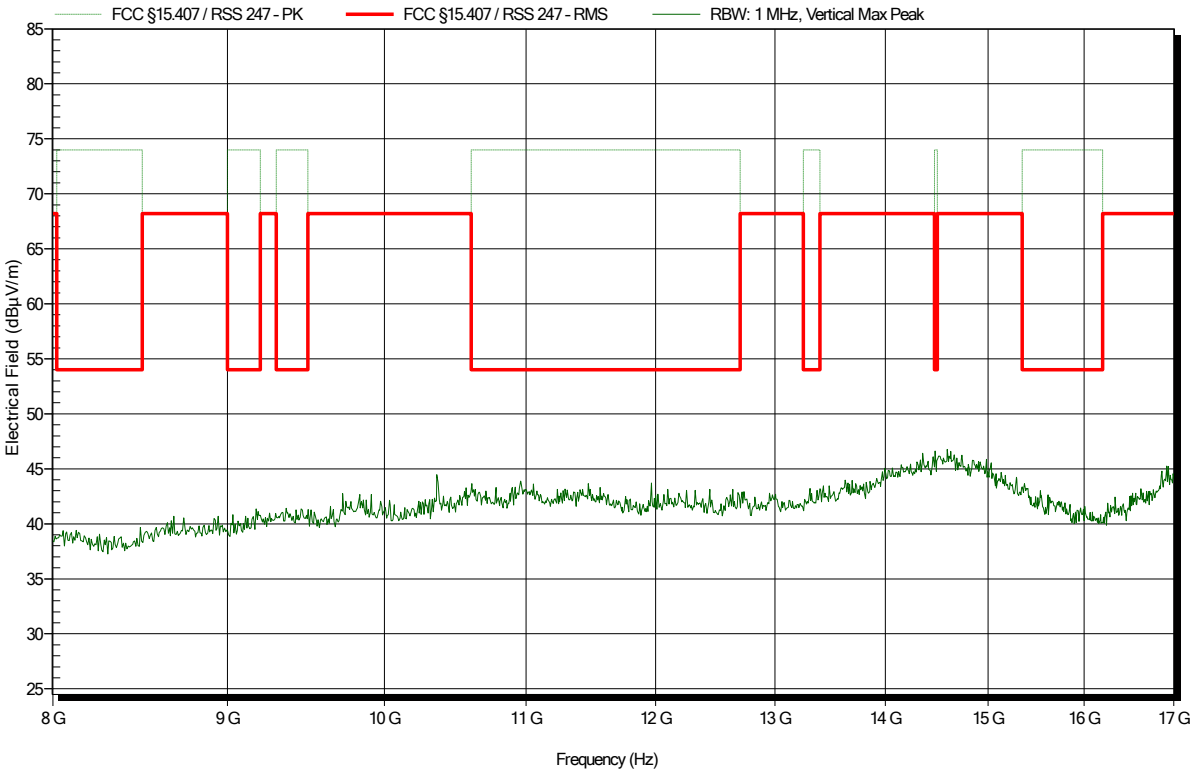

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 24.8°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; CH40 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-11
Note:	

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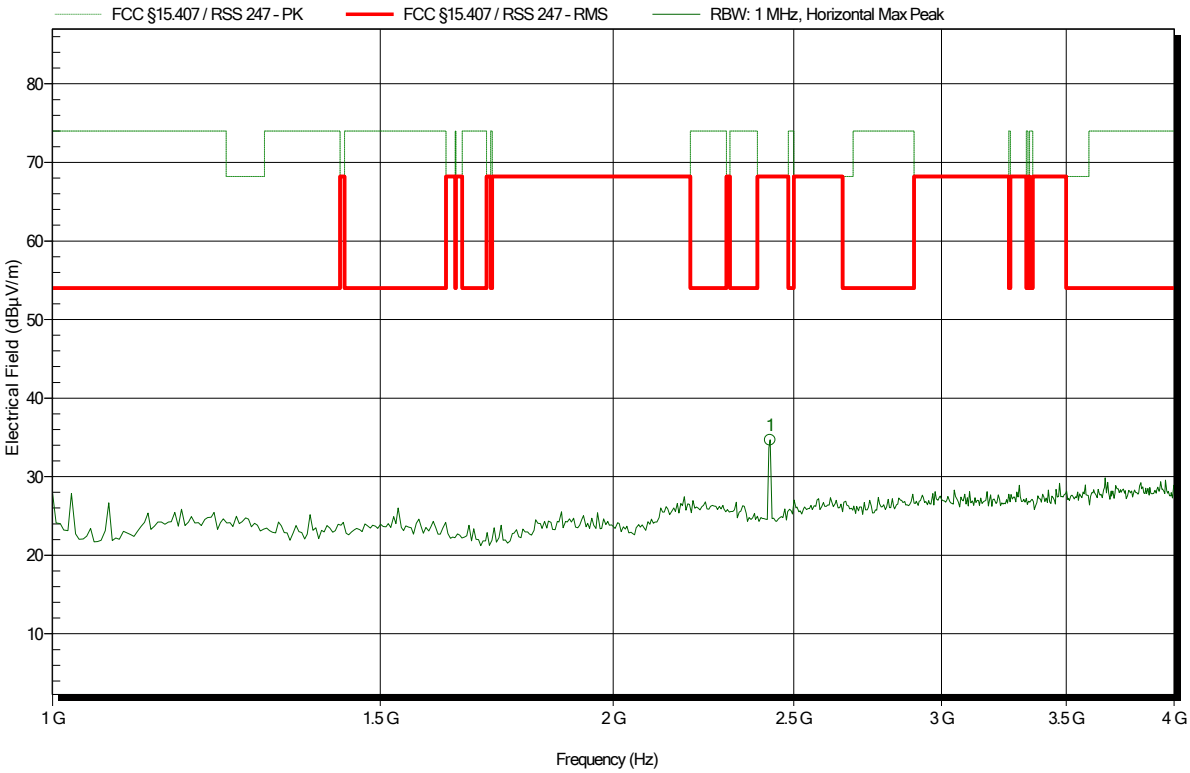

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.428 GHz	34.67 dBµV/m	68.2 dBµV/m	-33.53 dB	Pass

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 24.8°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH40 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-11
Note:	

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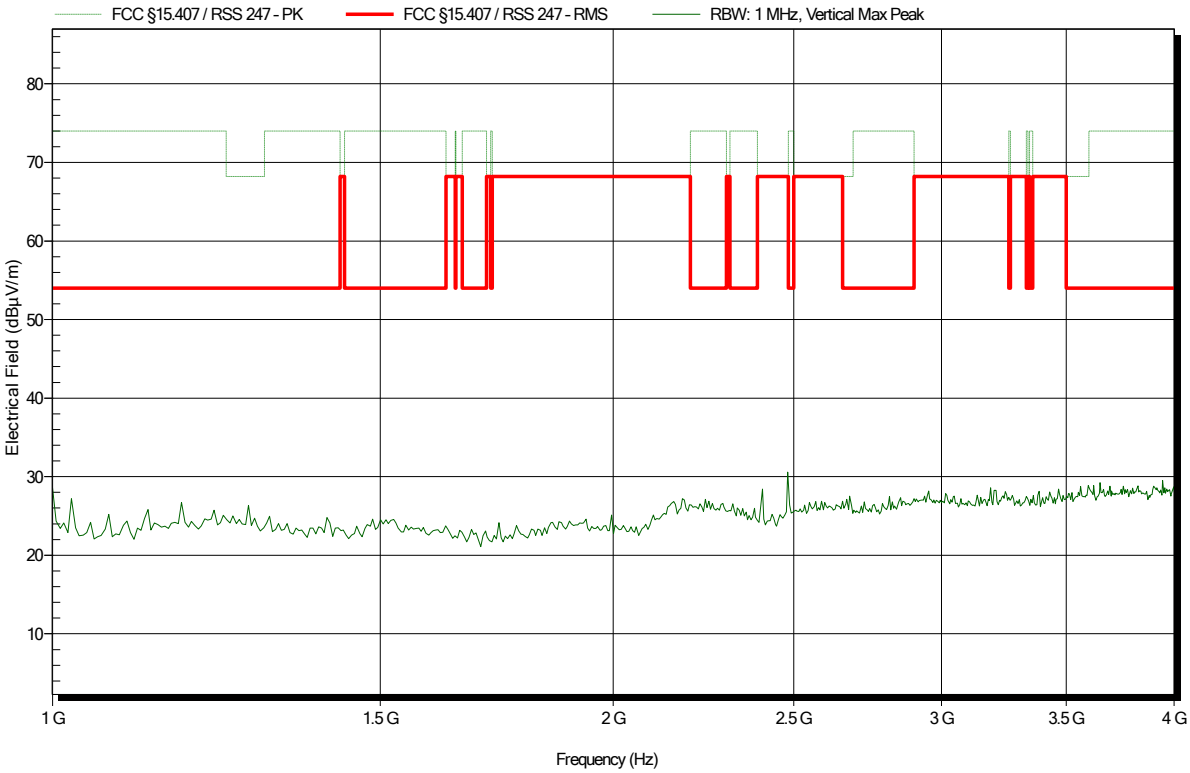

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 24.8°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; CH40 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-11
Note:	

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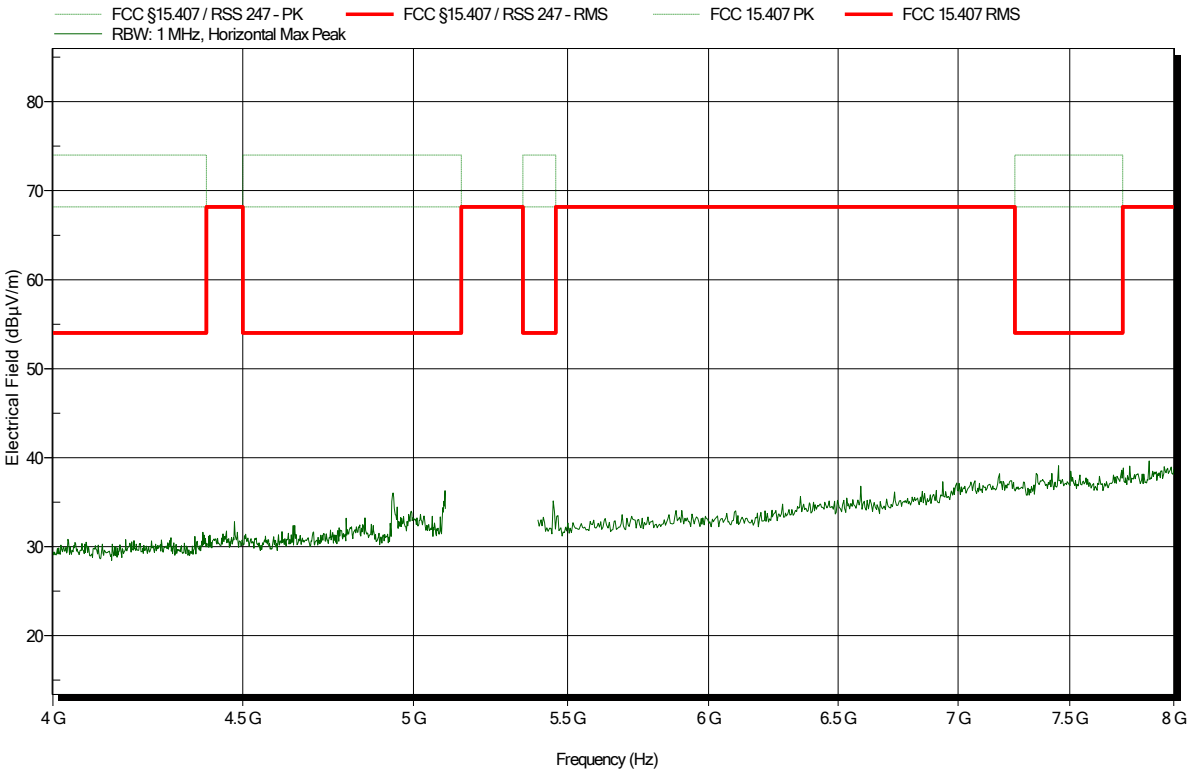

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 24.8°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH40 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-11
Note:	

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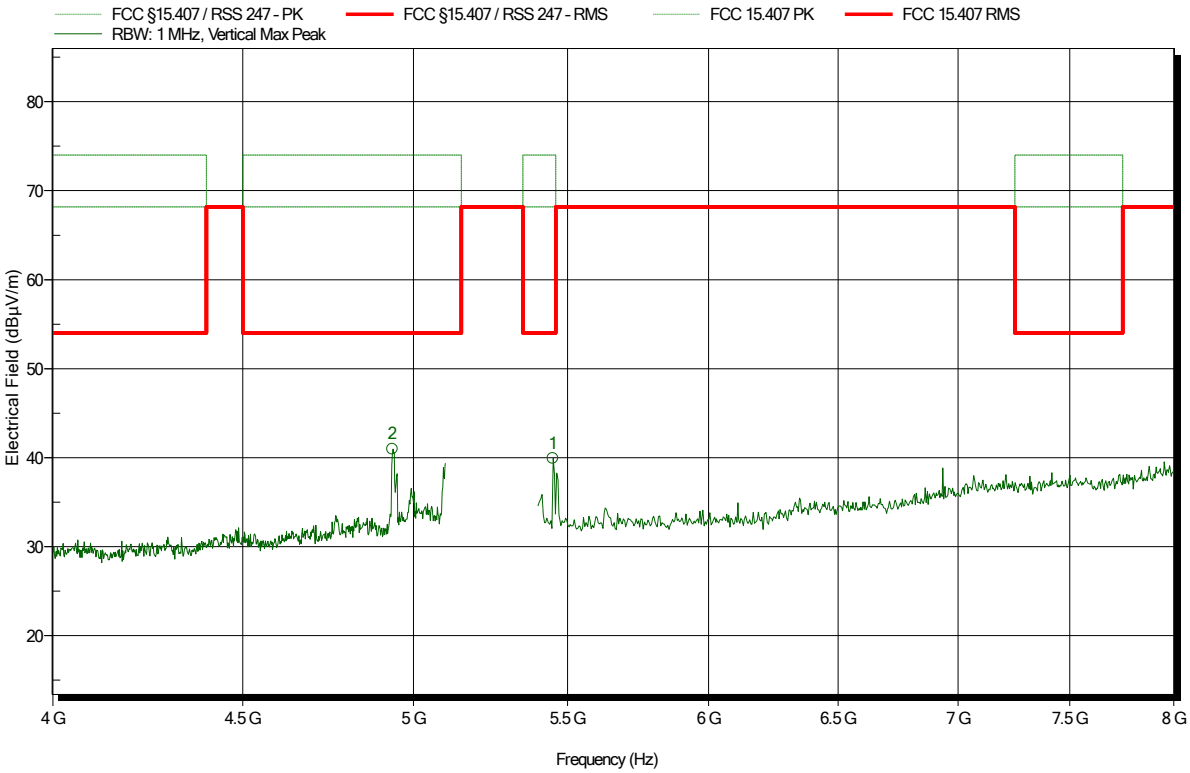

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
4.936 GHz	40.97 dBµV/m	54 dBµV/m	-13.03 dB	Pass
5.45 GHz	39.93 dBµV/m	54 dBµV/m	-14.07 dB	Pass

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 24.8°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; CH40 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-11
Note:	

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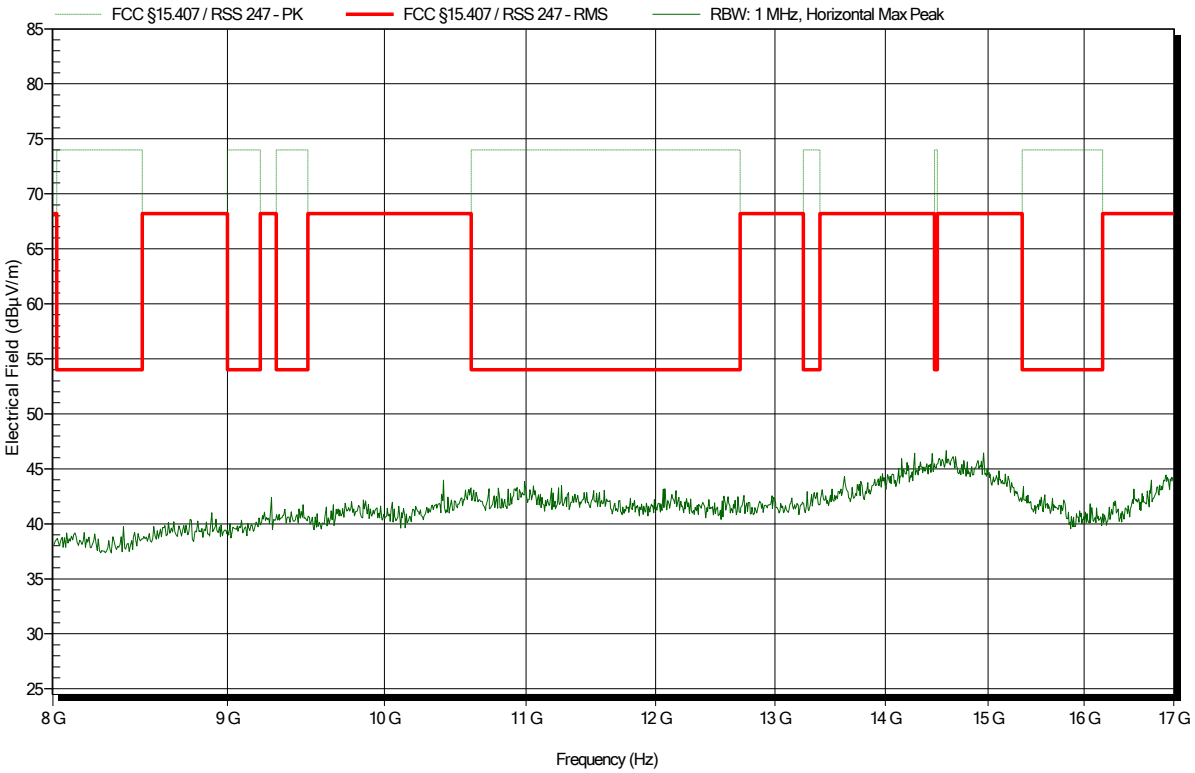

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 24.8°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH40 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-11
Note:	

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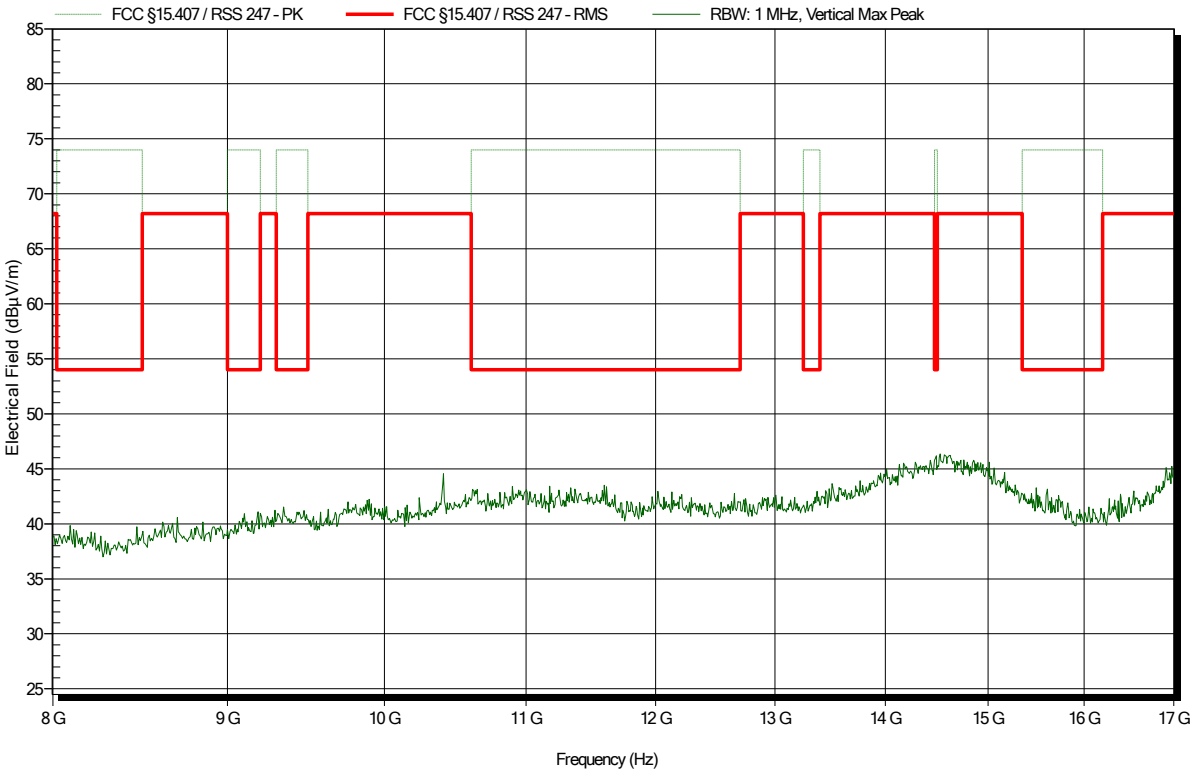

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 24.8°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; CH48 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-11
Note:	

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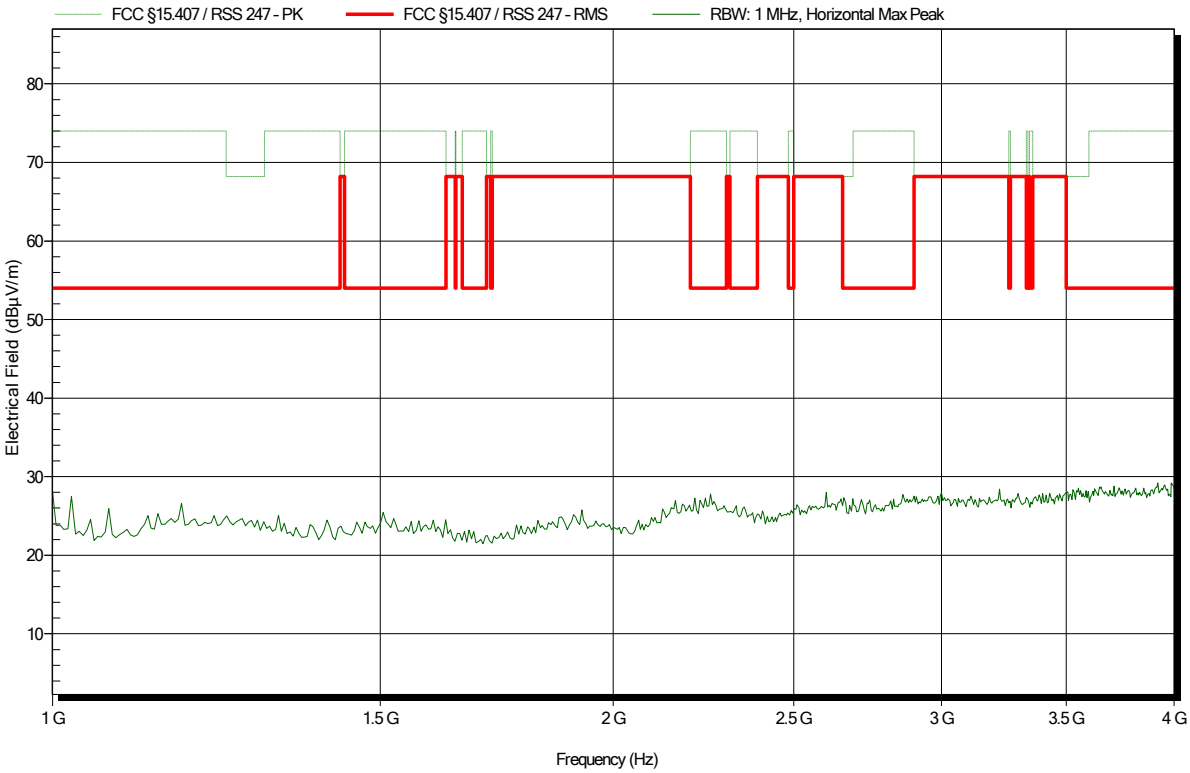

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 24.8°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH48 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-11
Note:	

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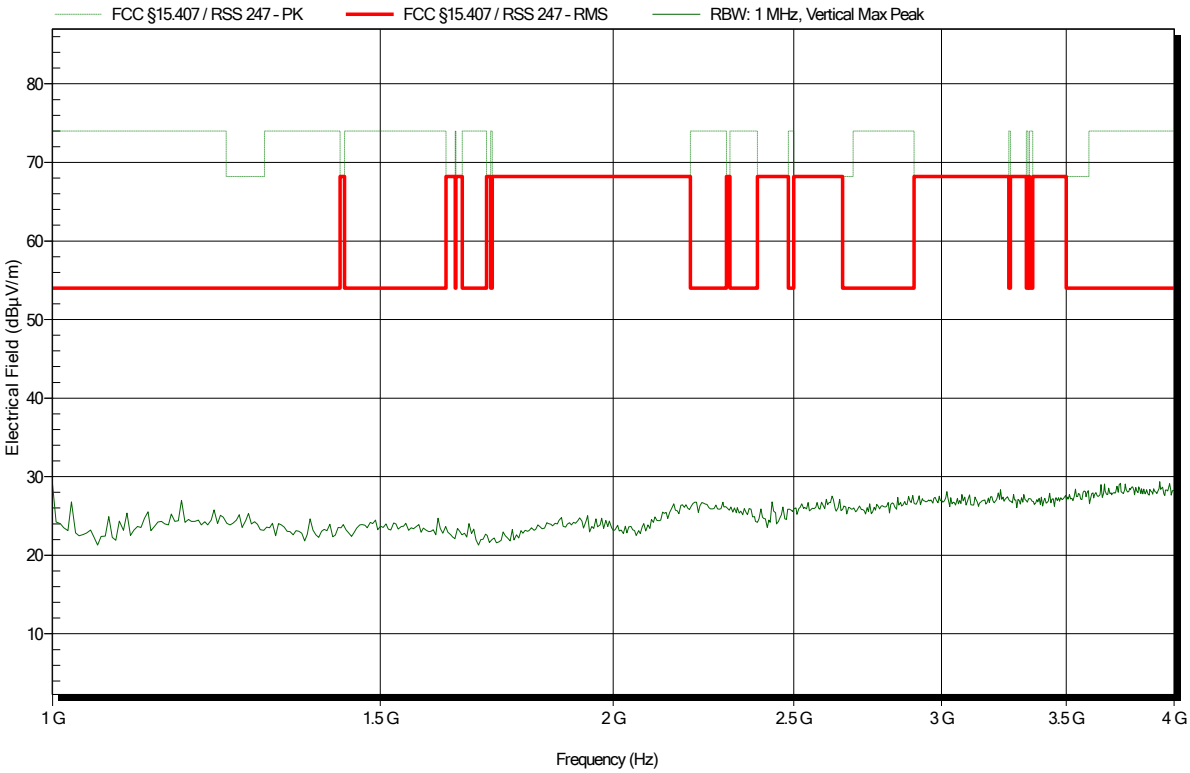

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 24.8°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; CH48 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-11
Note:	

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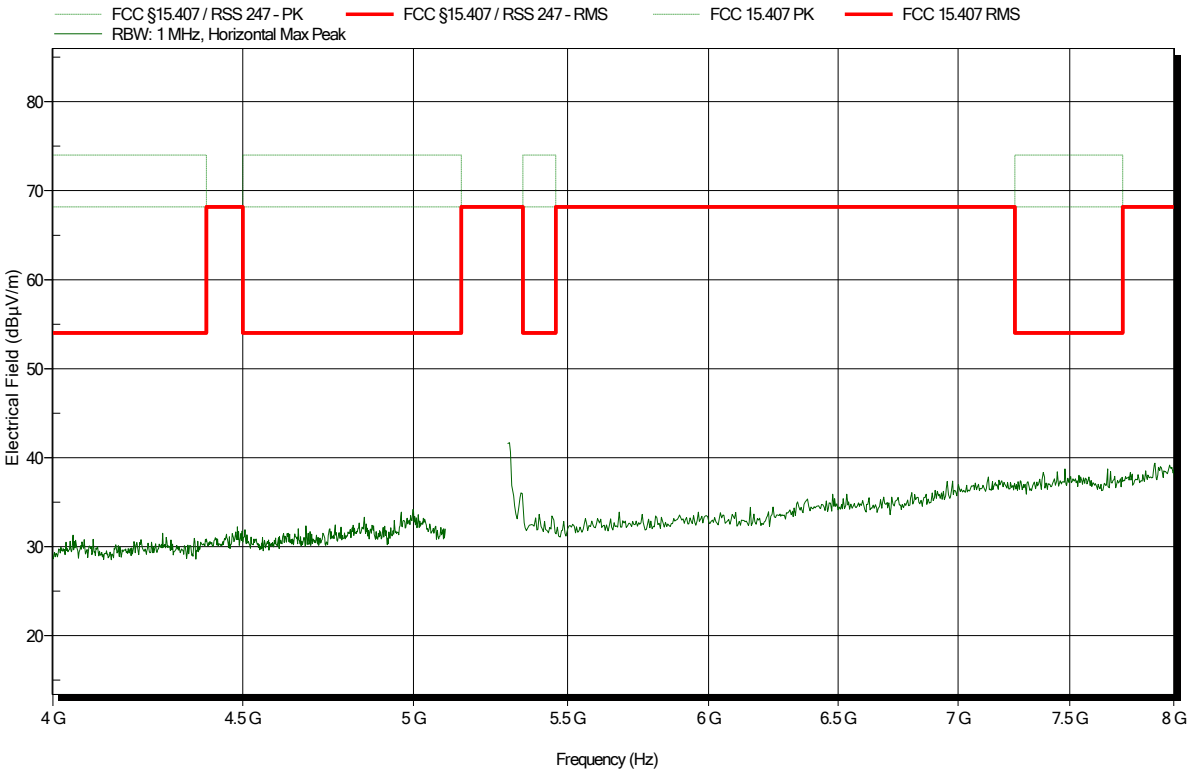

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 24.8°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH48 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-11
Note:	

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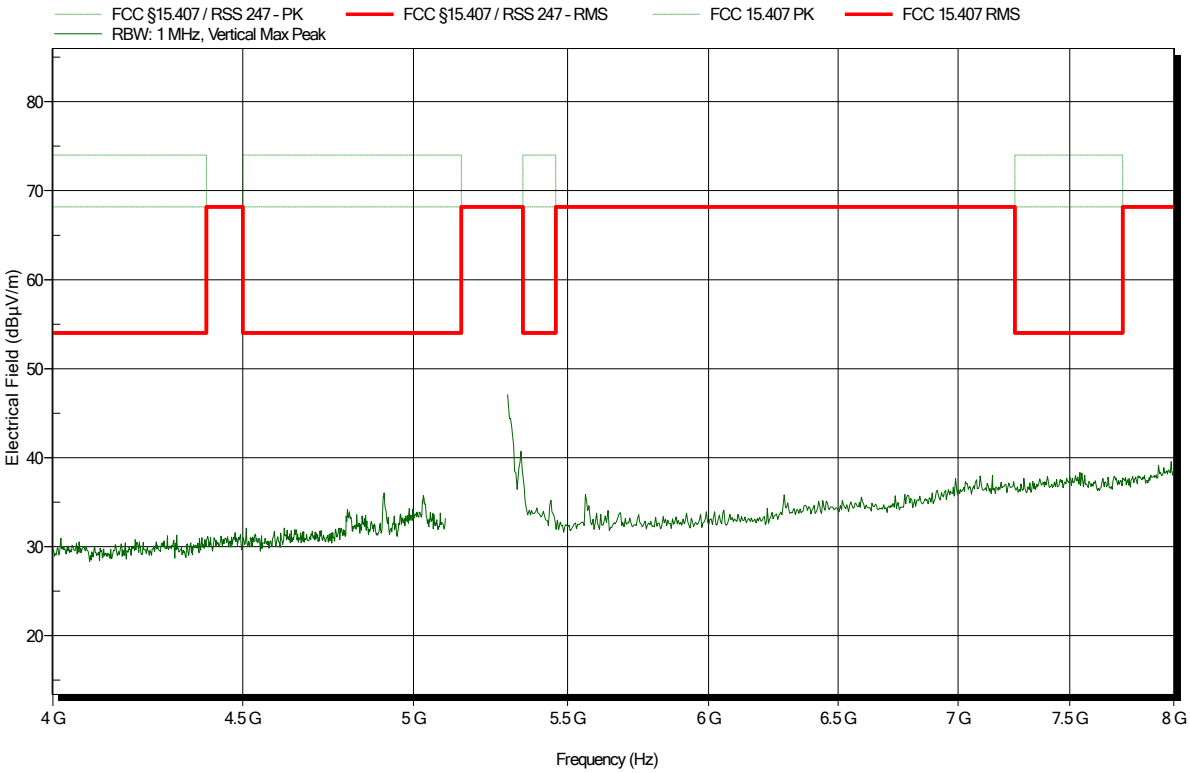

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 24.8°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; CH48 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-11
Note:	

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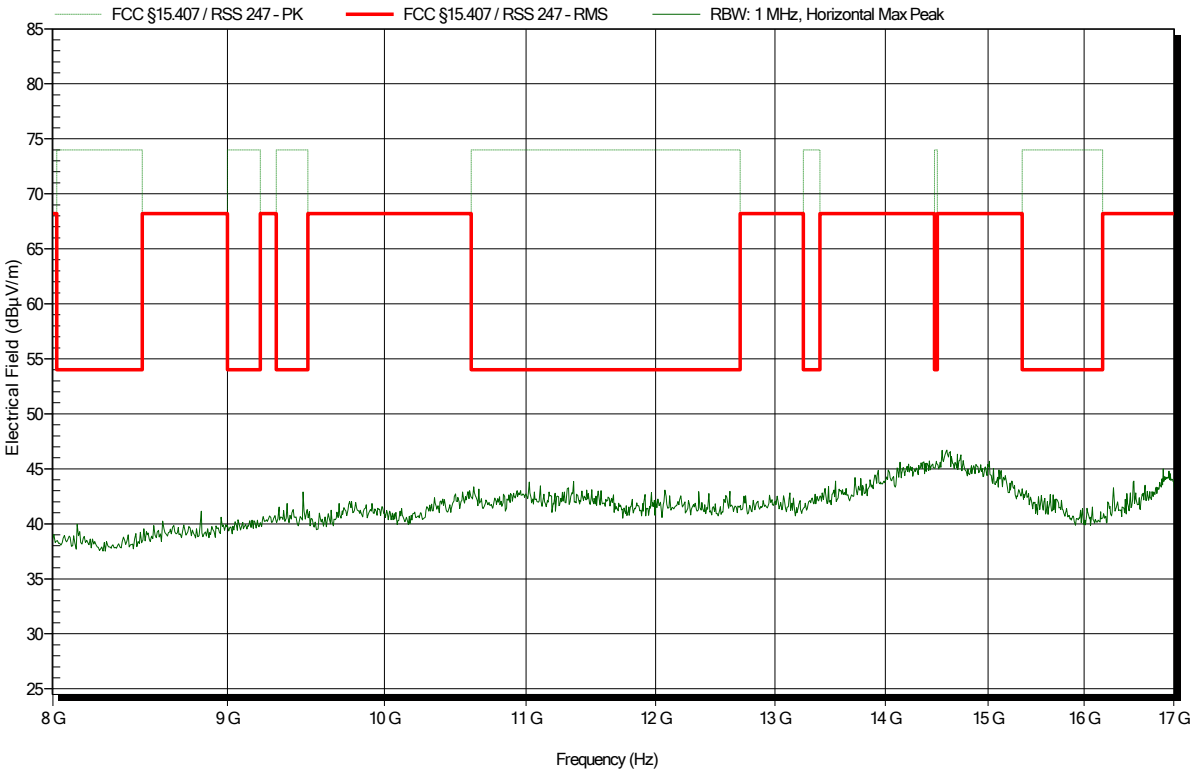

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 24.8°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH48 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-11
Note:	

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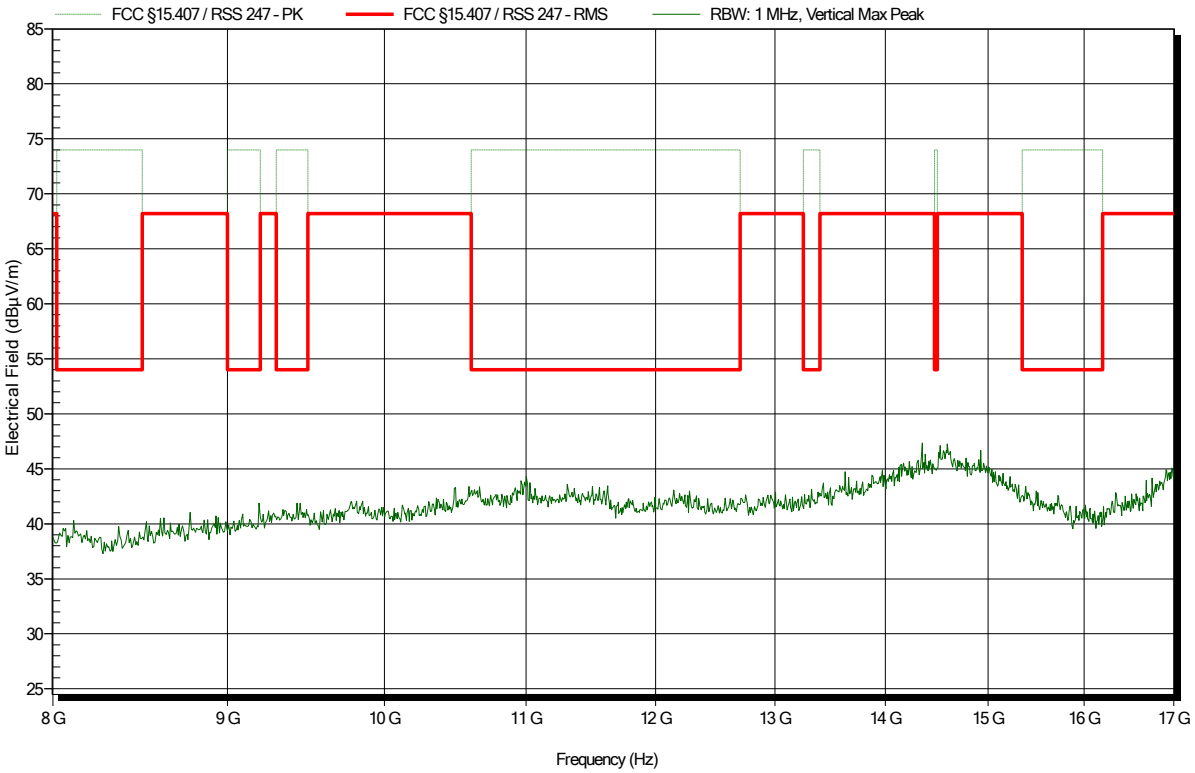

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH149 – EUT horizontal (antenna 0°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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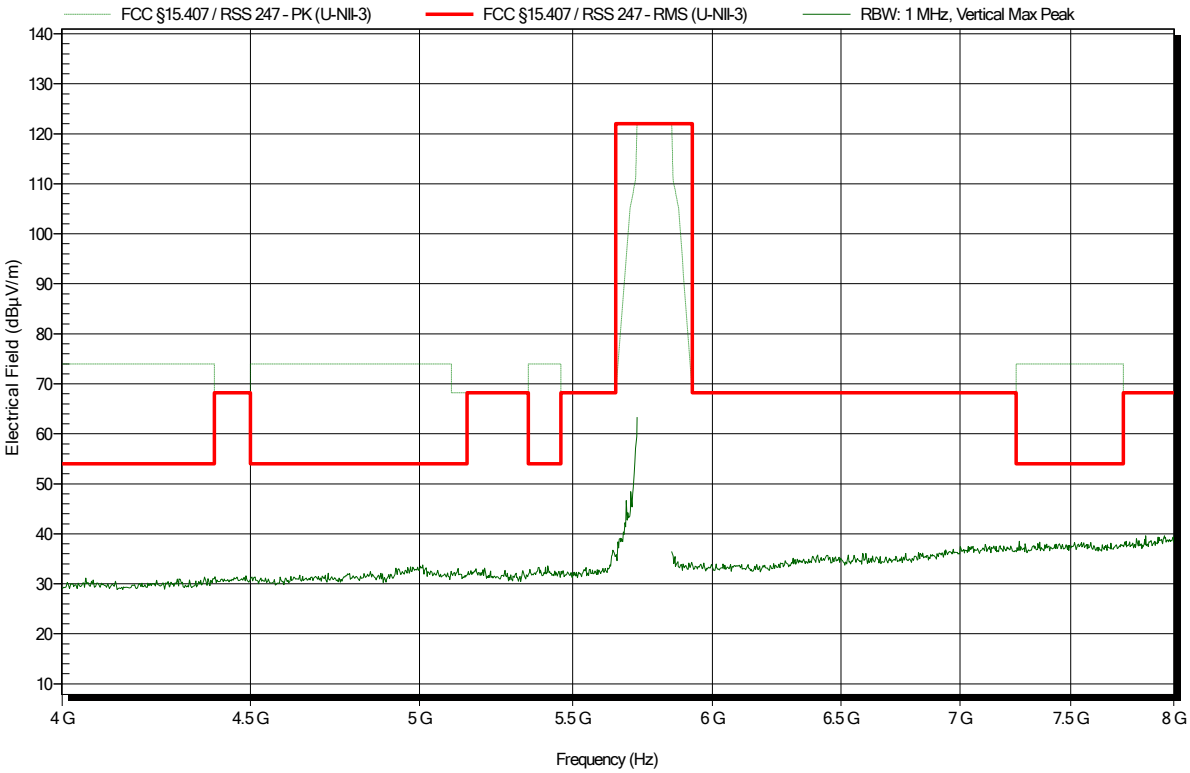

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; CH149 – EUT horizontal (antenna 0°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	lower band area

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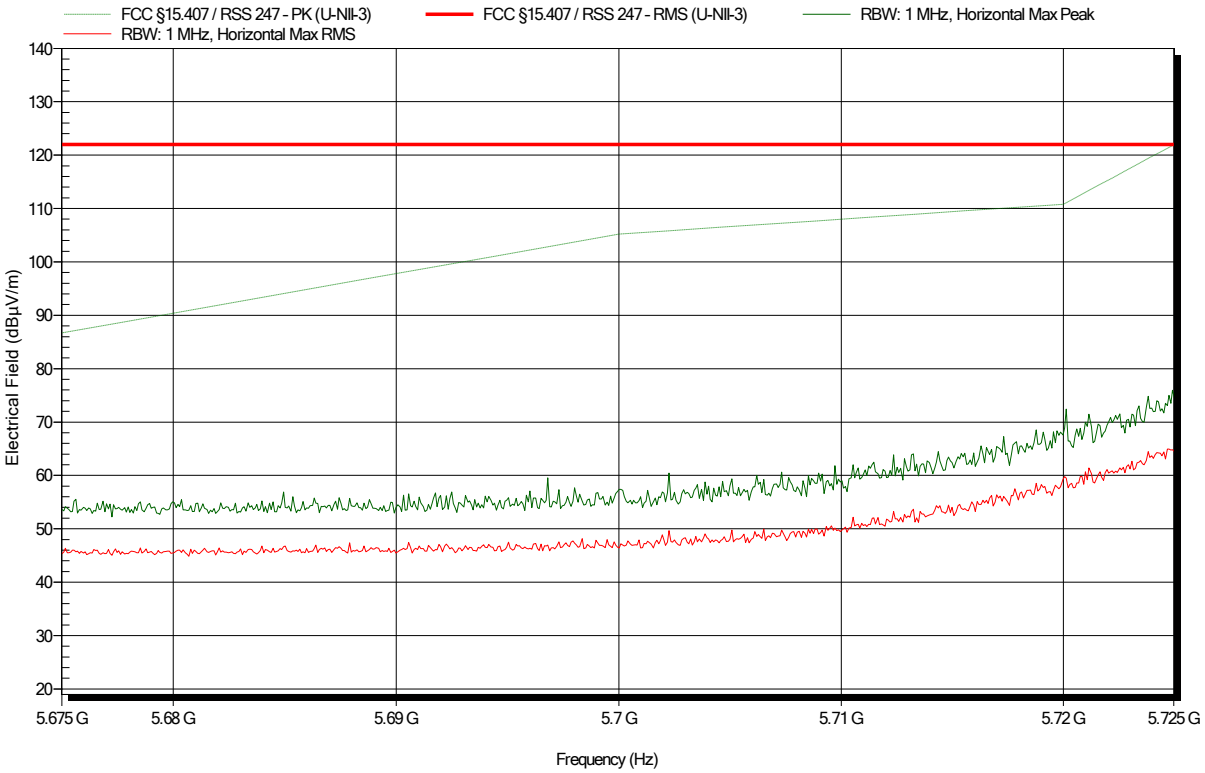

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH149 – EUT horizontal (antenna 0°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	lower band area

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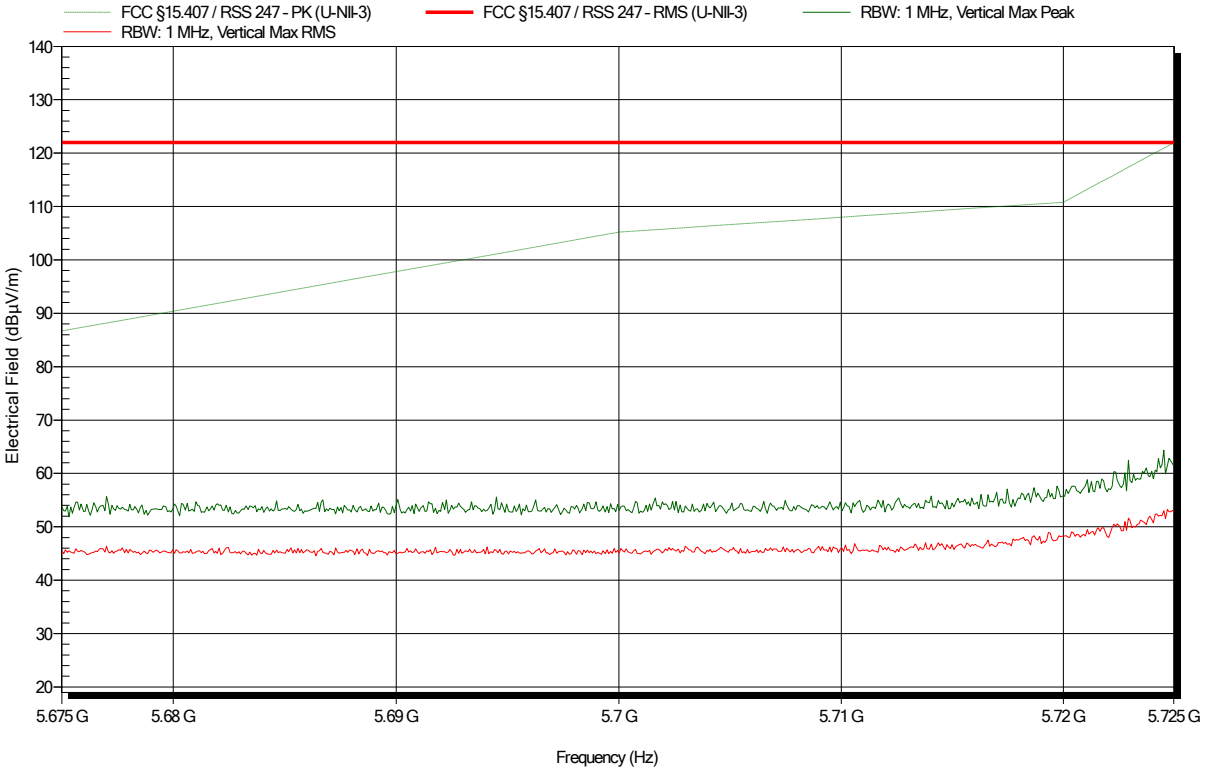

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; CH149 – EUT horizontal (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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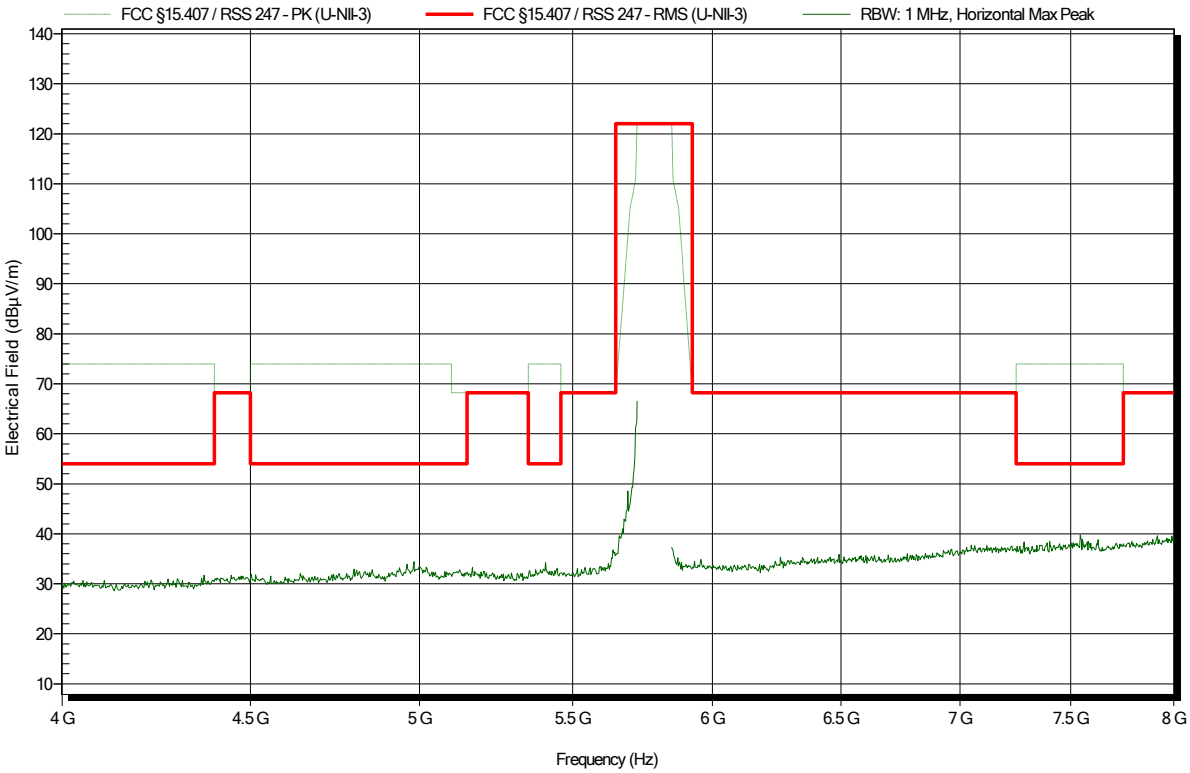

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; CH149 – EUT horizontal (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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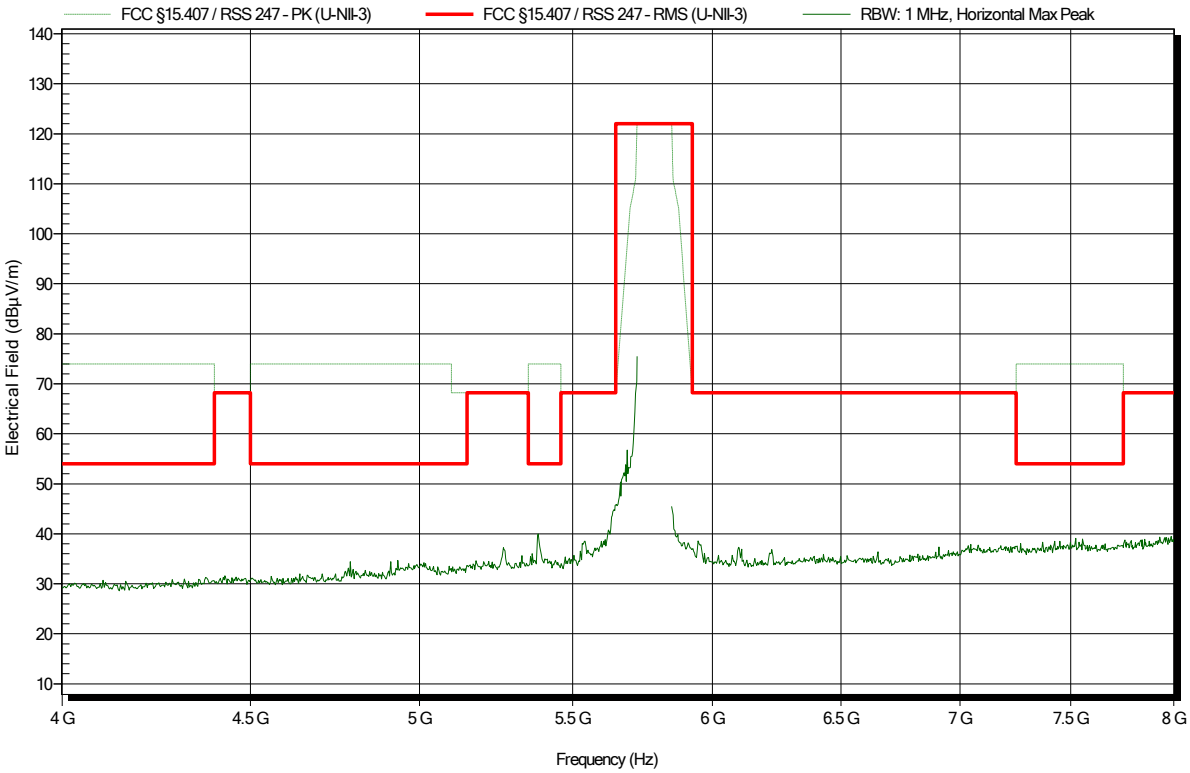

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH149 – EUT horizontal (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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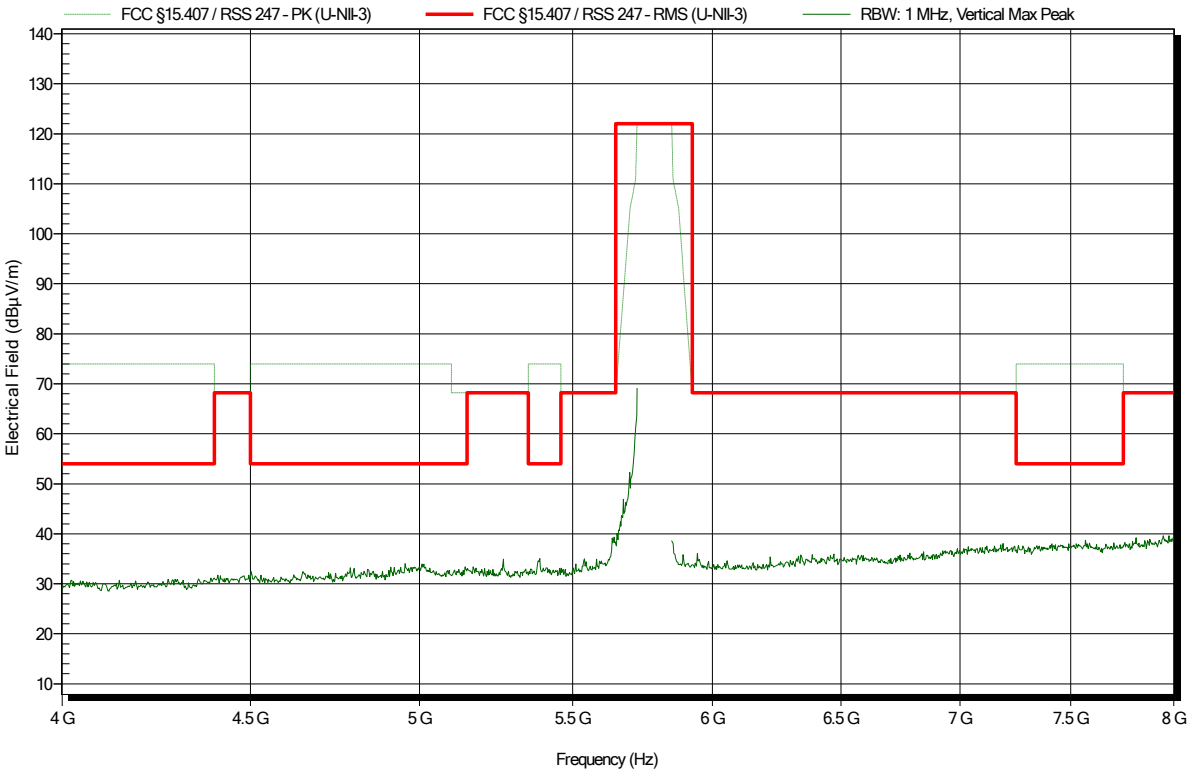

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; CH149 – EUT horizontal (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	lower band area

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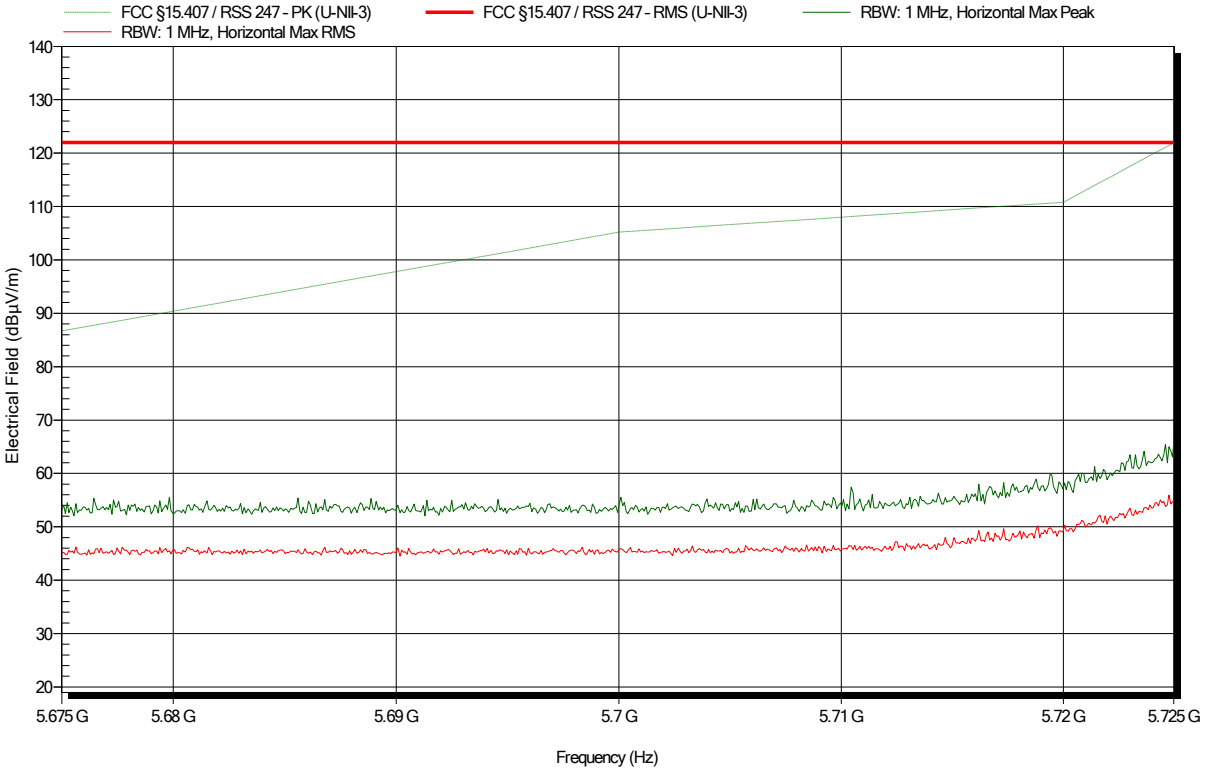

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH149 – EUT horizontal (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	lower band area

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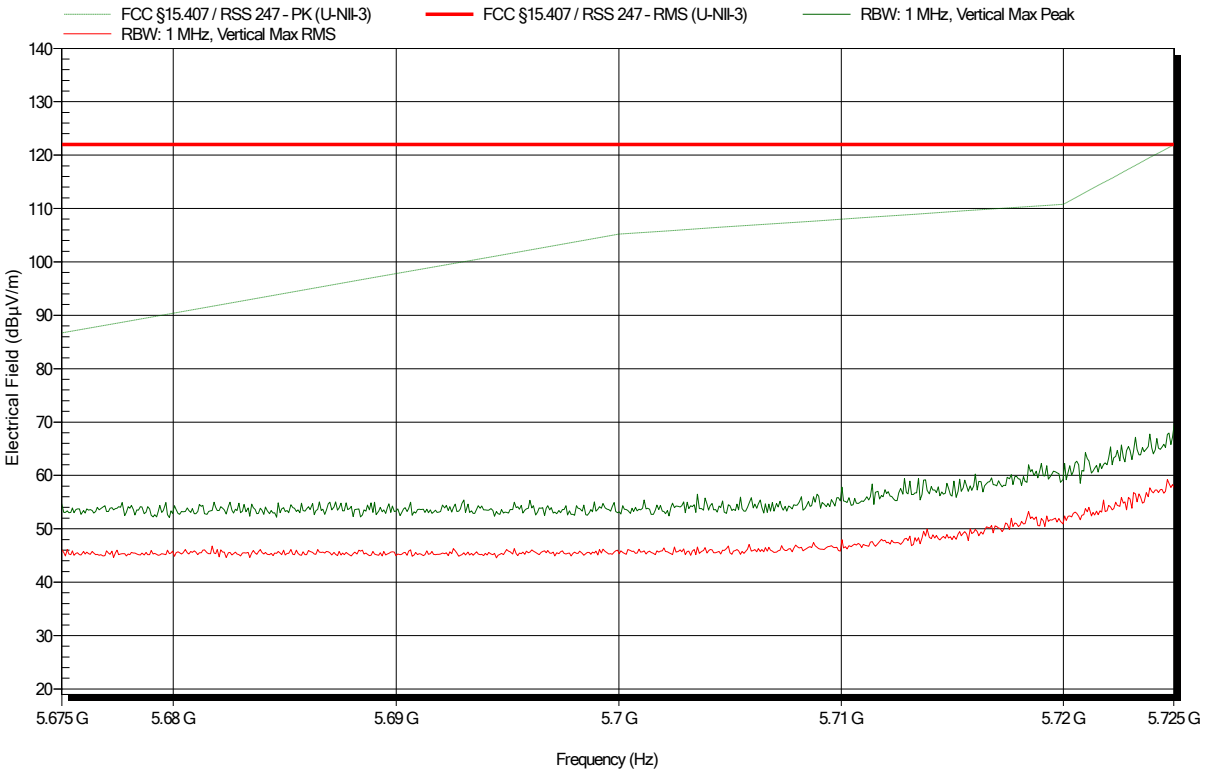

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; CH149 – EUT vertical (antenna 0°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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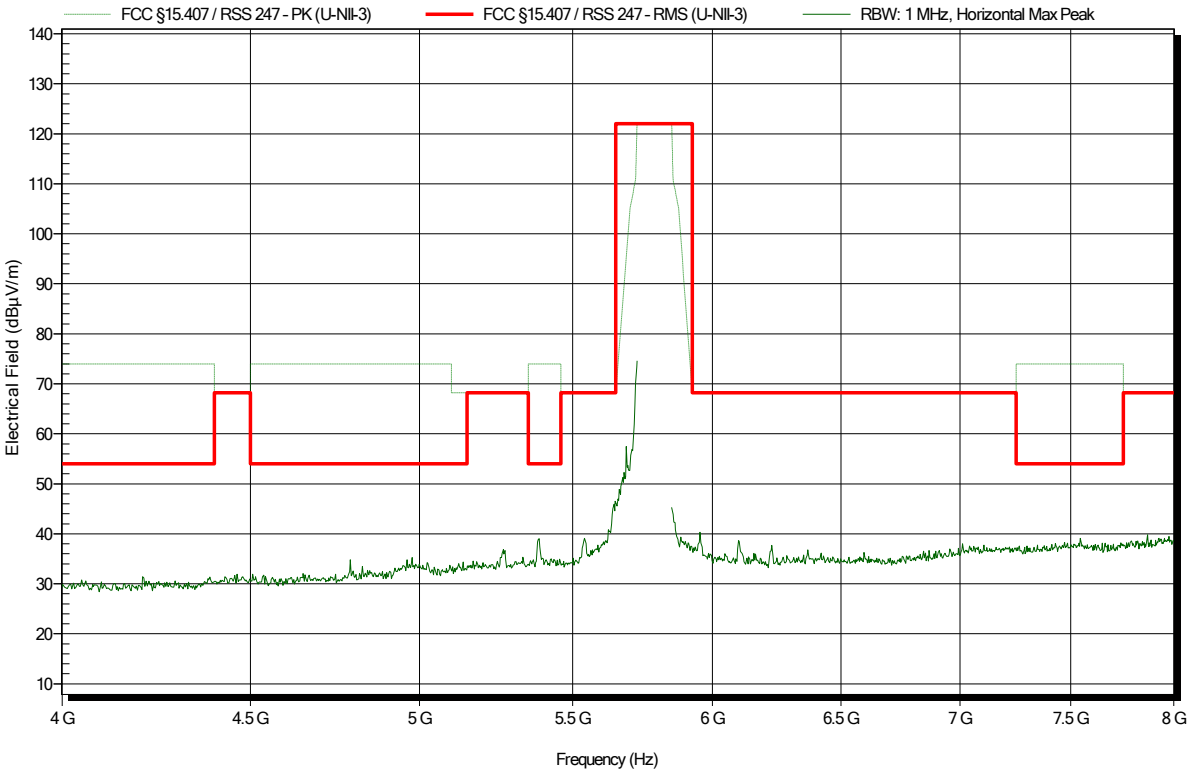

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH149 – EUT vertical (antenna 0°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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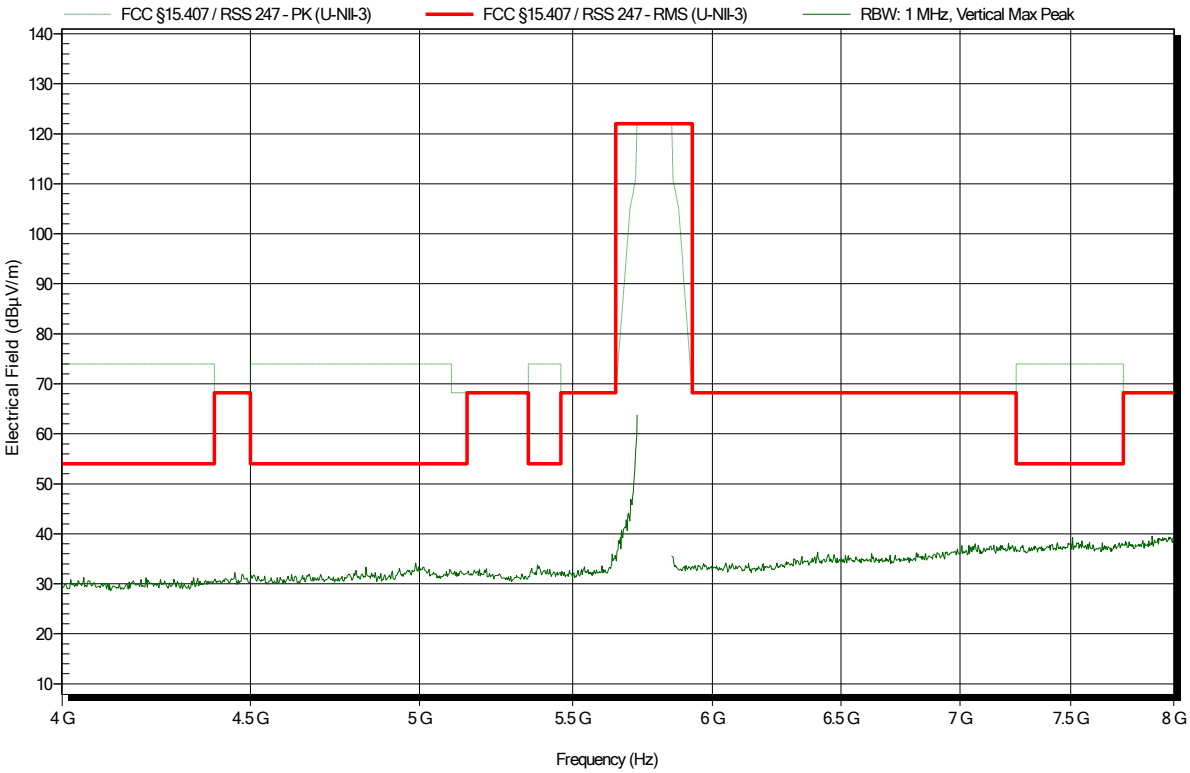

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; CH149 – EUT vertical (antenna 0°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	lower band area

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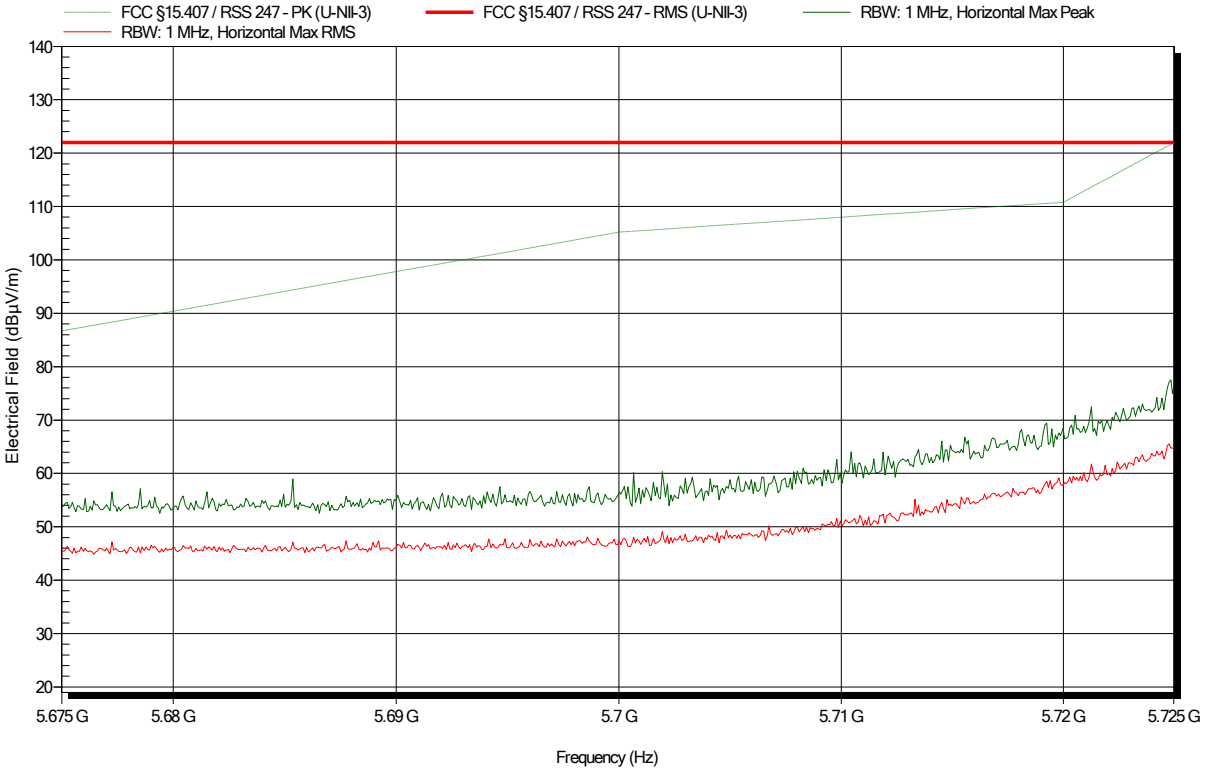

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH149 – EUT vertical (antenna 0°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	lower band area

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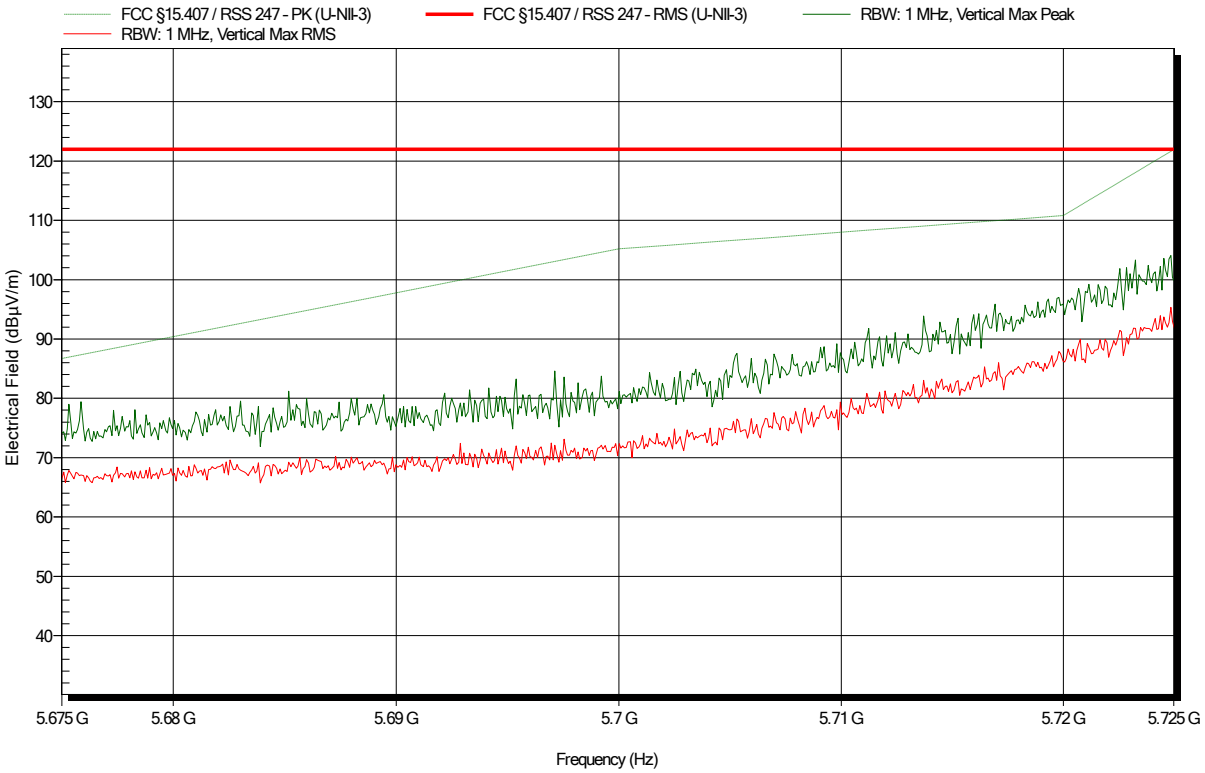

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; CH149 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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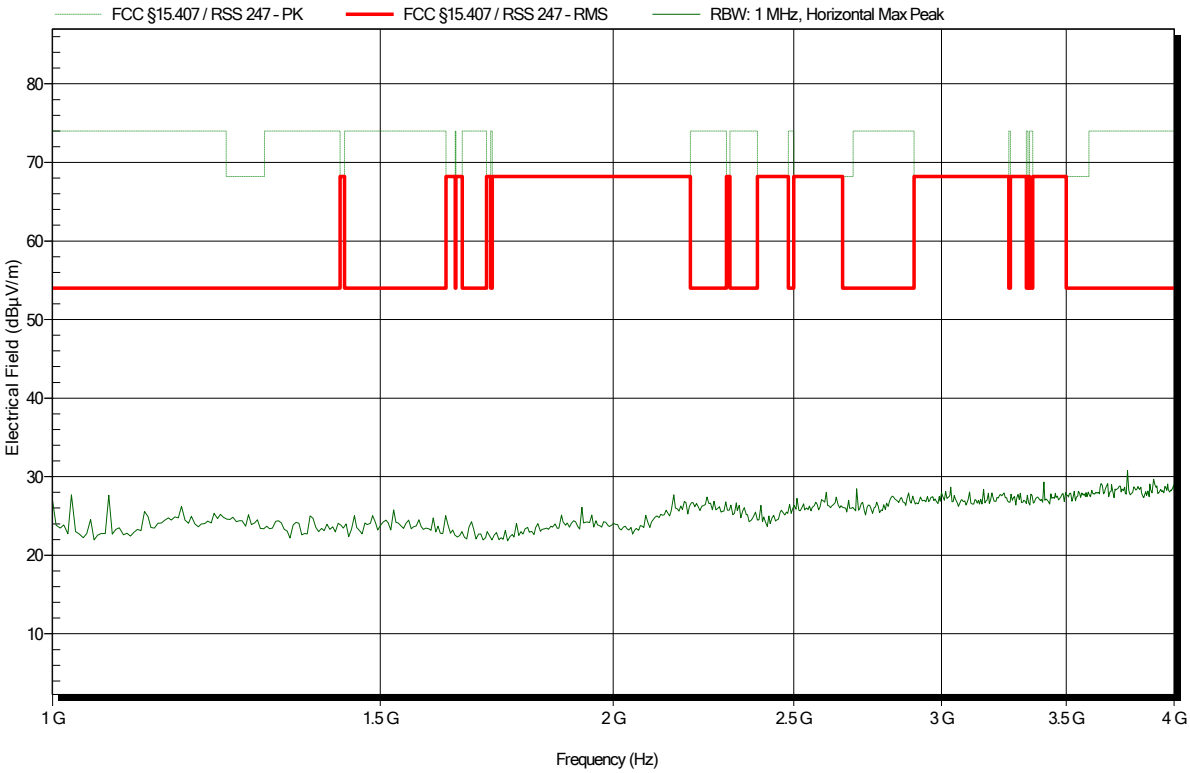

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH149 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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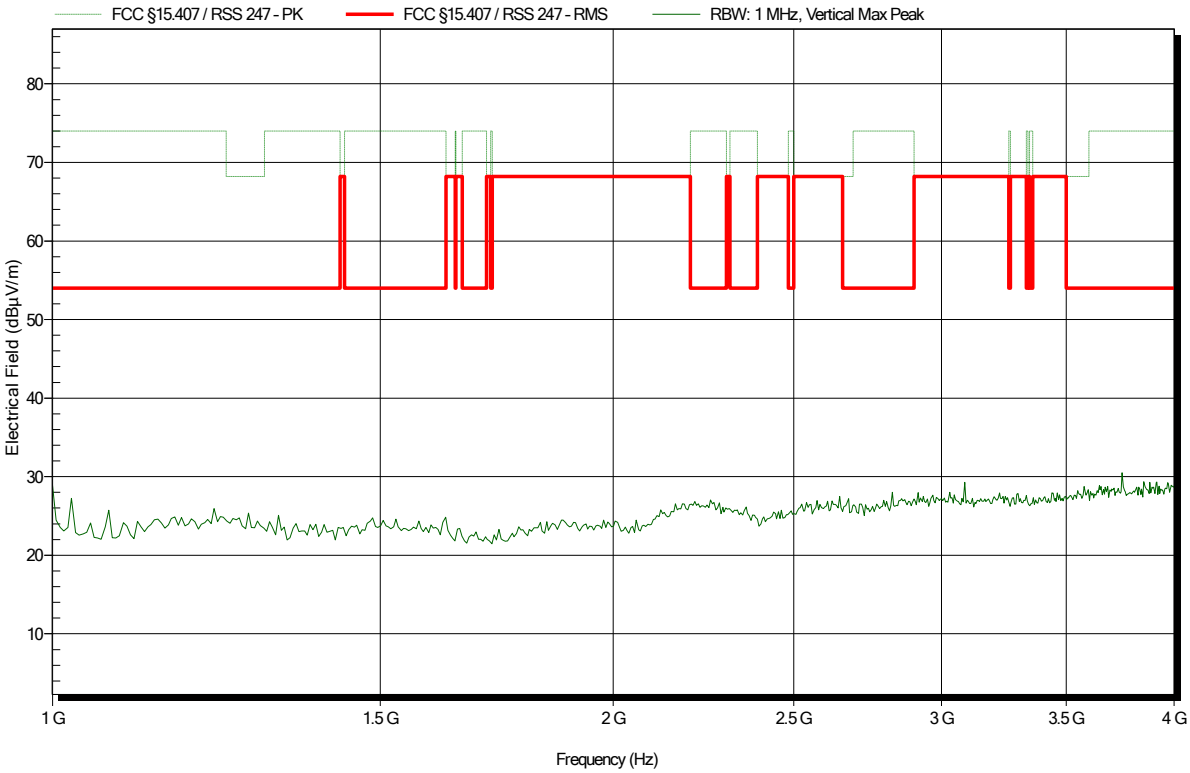

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; CH149 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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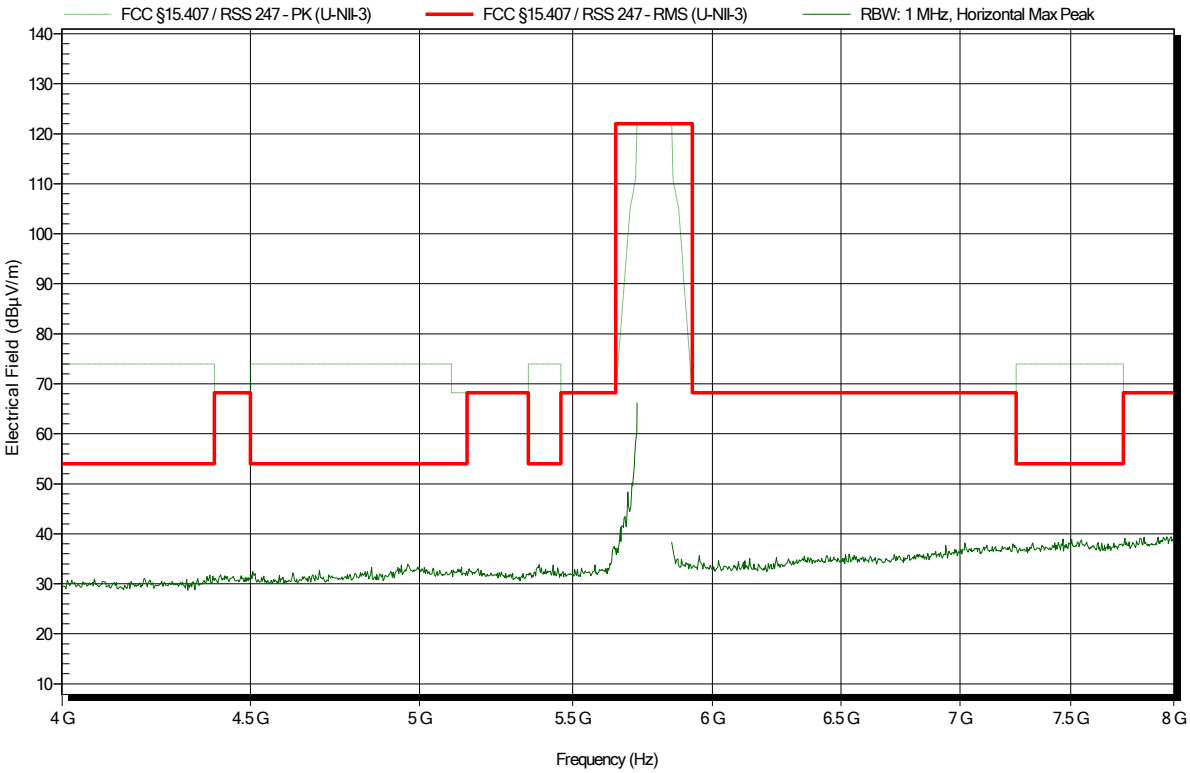

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH149 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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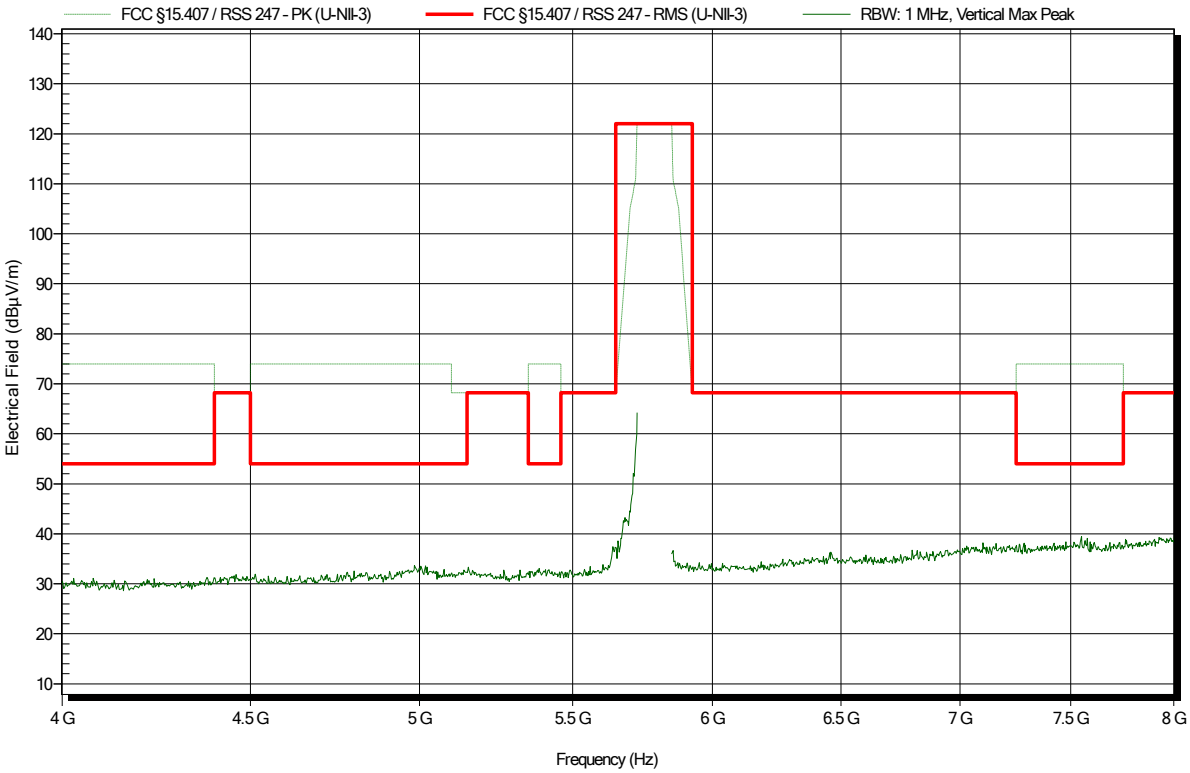

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; CH149 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	lower band area

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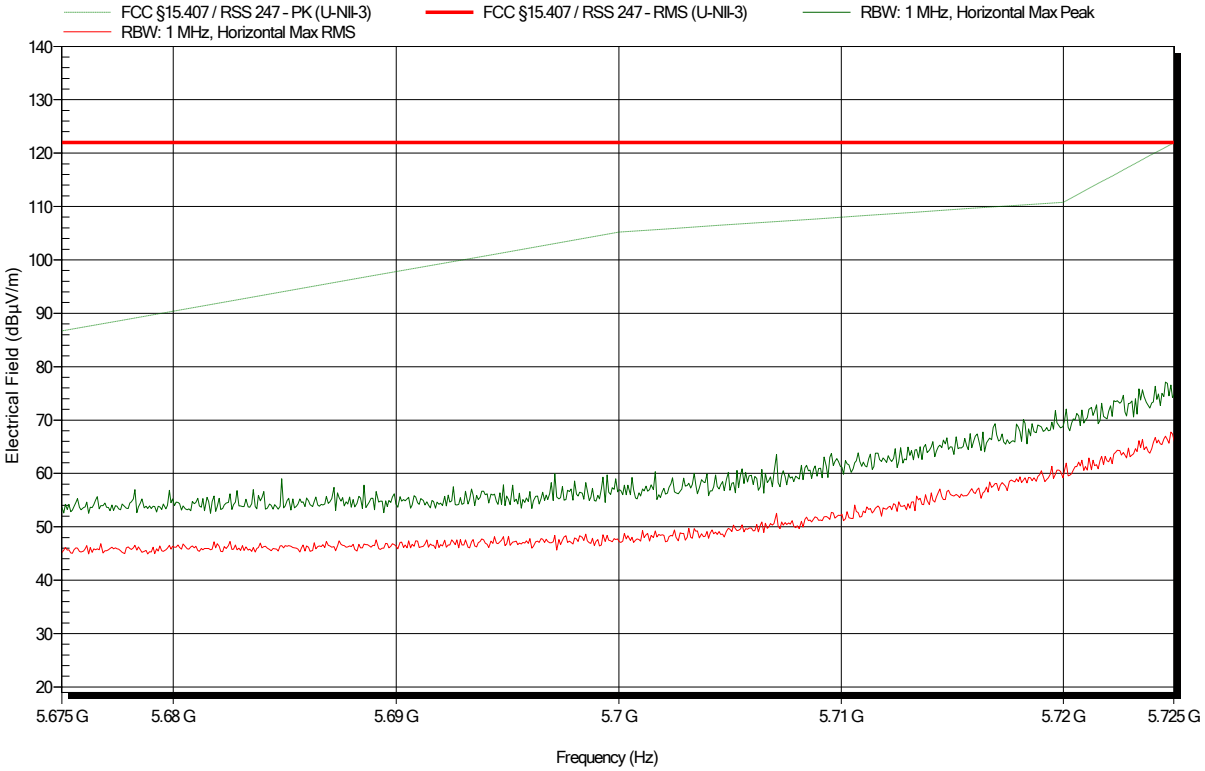

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH149 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	lower band area

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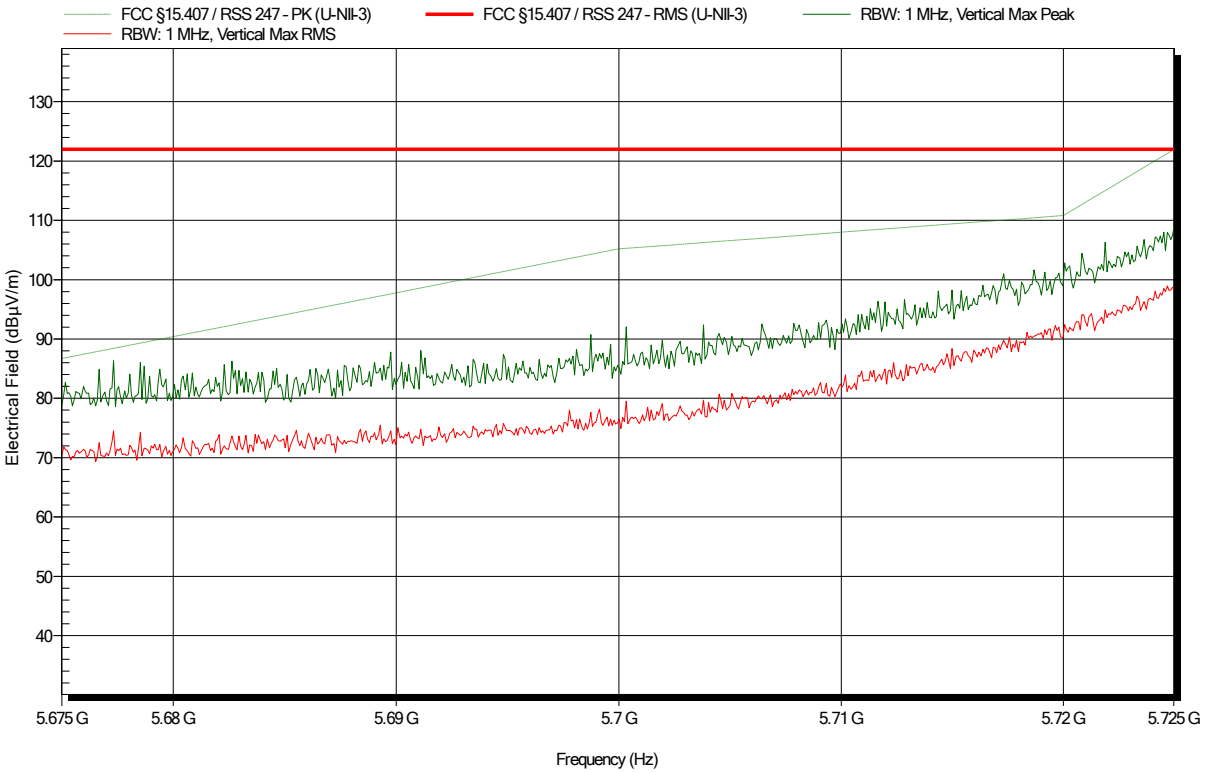

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; CH149 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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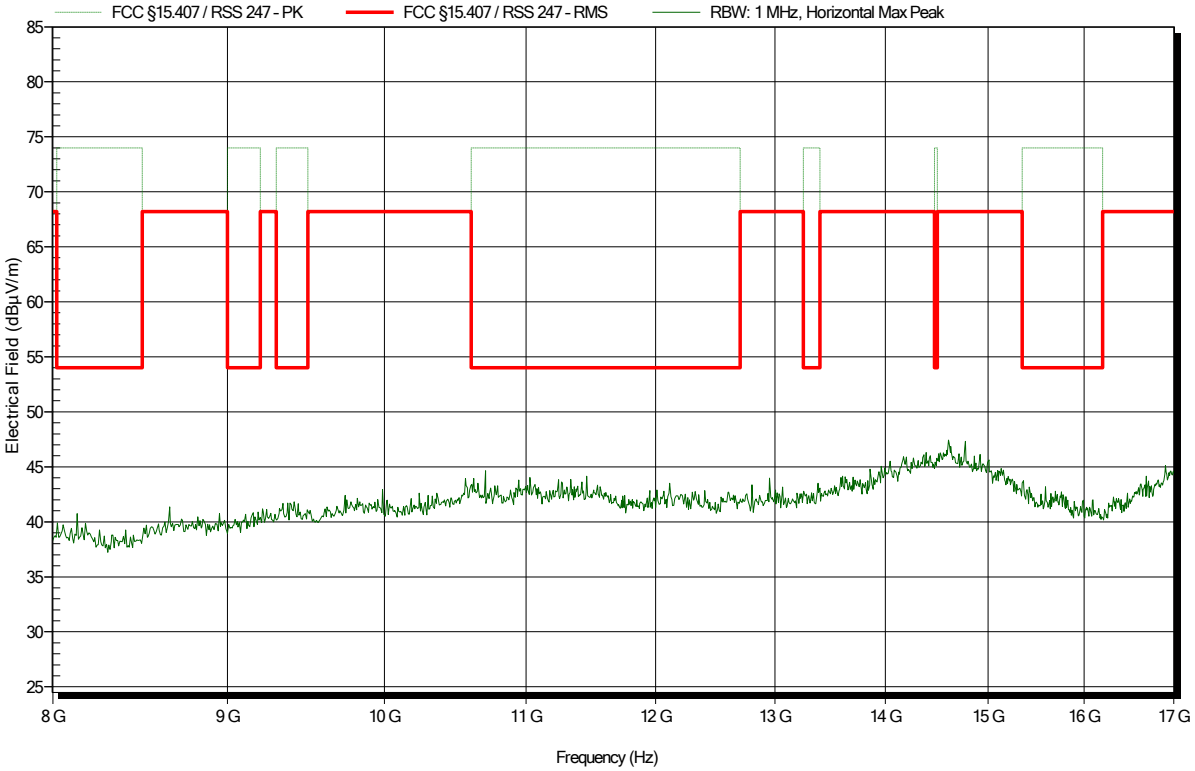

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH149 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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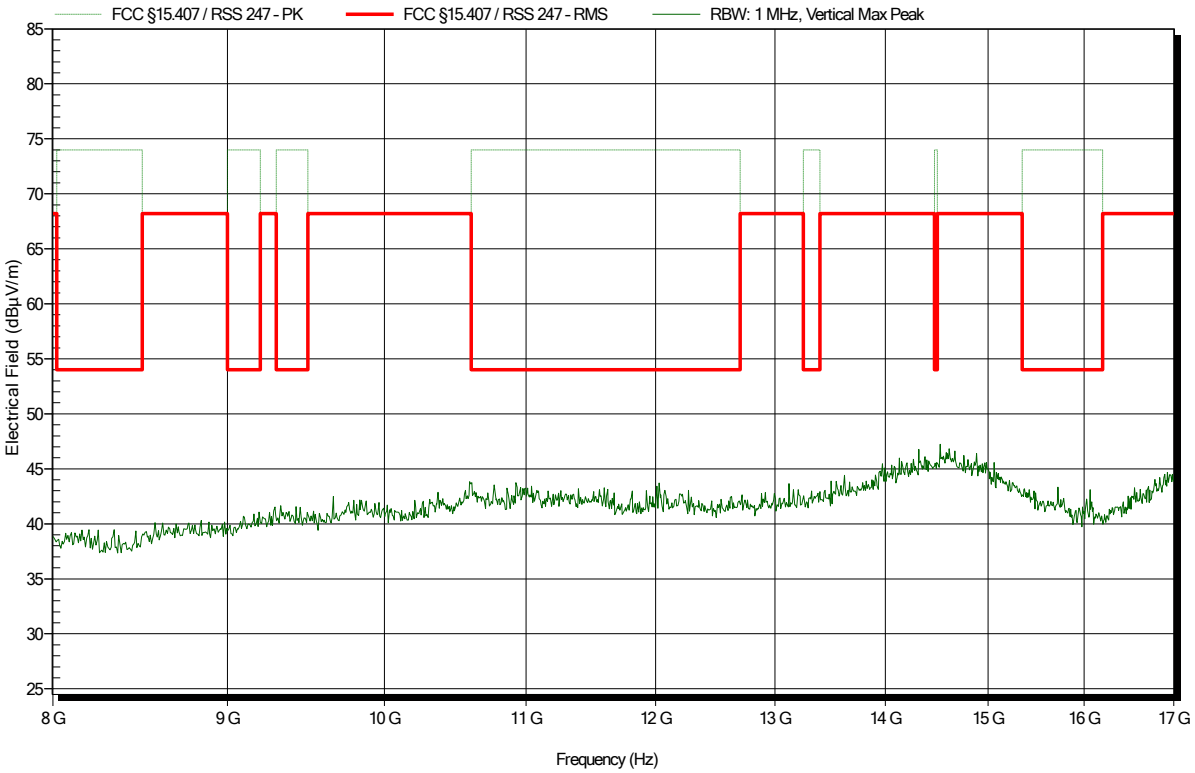

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; CH157 – EUT horizontal (antenna 0°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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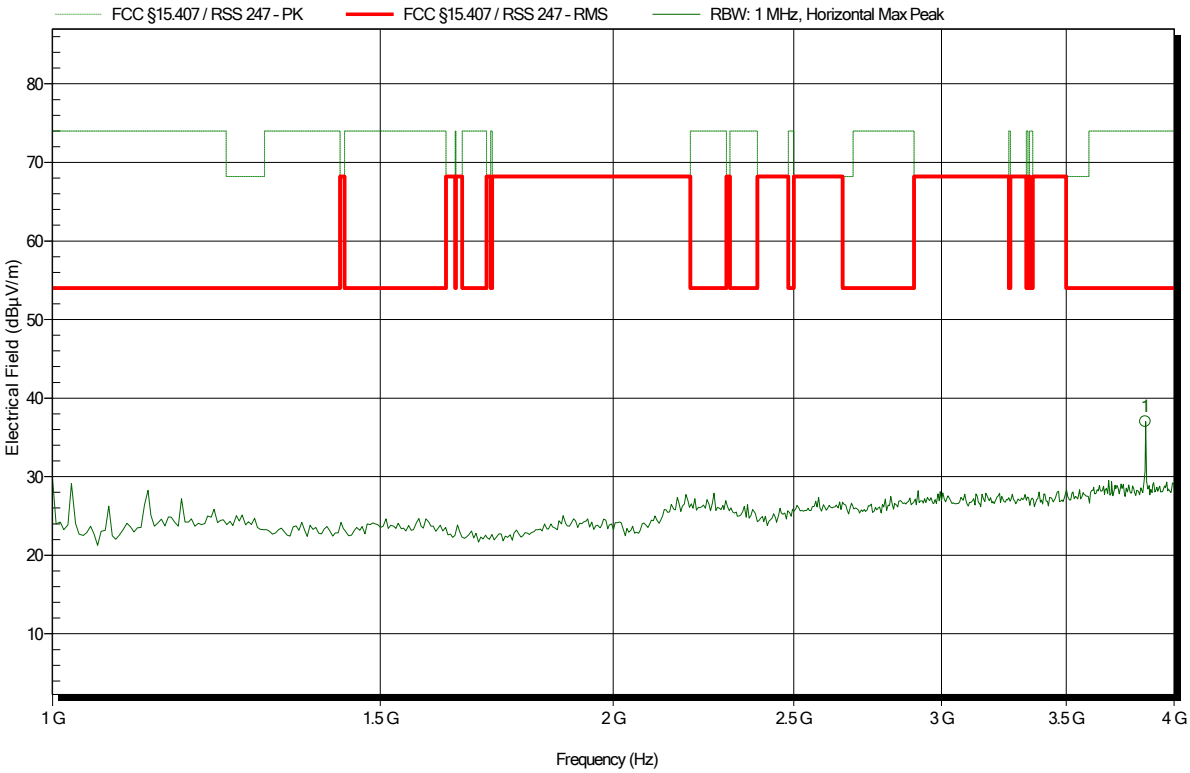

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
3.861 GHz	37.02 dBµV/m	54 dBµV/m	-16.98 dB	Pass

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH157 – EUT horizontal (antenna 0°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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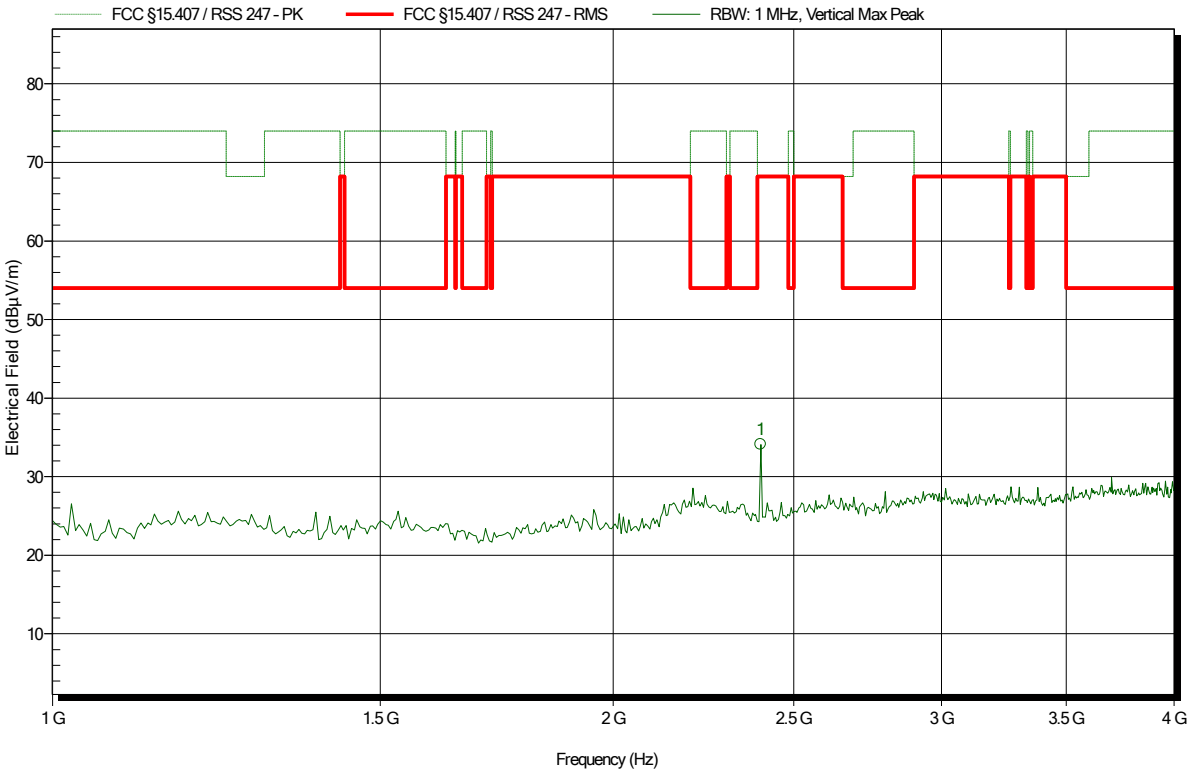

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.399 GHz	34.11 dBµV/m	68.2 dBµV/m	-34.09 dB	Pass

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; CH157 – EUT horizontal (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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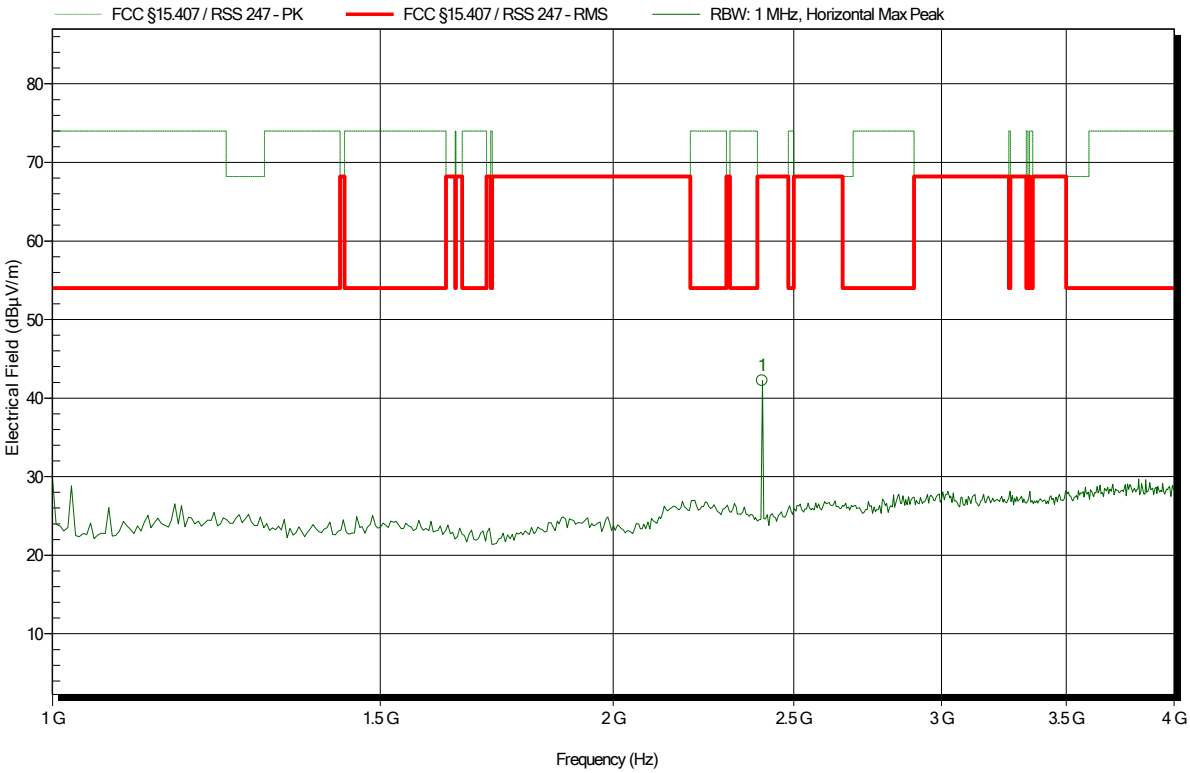

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.404 GHz	42.21 dBµV/m	68.2 dBµV/m	-25.99 dB	Pass

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH157 – EUT horizontal (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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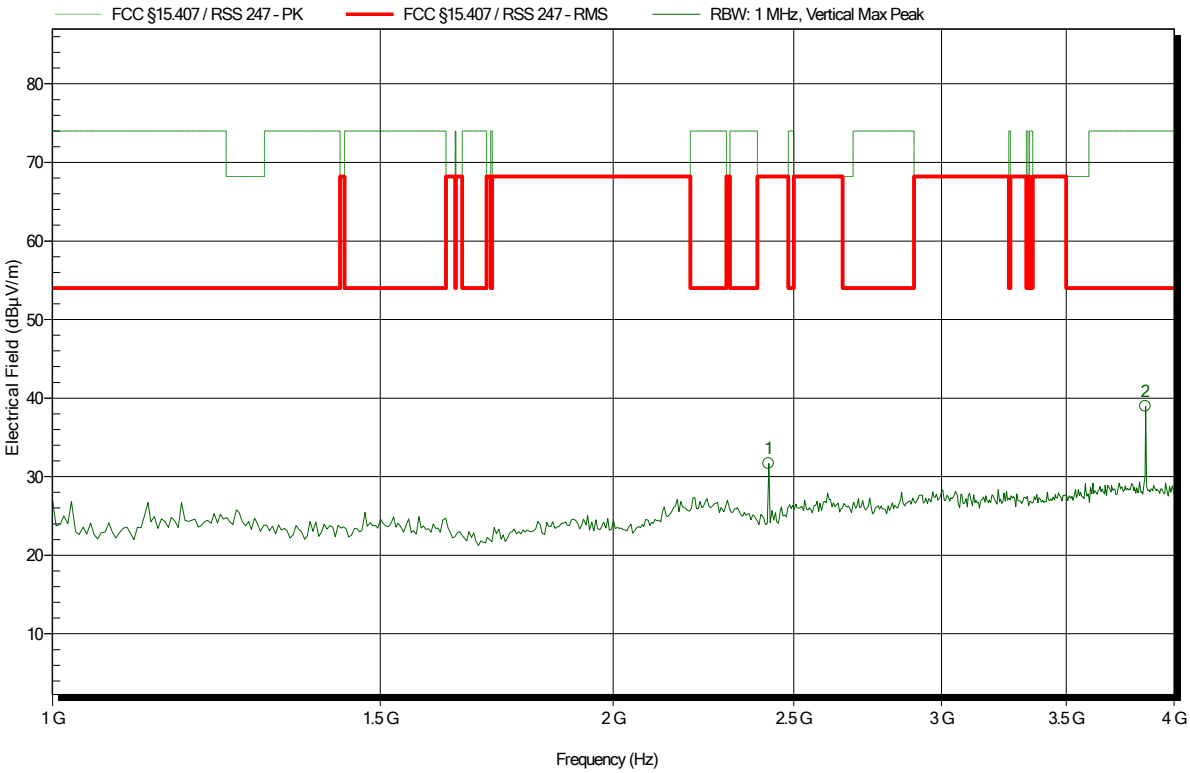

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.423 GHz	31.69 dBµV/m	68.2 dBµV/m	-36.51 dB	Pass
3.861 GHz	38.96 dBµV/m	54 dBµV/m	-15.04 dB	Pass

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; CH157 – EUT vertical (antenna 0°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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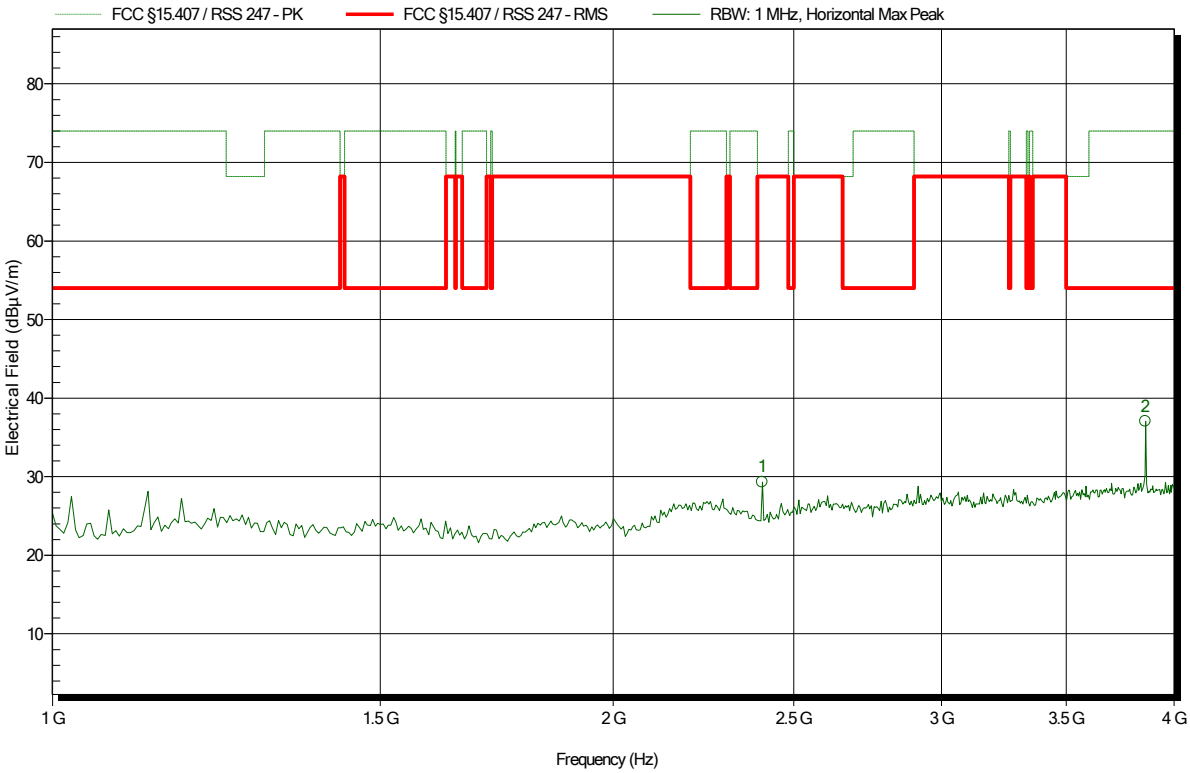

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.404 GHz	29.32 dBµV/m	68.2 dBµV/m	-38.88 dB	Pass
3.861 GHz	37.06 dBµV/m	54 dBµV/m	-16.94 dB	Pass

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH157 – EUT vertical (antenna 0°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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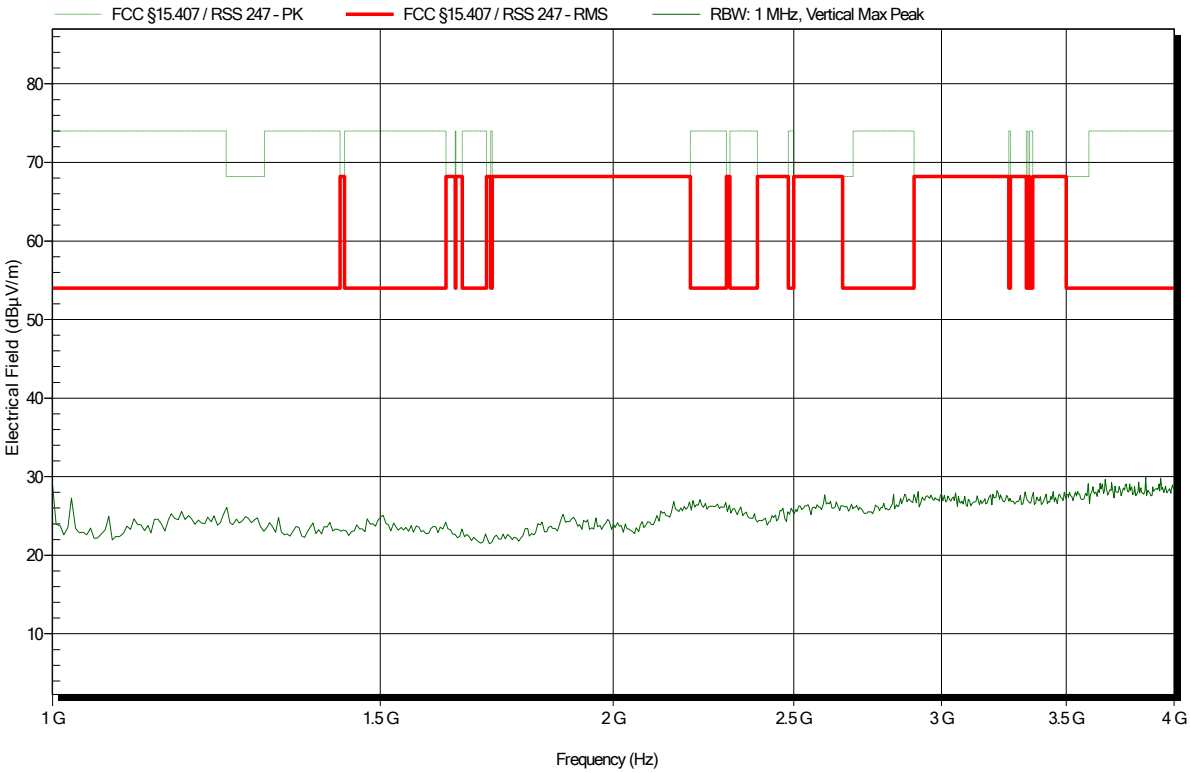

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; CH157 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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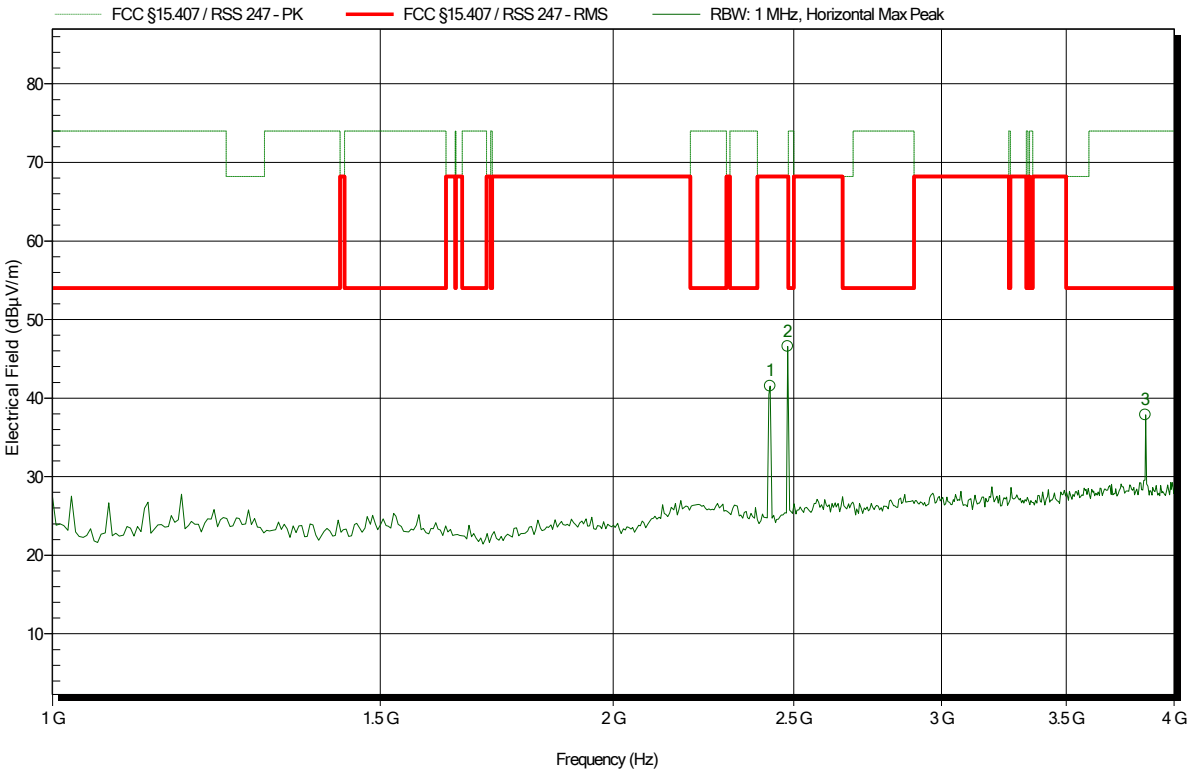

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.428 GHz	41.53 dBµV/m	68.2 dBµV/m	-26.67 dB	Pass
2.481 GHz	46.57 dBµV/m	68.2 dBµV/m	-21.63 dB	Pass
3.861 GHz	37.85 dBµV/m	54 dBµV/m	-16.15 dB	Pass

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH157 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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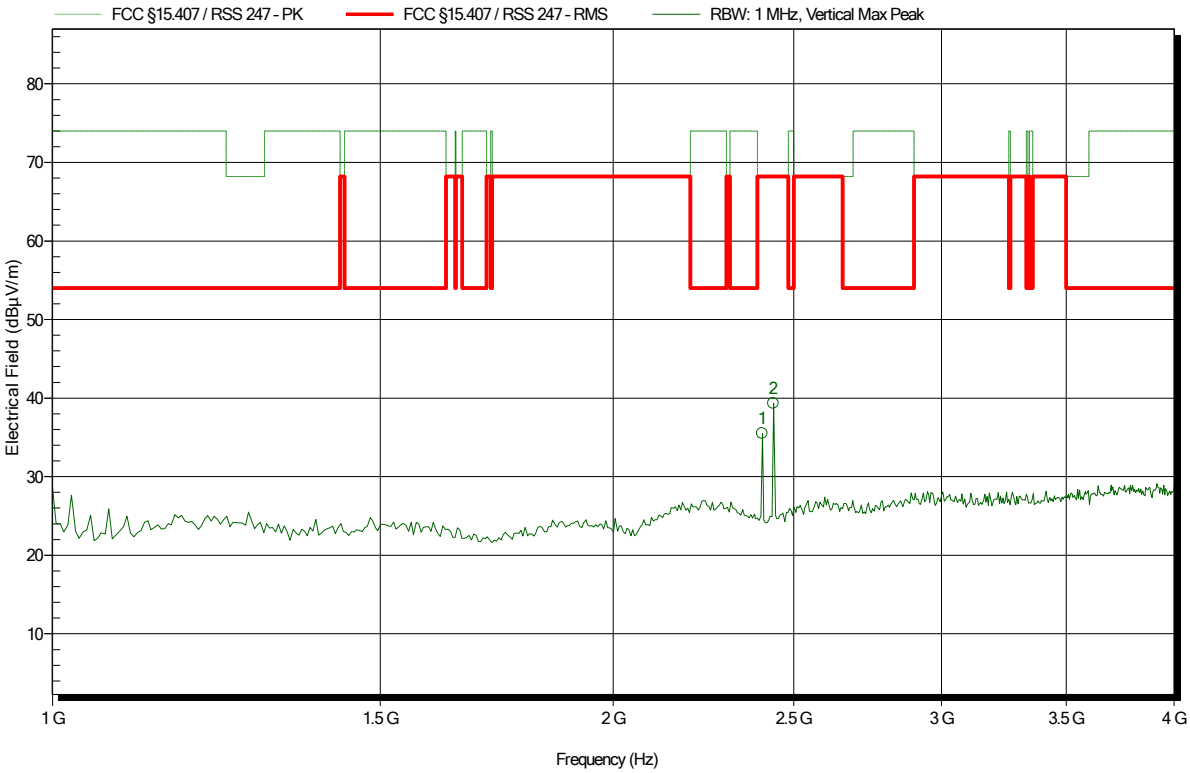

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.404 GHz	35.49 dBµV/m	68.2 dBµV/m	-32.71 dB	Pass
2.438 GHz	39.33 dBµV/m	68.2 dBµV/m	-28.87 dB	Pass

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; CH157 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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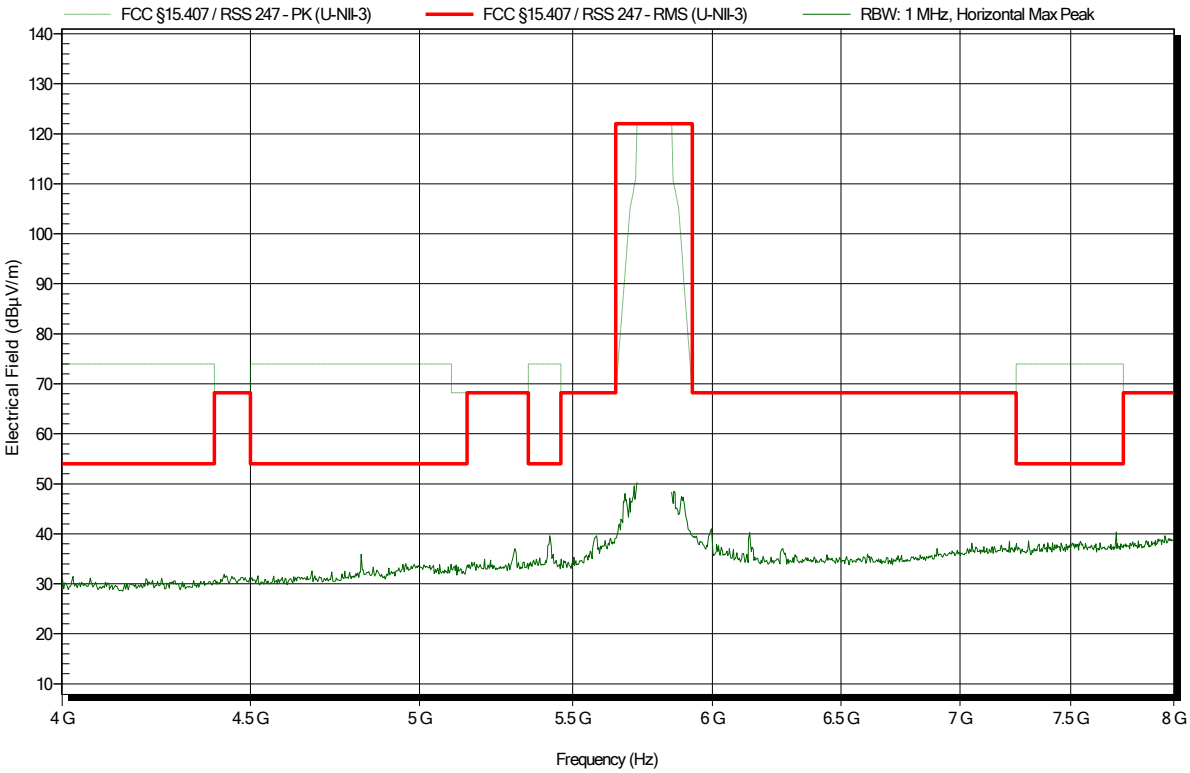

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH157 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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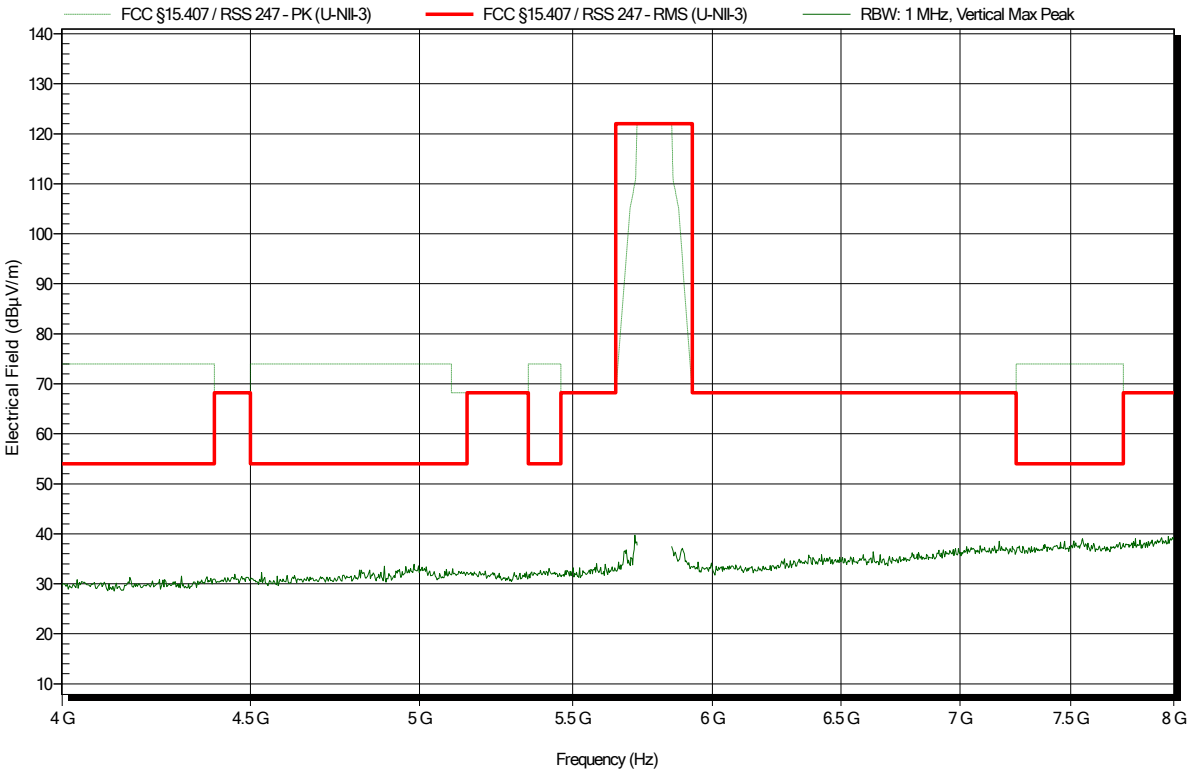

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; CH157 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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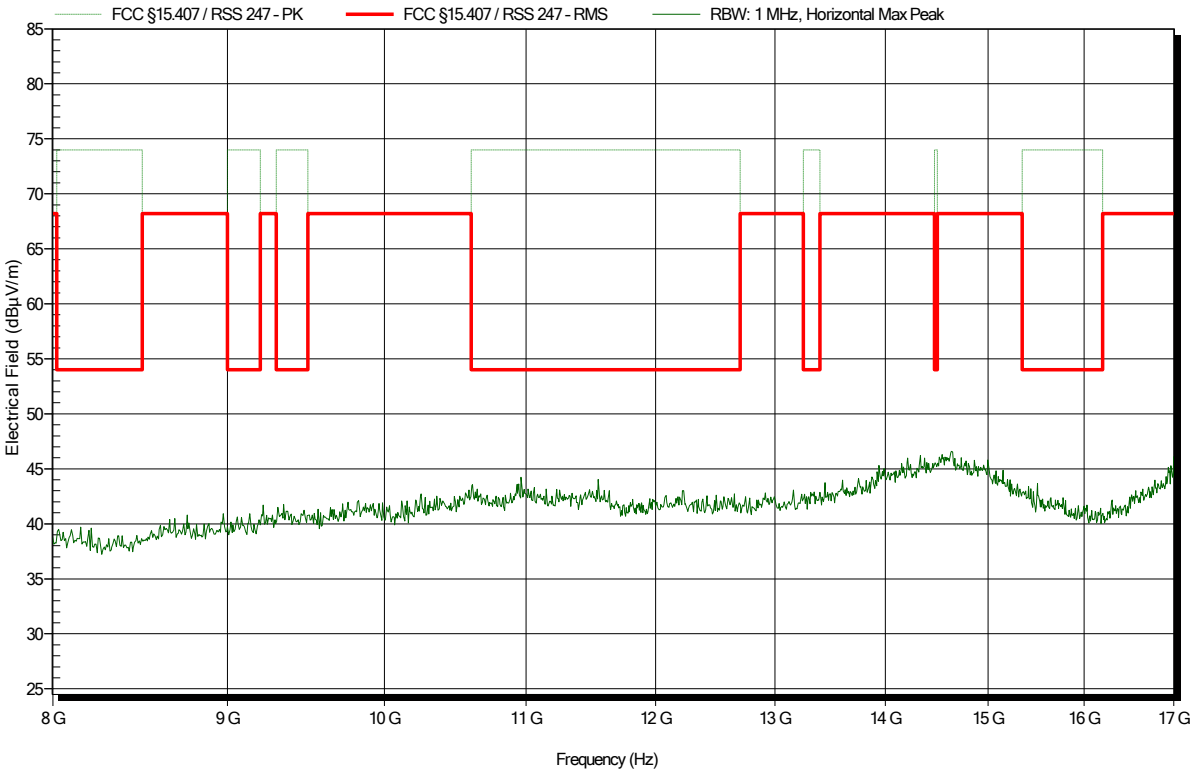

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH157 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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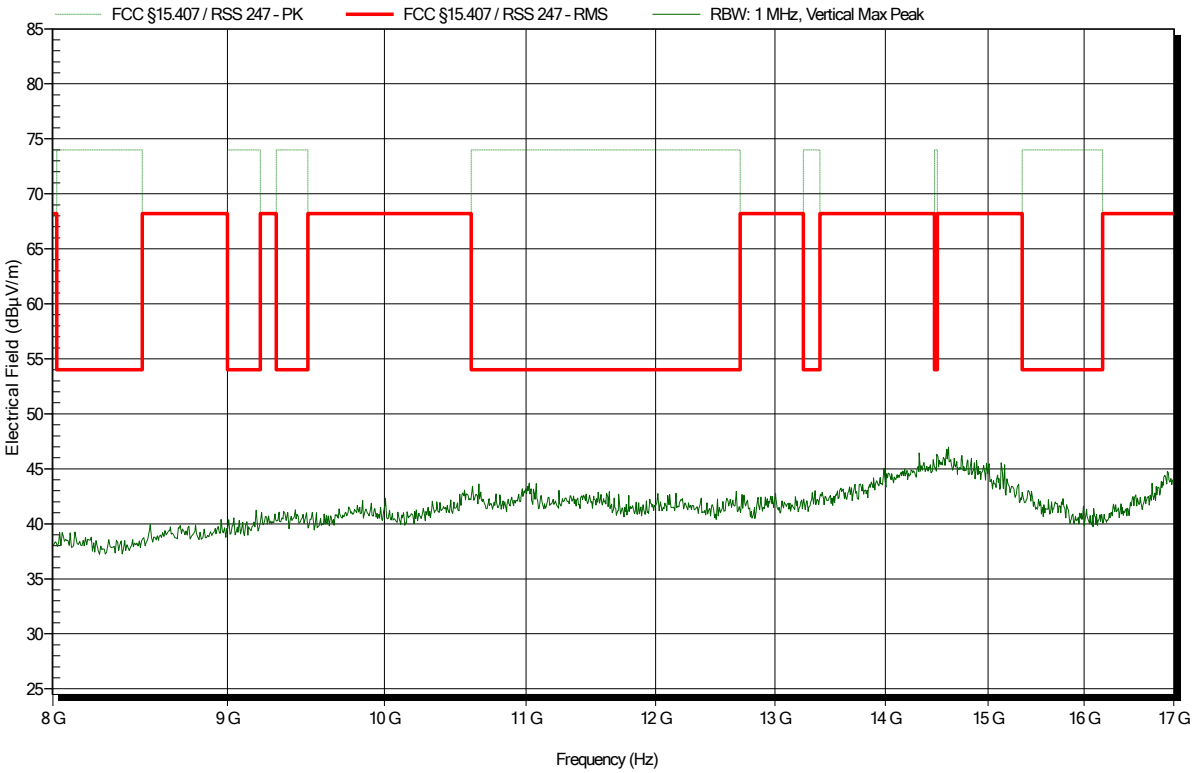

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH165 – EUT horizontal (antenna 0°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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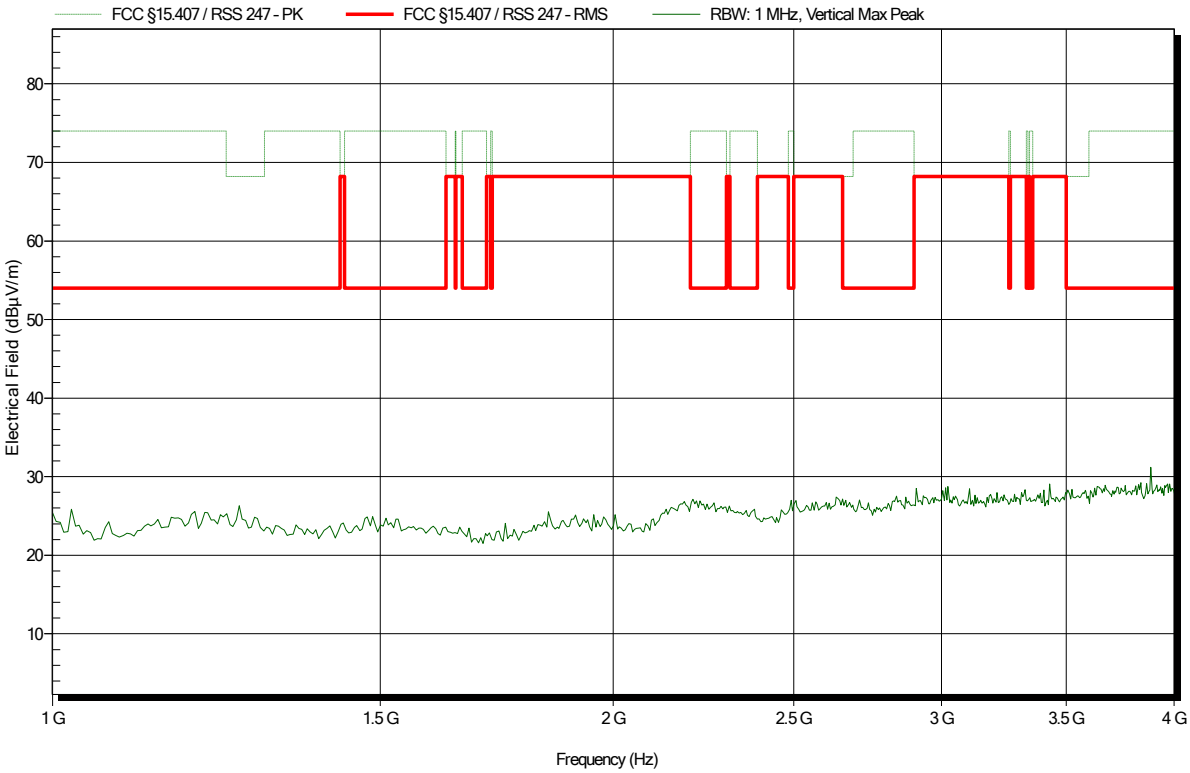

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH165 – EUT horizontal (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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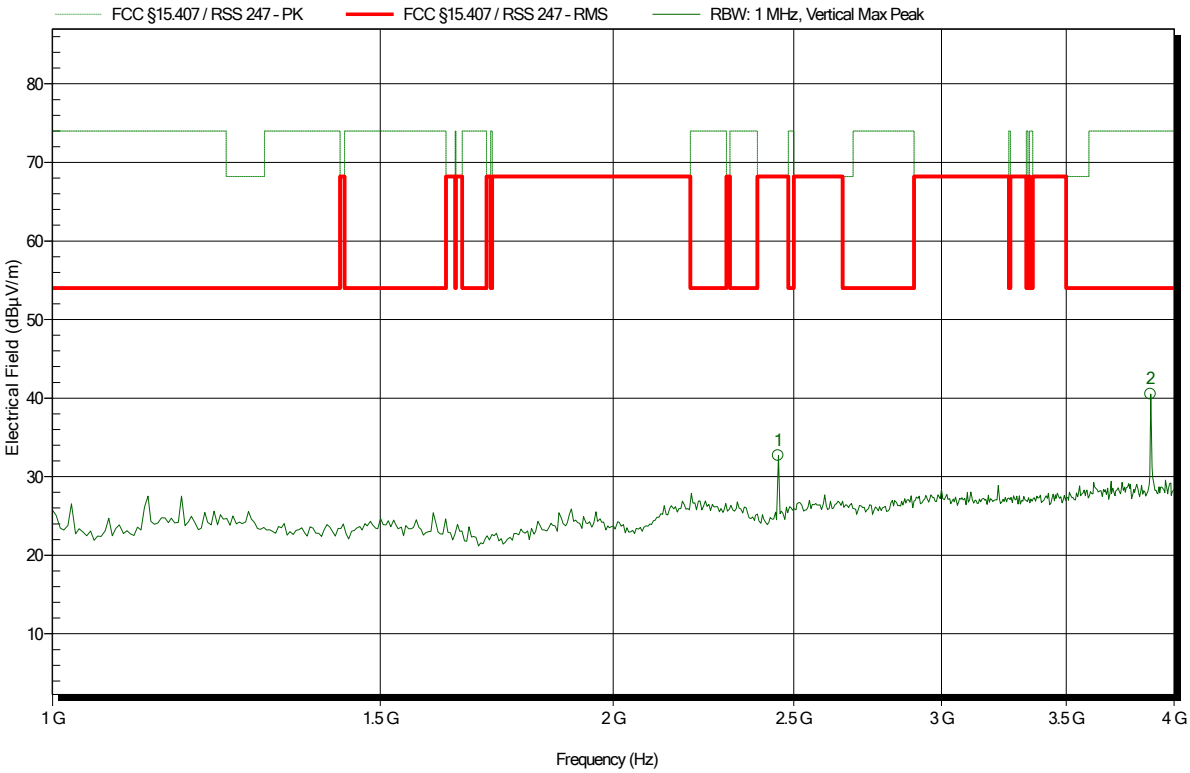

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.452 GHz	32.68 dBµV/m	68.2 dBµV/m	-35.52 dB	Pass
3.885 GHz	40.52 dBµV/m	54 dBµV/m	-13.48 dB	Pass

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH165 – EUT vertical (antenna 0°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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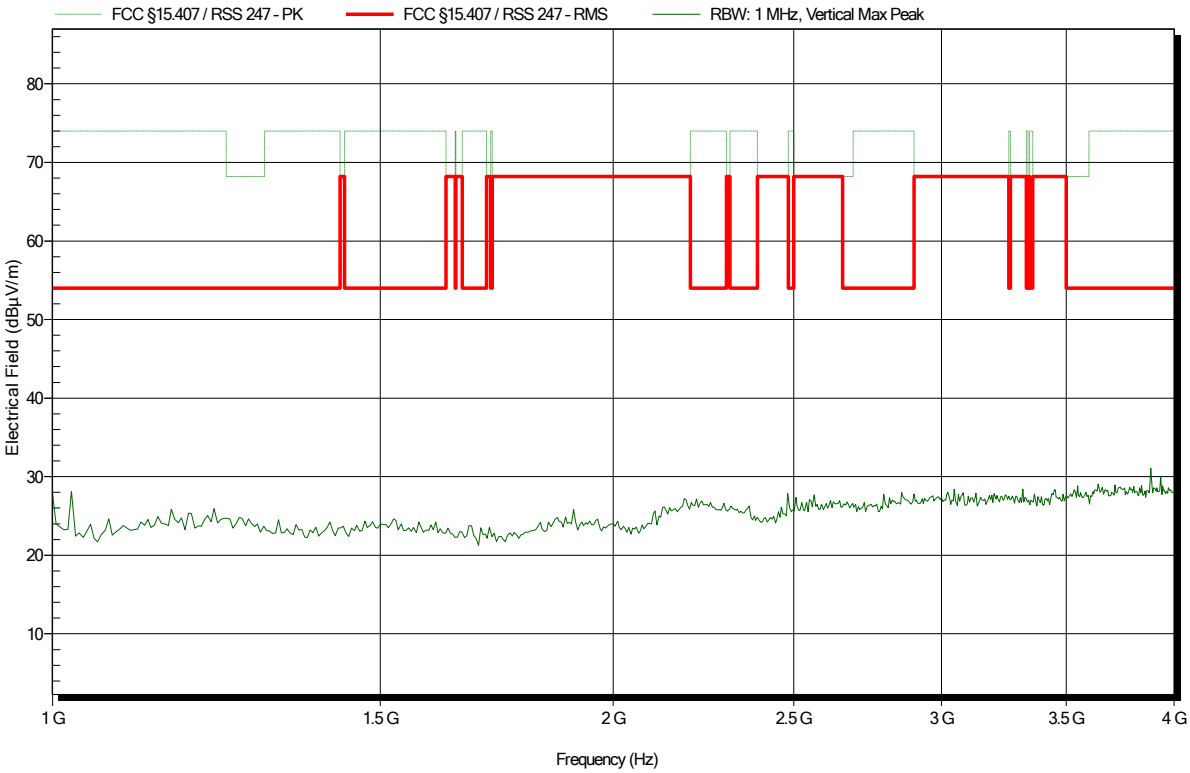

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; CH165 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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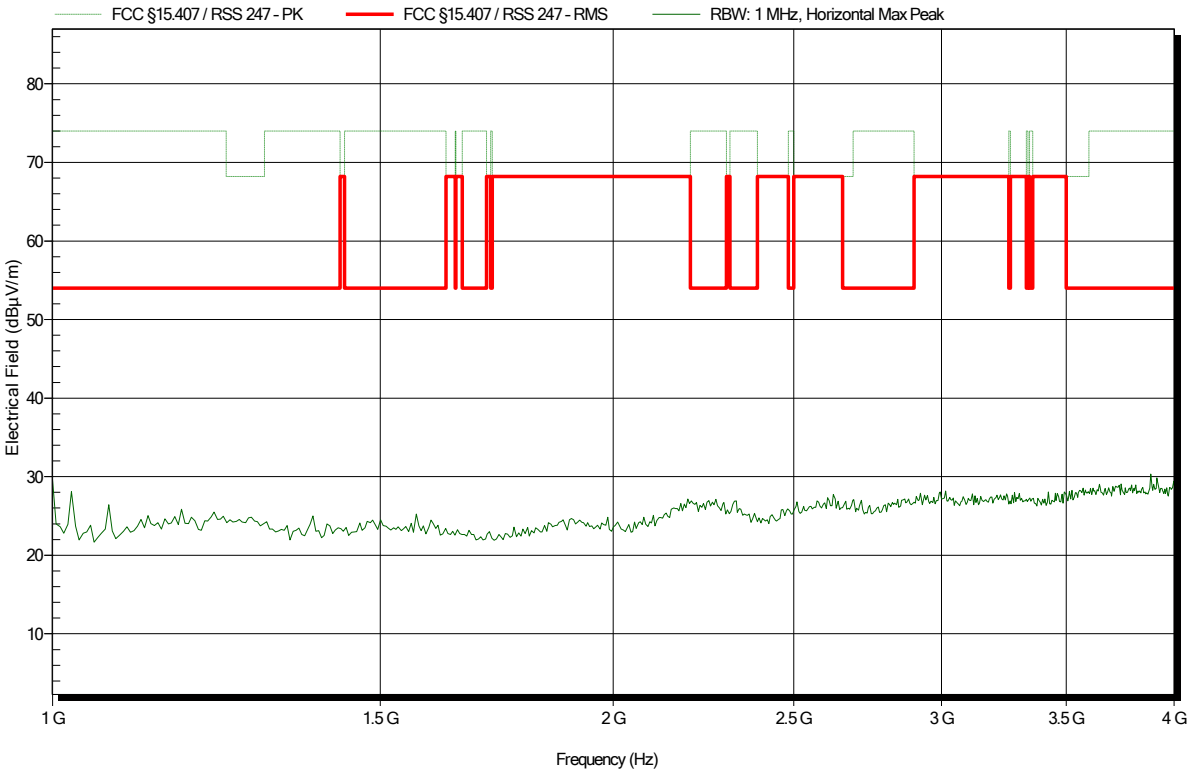

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH165 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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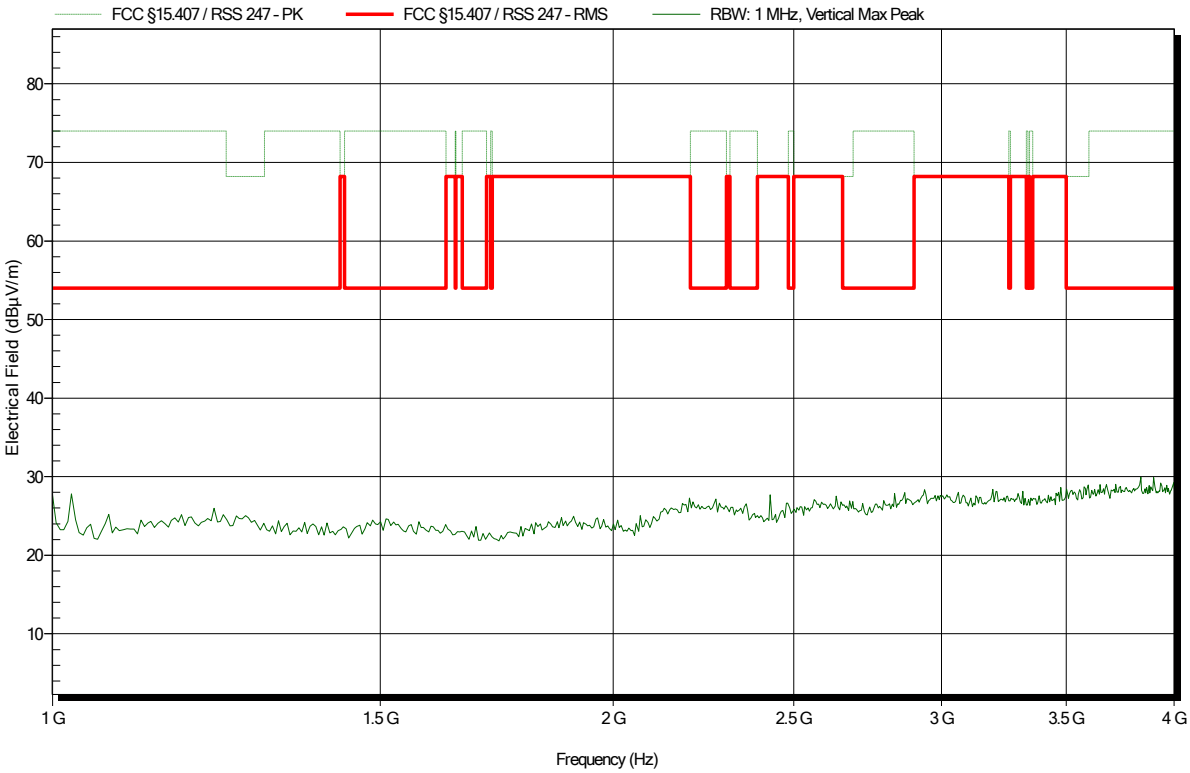

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; CH165 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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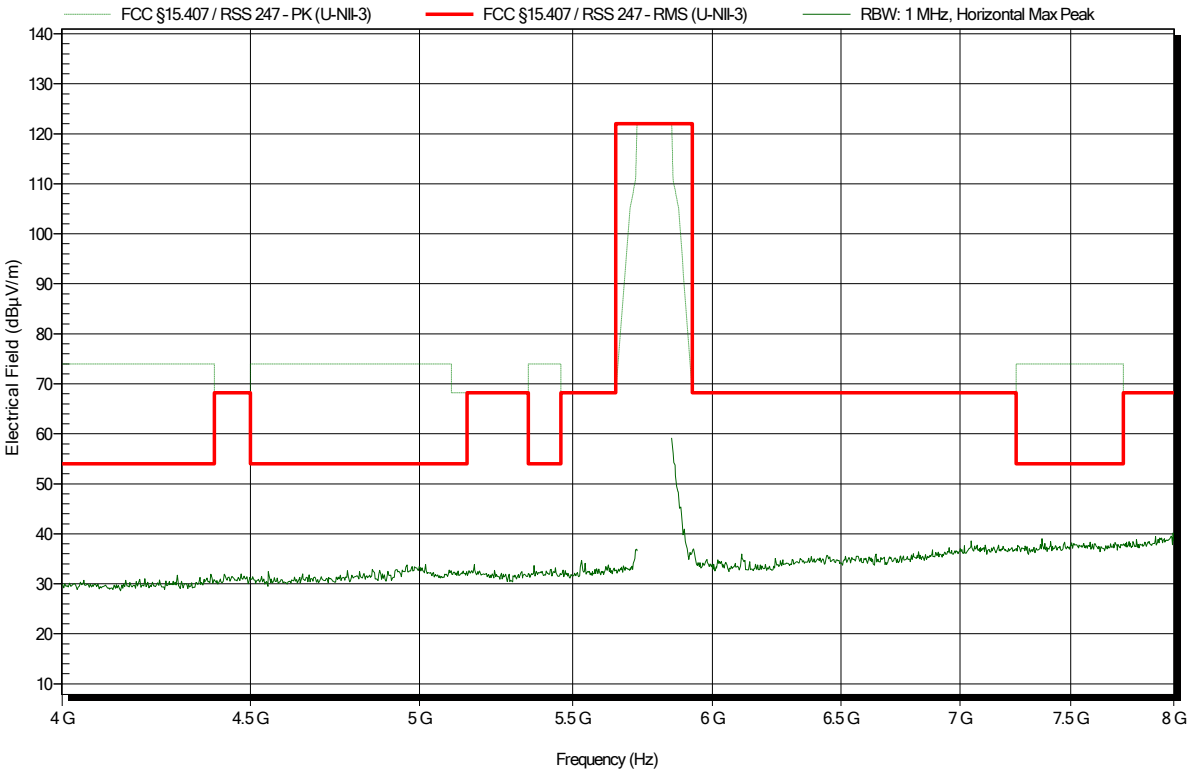

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH165 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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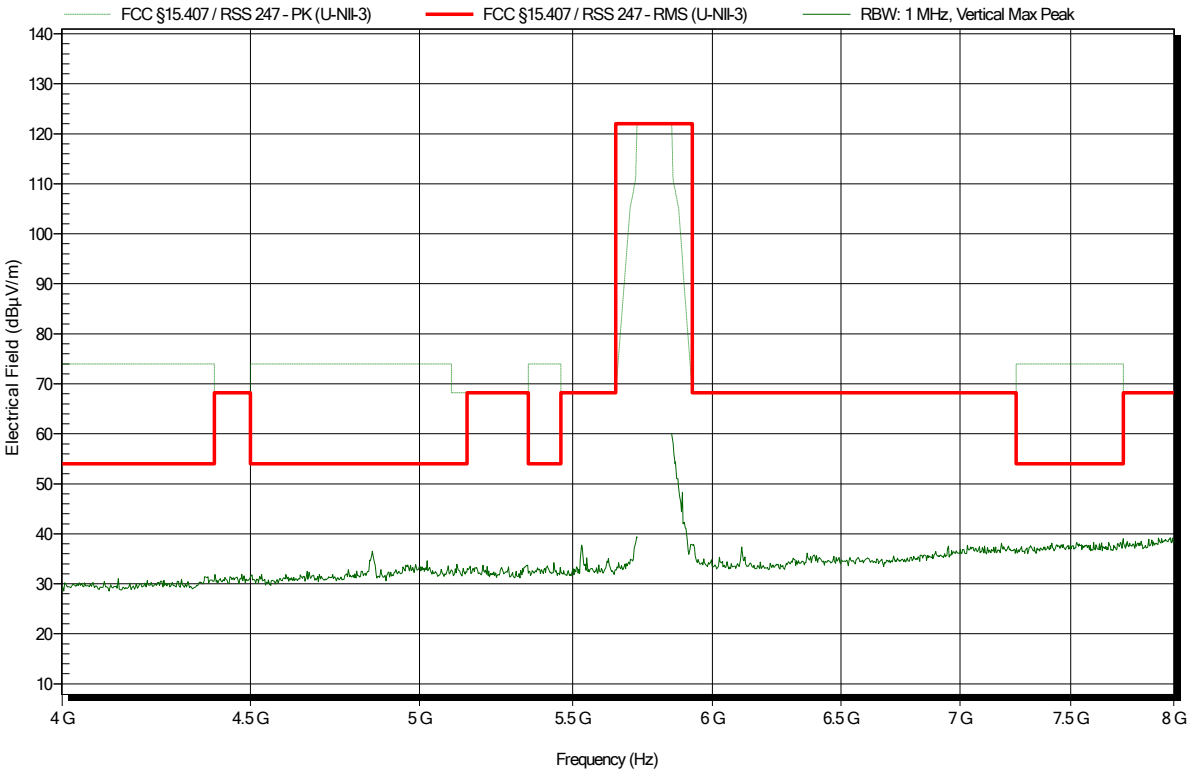

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH165 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	lower band area

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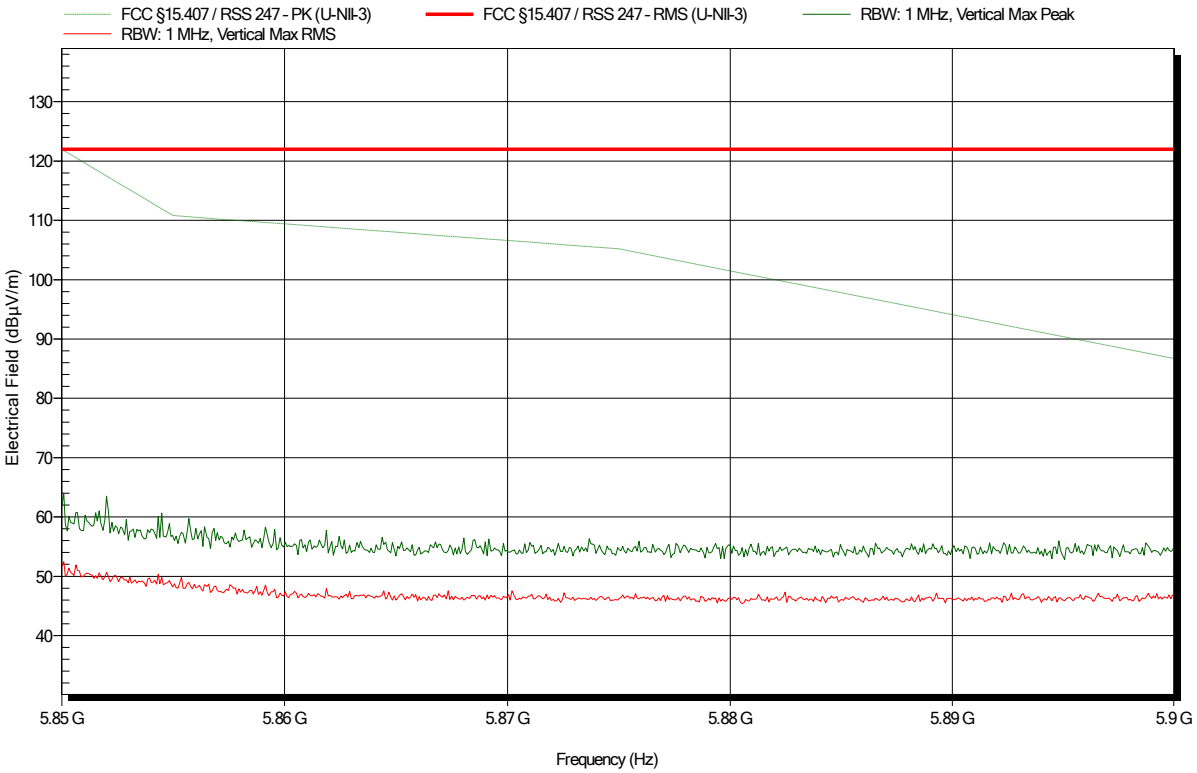

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m
Mode:	TX; CH165 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	lower band area

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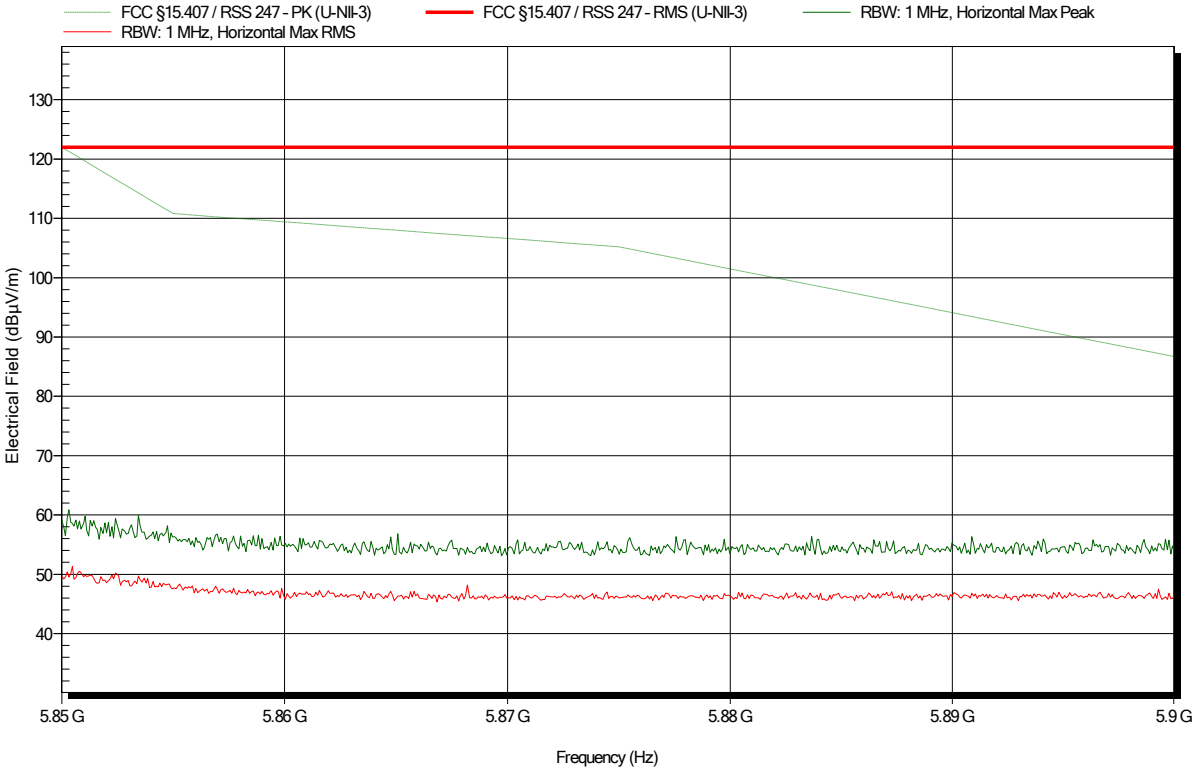

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; CH165 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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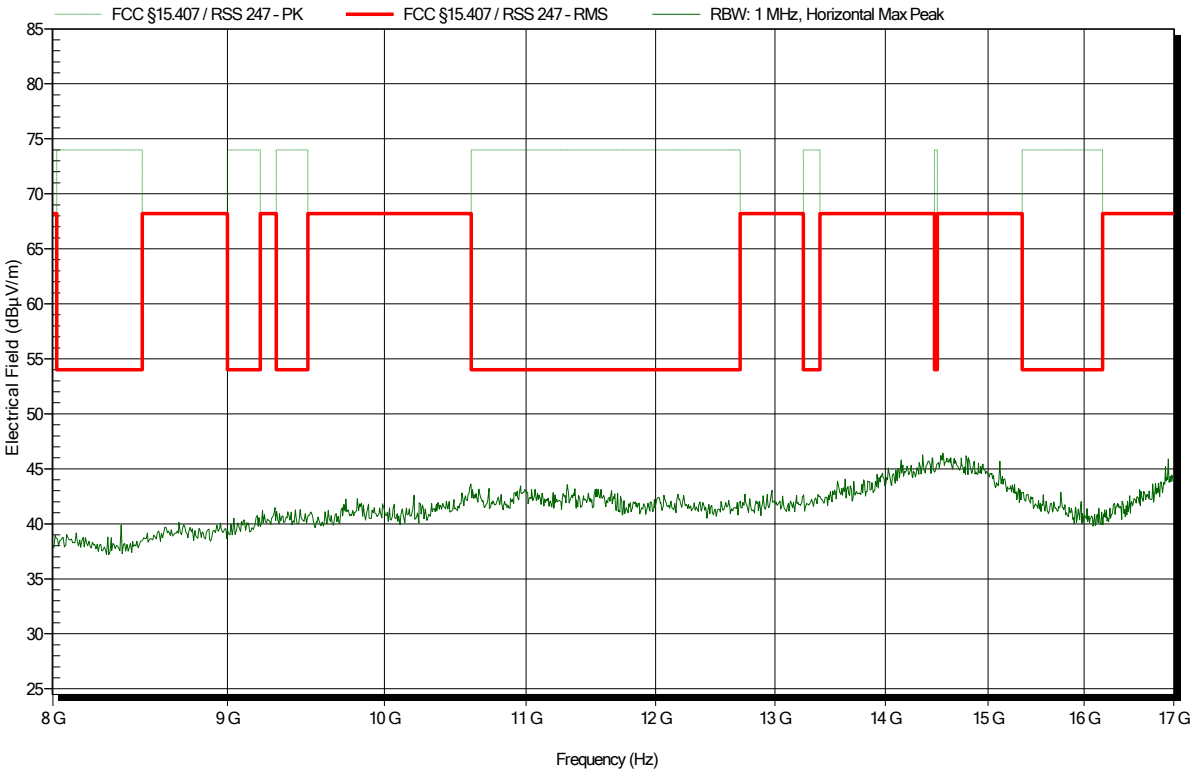

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH165 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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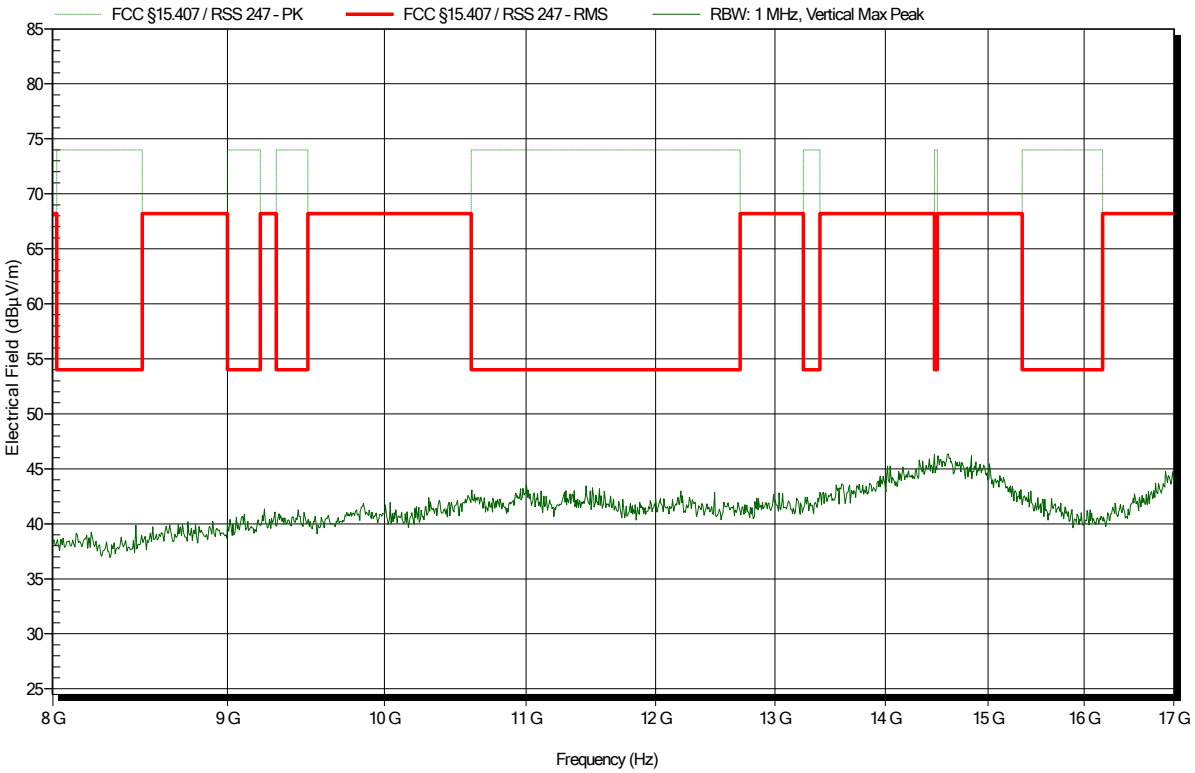

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Amplifier Research AT4560, Horizontal
Measurement distance:	1 m converted to 3m
Mode:	TX; CH165 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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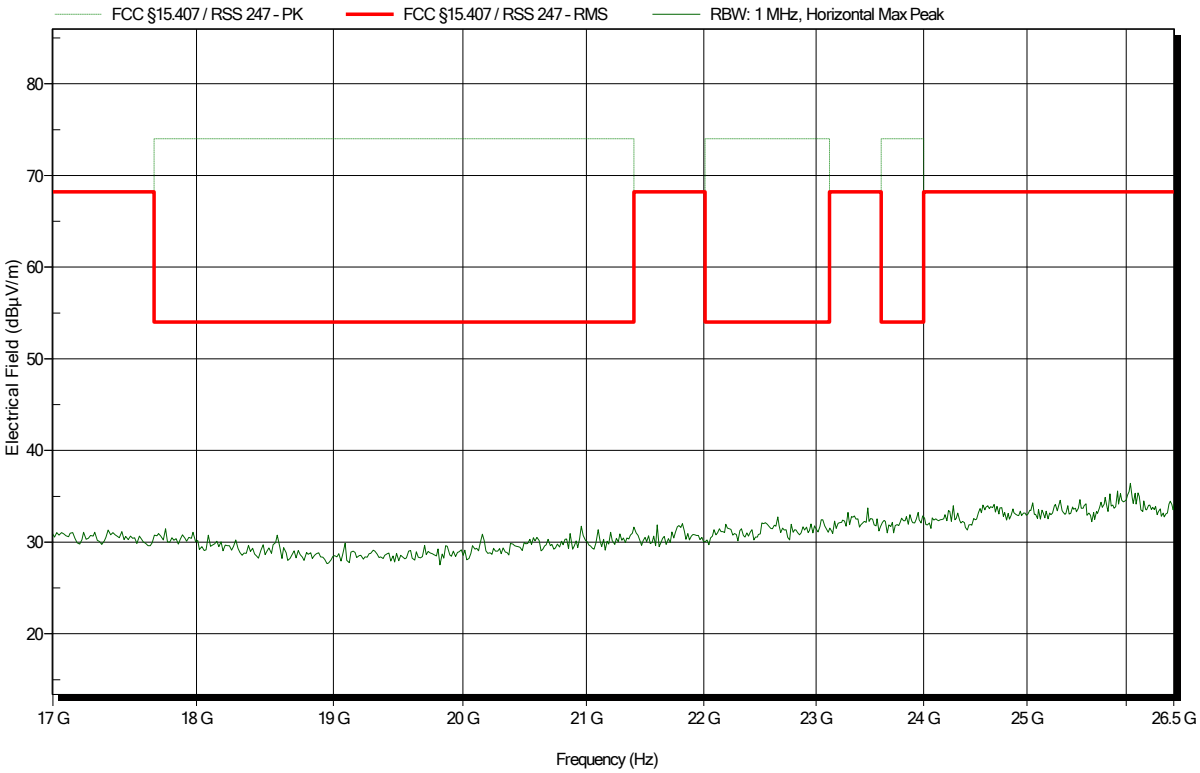

Spurious emissions according to FCC 47 CFR 15.407

Project number:	G0M-1907-8361
Applicant:	R3 - Reliable Realtime Radio Communications GmbH
EUT Name:	EchoRing Ethernet Bridge
Model:	ER-EB 1000M
Test Site:	Eurofins Product Service Germany
Operator:	Abdullah Al Jamal
Test Conditions:	Tnom: 25°C, Vnom:
Antenna:	Amplifier Research AT4560, Vertical
Measurement distance:	1 m converted to 3m
Mode:	TX; CH165 – EUT vertical (antenna 90°) – Test Sample ID 29090
Test Date:	2020-05-12
Note:	

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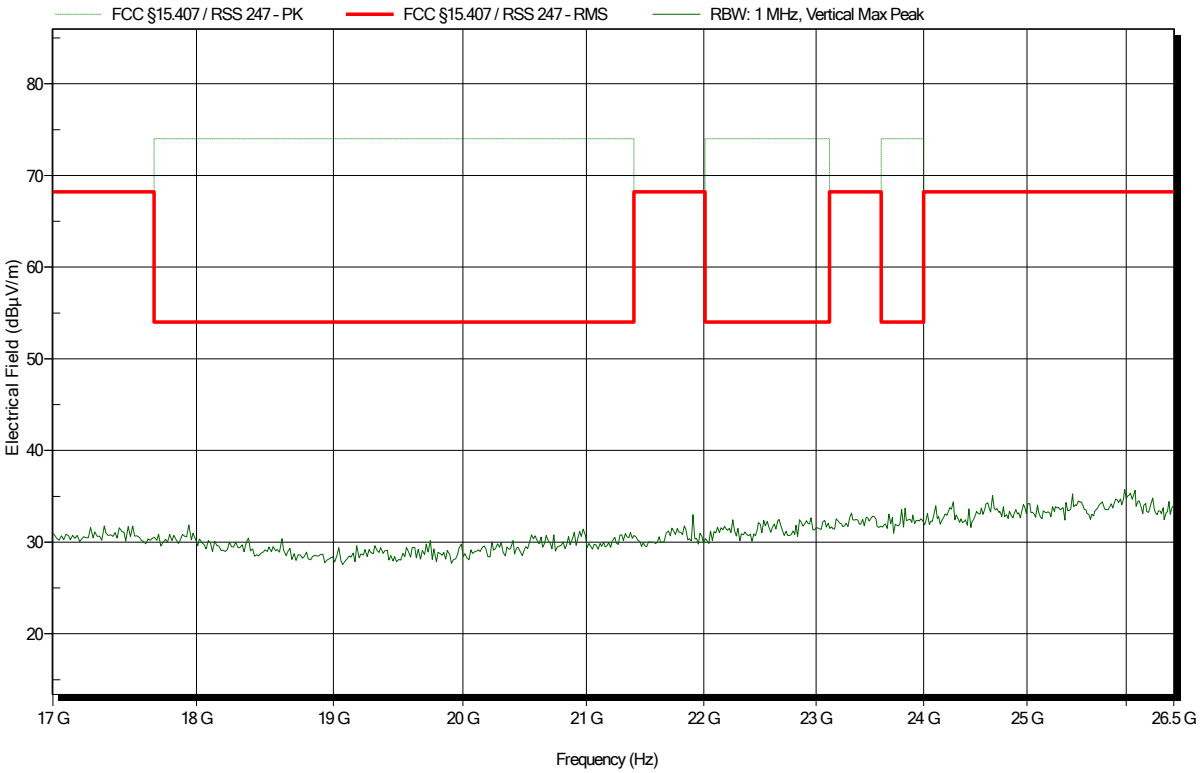

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