EMC TEST REPORT

FCC 47 CFR Part 15B, ISED ICES-003 Issue 6

Report Reference No	G0M-2003-8874-EF0115B-V01
Testing Laboratory	Eurofins Product Service GmbH
Address	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation	DAkkS - Registration number : D-PL-12092-01-03 (ISED) ISED Testing Laboratory site: 3470A-2 DAkkS - Registration number : D-PL-12092-01-04 (FCC) FCC Filed Test Laboratory, Reg.-No.: 96970
Applicant	NewTec GmbH
Address	Buchenweg 3 89284 Pfaffenhofen a. d. Roth GERMANY
Test Specification Standard(s)	47 CFR Part 15 Subpart B ISED ICES-003 Issue 6 ANSI C63.4:2014+A1:2017
Non-Standard Test Method	None
Equipment under Test (EUT):	
Product Description	Industrial Gateway
Model(s)	NTSecureGateway
Additional Model(s)	None
Brand Name(s)	None
Hardware Version(s)	V2.1
Software Version(s)	V0.9
FCC-ID	2AWTTNT-SECGW
IC	N/A
Test Result	**PASSED**

Possible test case verdicts:		
required by standard but not tested	N/T	
not required by standard	N/R	
required by standard but not appl. to test object	N/A	
test object does meet the requirement	P(PASS)	
test object does not meet the requirement	F(FAIL)	
Testing:		
Date of receipt of test item	2020-06-30	
Report:		
Compiled by	Manuel Engel	
Tested by (+ signature) (Responsible for Test)	Manuel Engel	.....
Approved by (+ signature) (Deputy Head of Lab)	Jens Marquardt	.....
Date of Issue	2020-10-23	
Total number of pages	33	
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:		

ABBREVIATIONS AND ACRONYMS

Acronyms	
Acronym	Description
EUT	Equipment Under Test
FCC	Federal Communications Commission
ISED	Innovation, Science and Economic Development Canada
T_{NOM}	Nominal operating temperature
V_{NOM}	Nominal supply voltage

VERSION HISTORY

Version History			
Version	Issue Date	Remarks	Revised By
01	2020-10-23	Initial Release	-

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1 Equipment (Test Item) Under Test

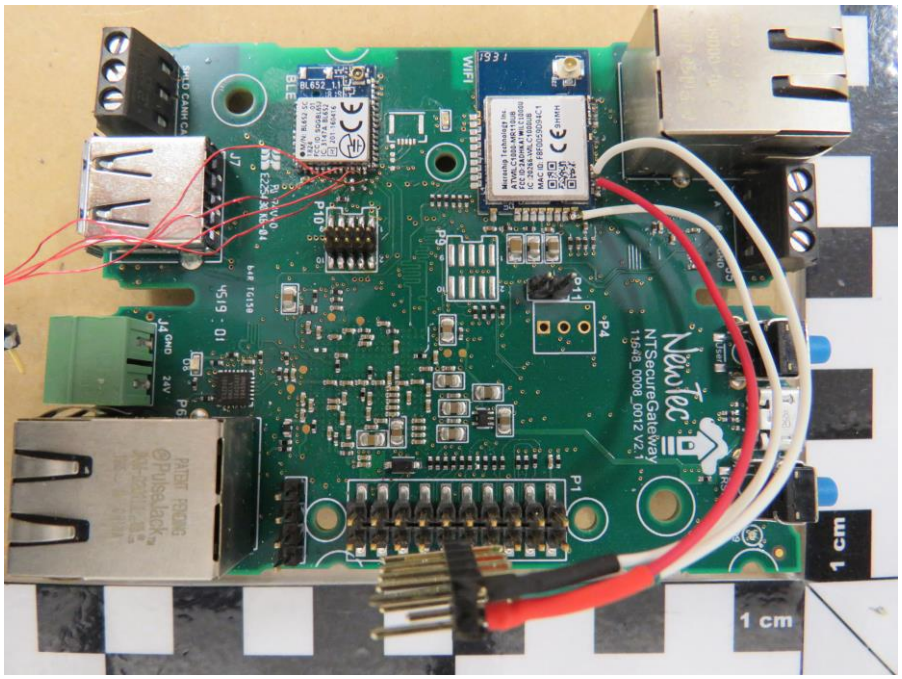
Description	Industrial Gateway	
Model	NTSecureGateway	
Additional Model(s)	None	
Brand Name(s)	None	
Serial Number(s)	000035	
Hardware Version(s)	V2.1	
Software Version(s)	V0.9	
FCC-ID	2AWTTNT-SECGW	
IC	N/A	
Class	Class A	
Equipment type	Table top	
Highest internal frequency [MHz]	500, device use ISM band 2.4 GHz	
Radio Module 1	Type	Wi-Fi Module
	Model	ATWILC1000-MR110UB
	Manufacturer	Microchip Technology / Atmel
	FCC-ID	2ADHKATWILC1000U
	IC	20266-WILC1000UB
Radio Module 2	Type	Bluetooth
	Model	BL652-SC-01
	Manufacturer	LAIRD
	FCC-ID	SQGBL652
	IC	3147A-BL652
Supply Voltage	V_{NOM}	24 V DC
AC/DC-Adaptor	None dedicated AC/DC adaptor	
Manufacturer	NewTec GmbH Buchenweg 3 89284 Pfaffenhofen a. d. Roth GERMANY	

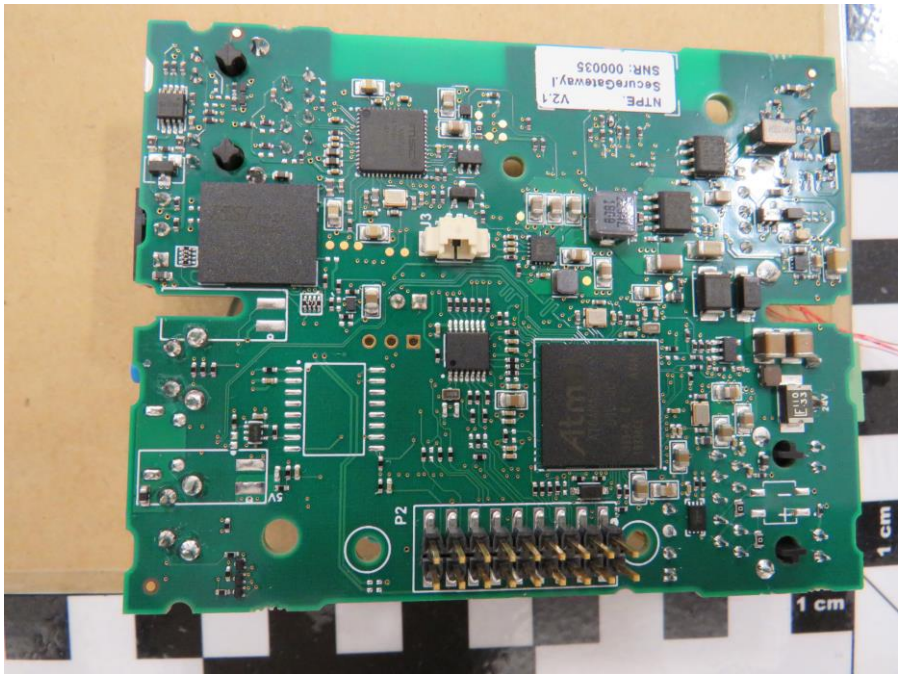
1.1 Equipment Ports

Name	Type	Attributes	Comment
Power supply	DC	Count: 1 Direction: In Service only: No	Maximum length 2 m
Network	IO	Count: 2 Direction: IO Service only: No	Ports shielded
USB	IO	Count: 2 Direction: IO Service only: Yes	1x USB-A port 1x Micro-USB
WIFI	IO	Count: 1 Direction: IO Service only: No	Antenna port SMA
BLE	IO	Count: 1 Direction: IO Service only: No	Antenna port SMA

Description:	
AC	AC mains power input/output port
DC	DC power input/output port
BAT	DC power input port connected to external battery
IO	Input/Output port
TP	Telecommunication port
NE	Non-electrical port

1.2 Equipment Photos - Internal

PCB top


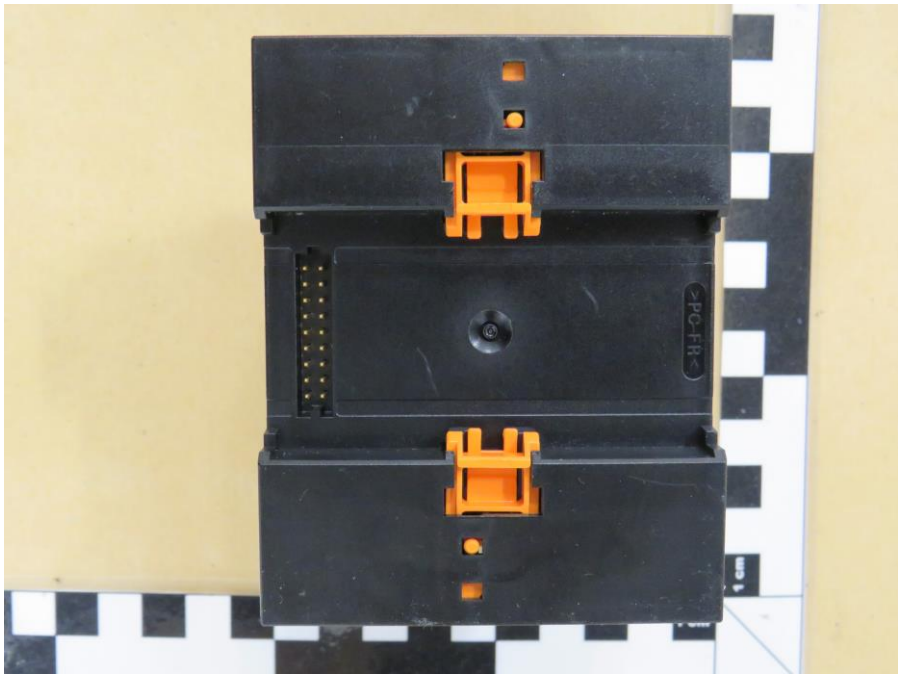
PCB bottom


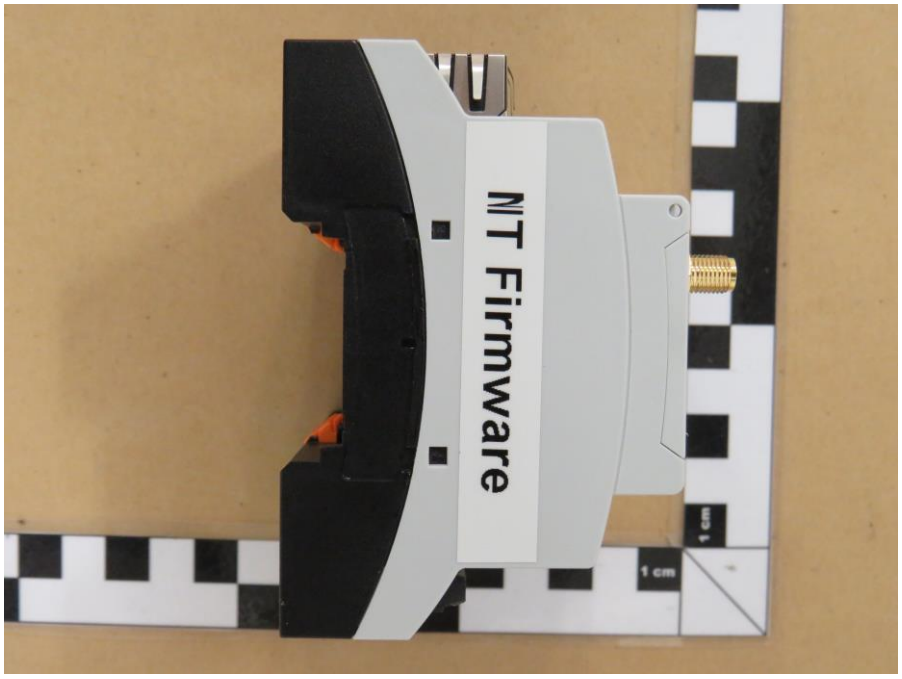
Radio module WI-FI

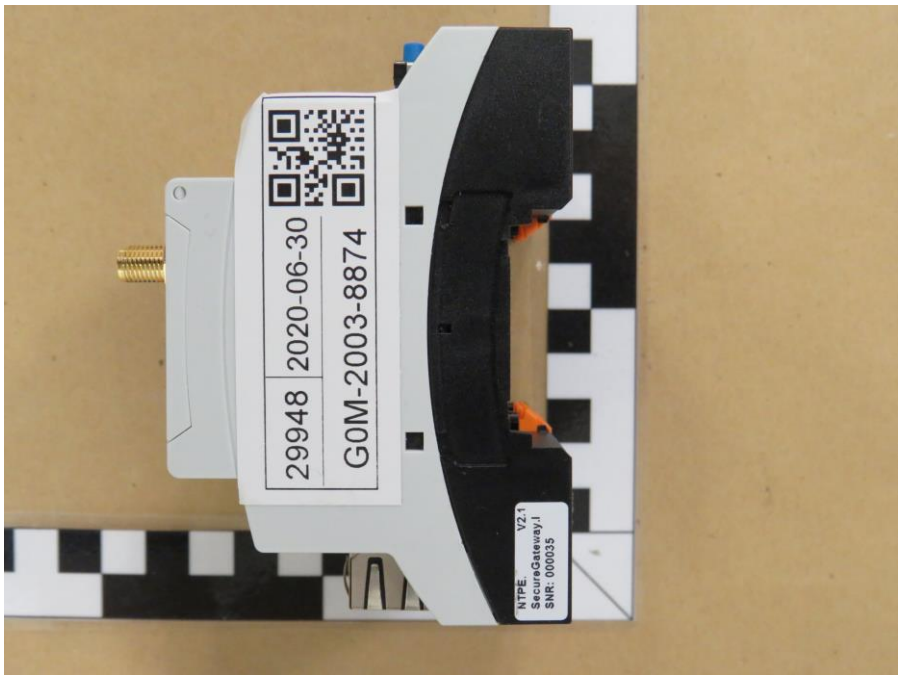
Radio module Bluetooth

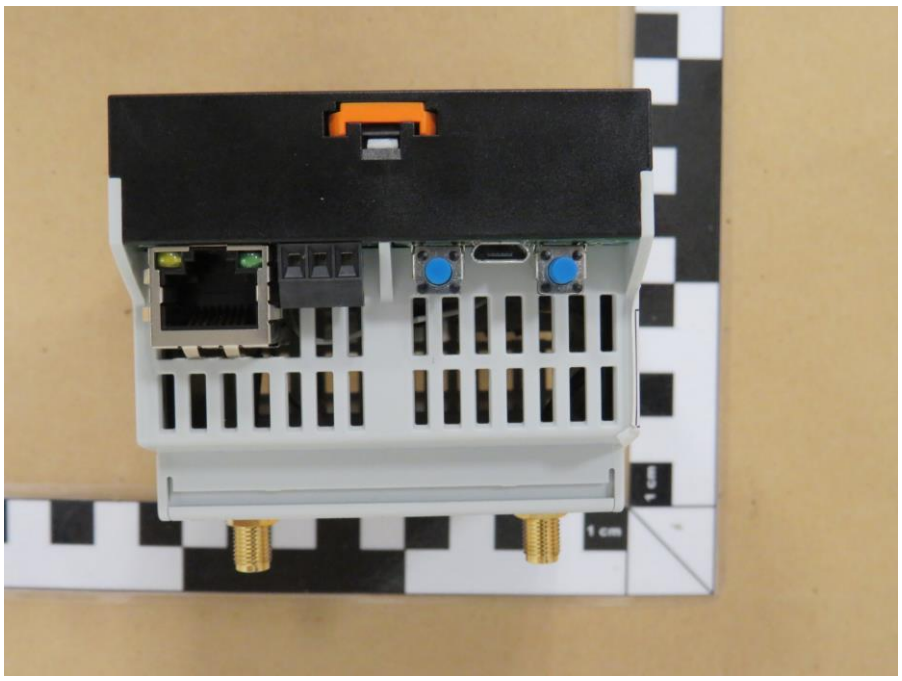
1.3 Equipment Photos - External

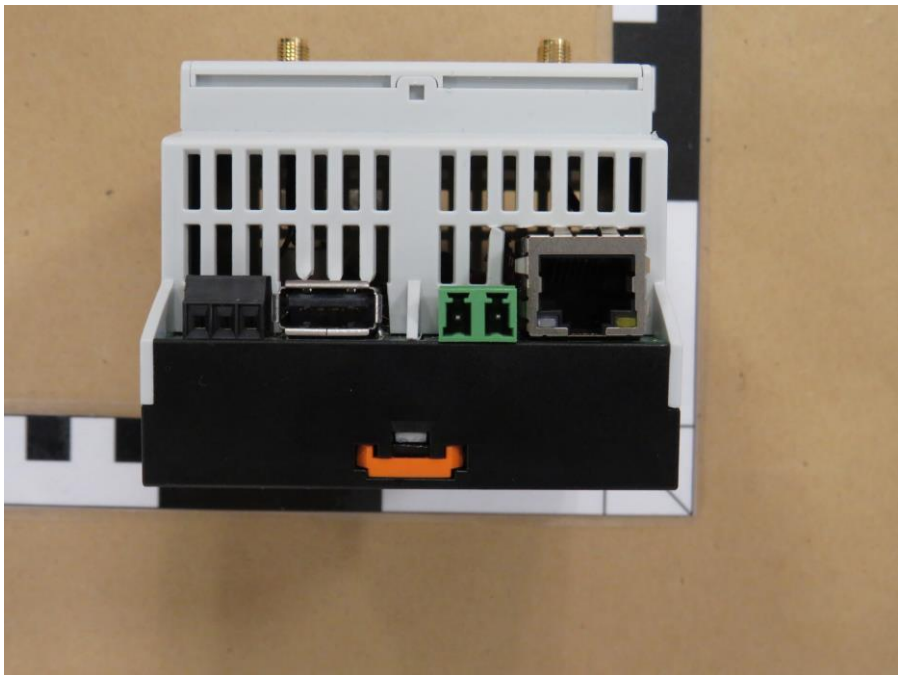
EUT front

EUT back


EUT left


EUT right


EUT top


EUT bottom


1.4 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
EUT	Antenna	Pulse	W1010	SMA Antenna 2 dBi
AE	Notebook	Dell	Latitude ES5410	LP10012
AE	AC/DC adaptor	Mean Well	GST120A24-P1M	-
AE	Bluetooth dongle	LogiLink	BT0015	-
Description:				
EUT	Equipment Under Test			
AE	Auxiliary Equipment			
SIM	Simulator			
MON	Monitoring Equipment			
CBL	Connecting Cable			
Comment:				

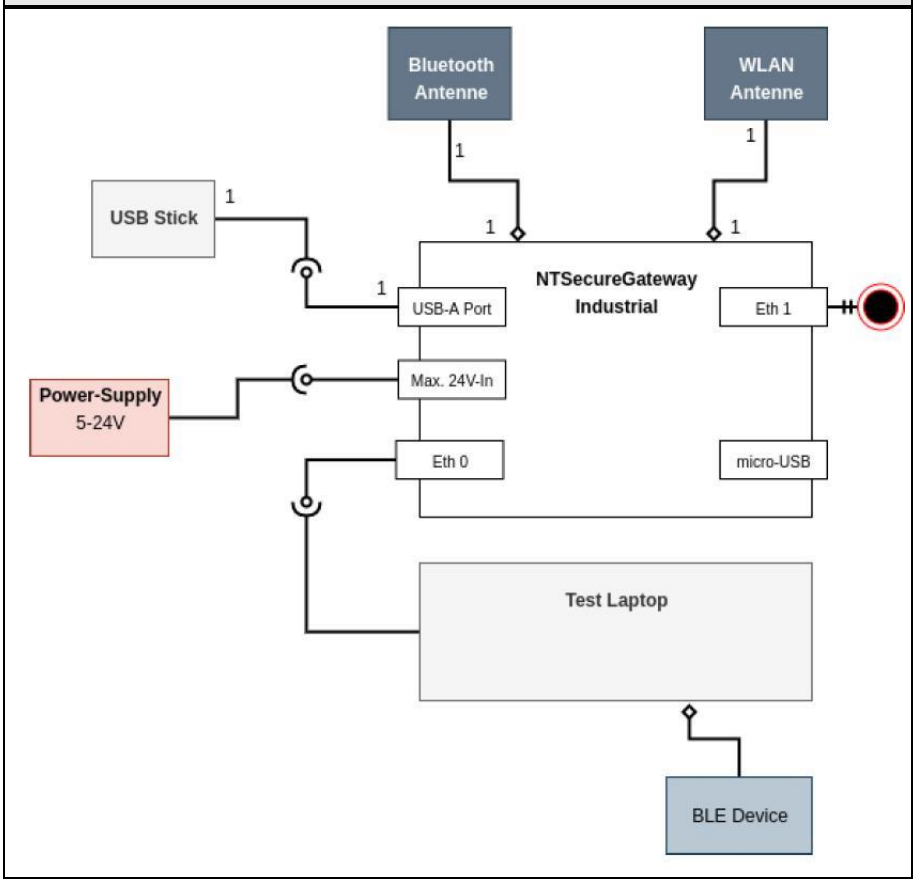
1.5 Operational Modes

Mode #	Description
1	Test mode script active on notebook, following function are implemented to simulate the intended use. - Get IP address from Test PC via DHCP - ping Test PC - Write and read from USB device - Scan for wireless access points - Try to send CAN messages - Scan for Bluetooth low energy devices
Comment:	

1.6 EUT Configuration

Configuration #	Description
1	Antennas connected to the ports BLE and Wifi. USB stick connected to USB-A port. Ethernet port on bottom of EUT connected via Ethernet CAT 6 shielded cable to notebook. Notebook connected via USB cable to USB Bluetooth dongle. Device powered with 24 V DC.
2	Antennas connected to the ports BLE and WiFi. USB stick connected to USB-A port. Ethernet port on bottom of EUT connected via Ethernet CAT 6 shielded cable to notebook. Notebook connected with USB Bluetooth dongle. Device powered with 24 V DC via AC/DC adaptor, adaptor powered with 120 V 60 Hz.
Comment:	

Block diagram configuration



1.7 Sample emission level calculation

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

Reading:

This is the reading obtained on the spectrum analyser in dBµV. Any external preamplifiers used are taken into account through internal analyser 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 analyser. 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 Analyser (dBµV) + A.F. (dB/m) = Net field strength (dBµV/m)

Net:

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

Limit:

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

Limit (dBµV/m) = 20*log (µV/m)

Margin:

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

Example only:

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

2 Result Summary

FCC 47 CFR Part 15B, ISED ICES-003 Issue 6				
Reference	**Requirement**	**Reference Method**	**Result**	**Remarks**
Emission				
FCC 15.109 ICES-003, 6.2	Radiated emissions	ANSI C63.4:2014 +A1:2017	PASS	-
FCC 15.107 ICES-003, 6.1	AC power line conducted emissions	ANSI C63.4:2014 +A1:2017	PASS	-
Comment:				

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

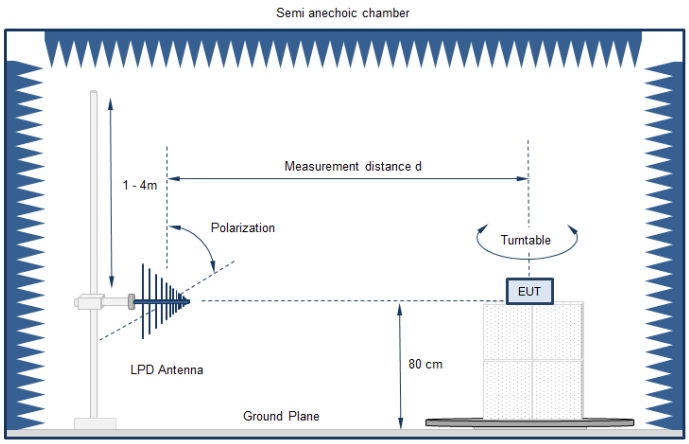
2.1 Test Conditions and Results - Radiated emissions acc. to ANSI C63.4

2.1.1 Information

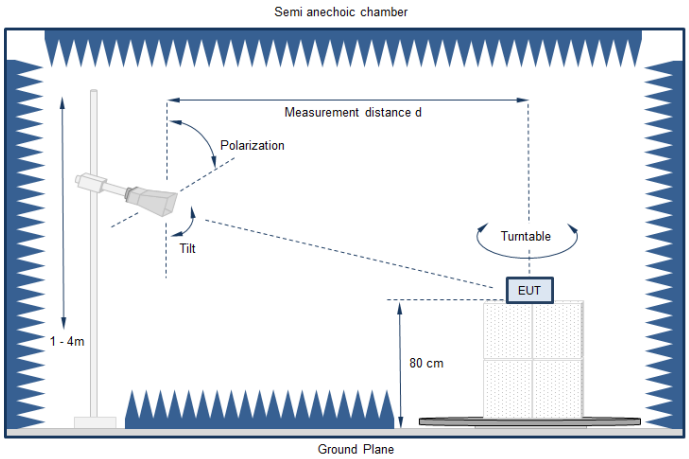
Test Information	
Reference	FCC 15.109, ICES-003, 6.2
Reference method	ANSI C63.4:2014+A1:2017 Section 8
Equipment class	Class A
Equipment type	Table top
Highest internal frequency [MHz]	2500
Measurement range	30 MHz to 12500 MHz
Temperature [°C]	23
Humidity [%]	52
Operator	Manuel Engel
Date	2020-09-25

2.1.2 Setup

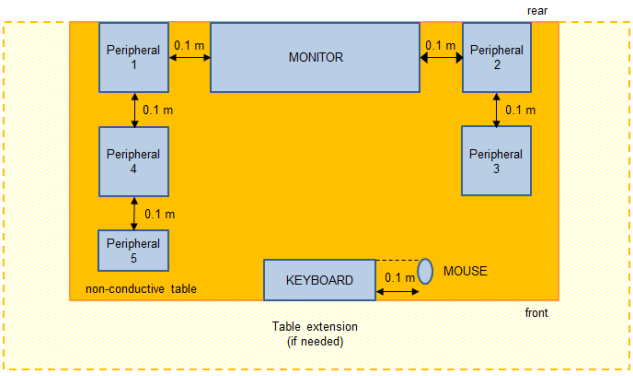
Measurement up to 1 GHz



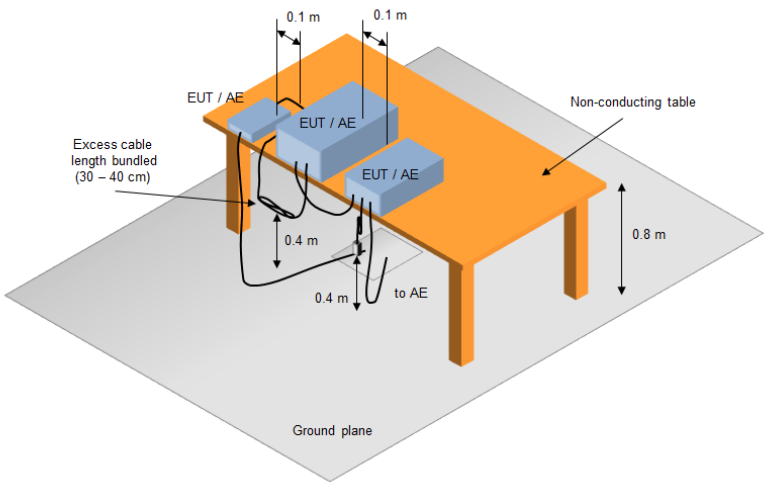
Measurement above 1 GHz



Equipment placement - Table top



Test Setup



2.1.3 Equipment

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

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic chamber	Frankonia	AC1	EF00062	2018-07	2021-07
EMI Test Receiver	Keysight	N9038A-526/WXP	EF01070	2020-06	2021-06
AC & DC Power Supply	Chroma ATE Inc.	61604	EF01380	2020-07	2021-07
Biconical Antenna	R&S	HK116	EF00030	2019-04	2022-04
LPD Antenna	R&S	HL223	EF00187	2019-05	2022-05
Horn Antenna	Schwarzbeck	BBHA9120D	EF00018	2019-10	2022-10
Climatic Sensor	Embedded Data Systems, LLC.	280010000025417E	EF01054	2020-03	2021-03

2.1.4 Procedure

Exploratory measurement
1. The EUT was placed on a non-conductive table at a height of 0.8m. 2. The EUT and support equipment, if needed, were set up to simulate typical usage. 3. Cables, of type and length specified by the manufacturer, were connected to at least one port of each type and were terminated by a device or simulating load of actual usage. 4. The antenna was placed at a distance of 3 or 10 m. 5. The received signal was monitored at the measurement receiver. 6. This procedure has to be performed in both antenna polarizations, horizontal and vertical. 7. The arrangement of the equipment with the maximum emission level is shown on the setup picture at item 1.3

Final measurement
1. The EUT was placed on a 0.8 m non-conductive table at a 3 m distance from the receive antenna. The antenna output was connected to the measurement receiver. 2. A biconical antenna was used for the frequency range 30 – 200 MHz, a logarithmic periodical antenna was used for the frequency range from 200 – 1000 MHz. Above one 1 GHz a Double Ridged Broadband Horn antenna was used. The antenna was placed on an adjustable height antenna mast. 3. The EUT and cable arrangement were based on the exploratory measurement results. 4. Emissions were maximized at each frequency by rotating the EUT and adjusting the receive antenna height and polarization. The maximum values were recorded. 5. The test data of the worst-case conditions were recorded and shown on the next pages.

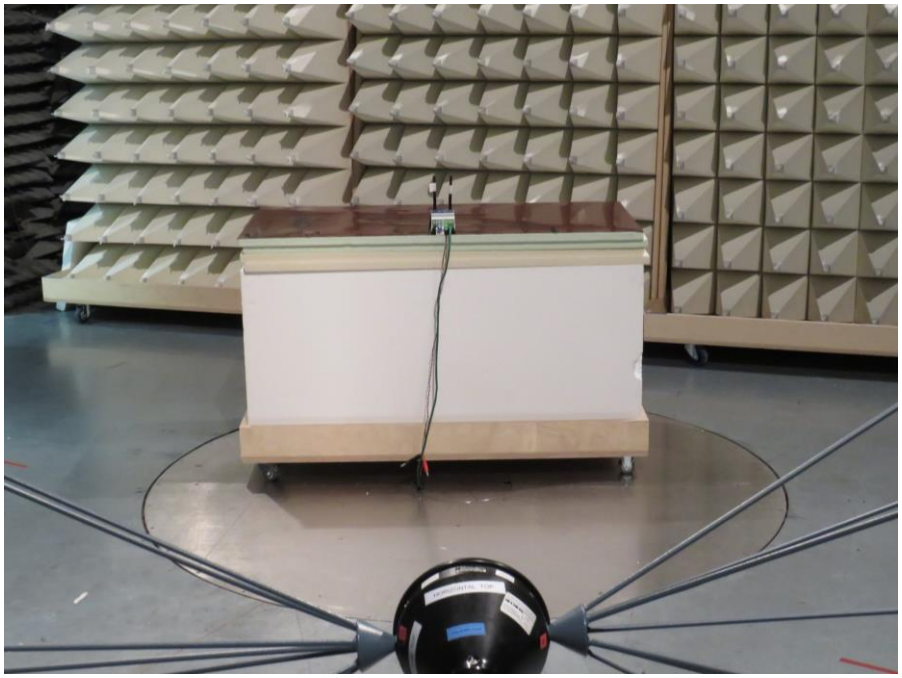
2.1.5 Limits

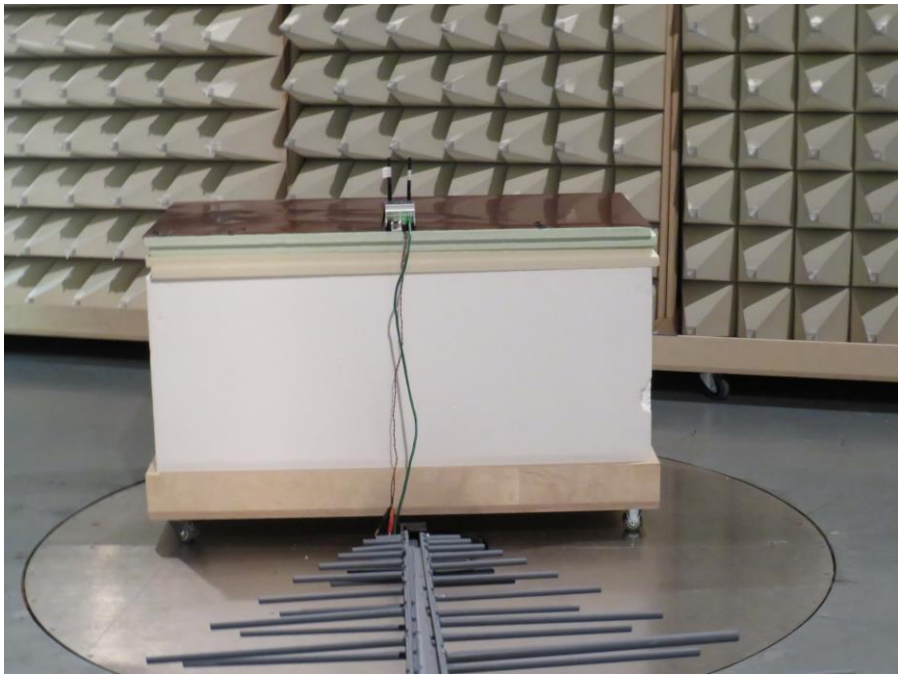
Class A @ 10 m		
Frequency [MHz]	Detector	Limit [dBµV/m]
30 - 88	Quasi-peak	39
88 - 216	Quasi-peak	43.5
216 - 960	Quasi-peak	46.5
960 - 1000	Quasi-peak	49.5
> 1000	Peak Average	69.5 49.5

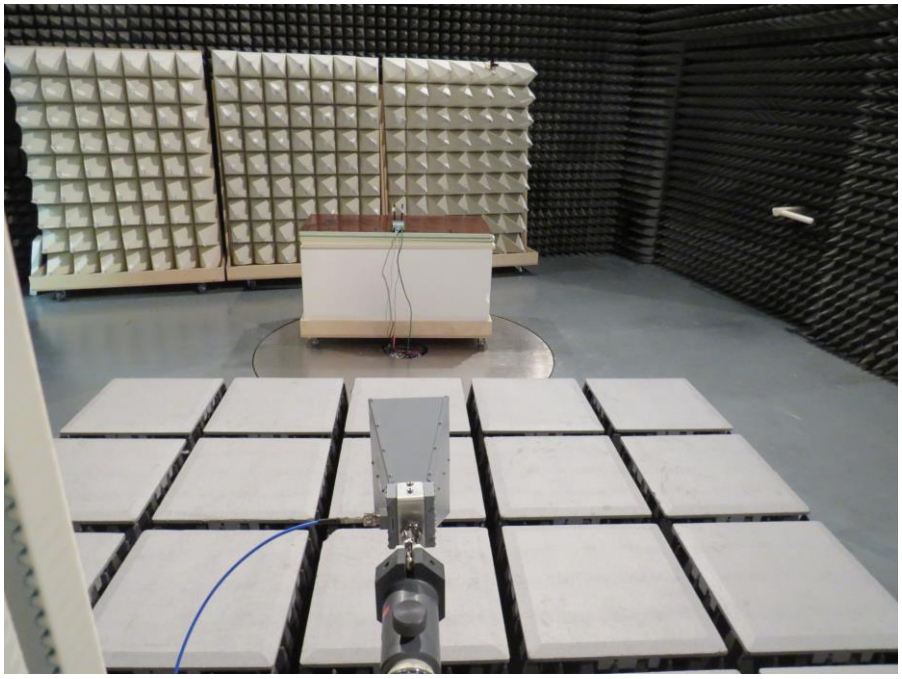
2.1.6 Results

Test Results			
Operational mode	EUT Configuration	Verdict	Remark
1	1	PASS	-

2.1.7 Setup Photos

Test setup with antenna HK116


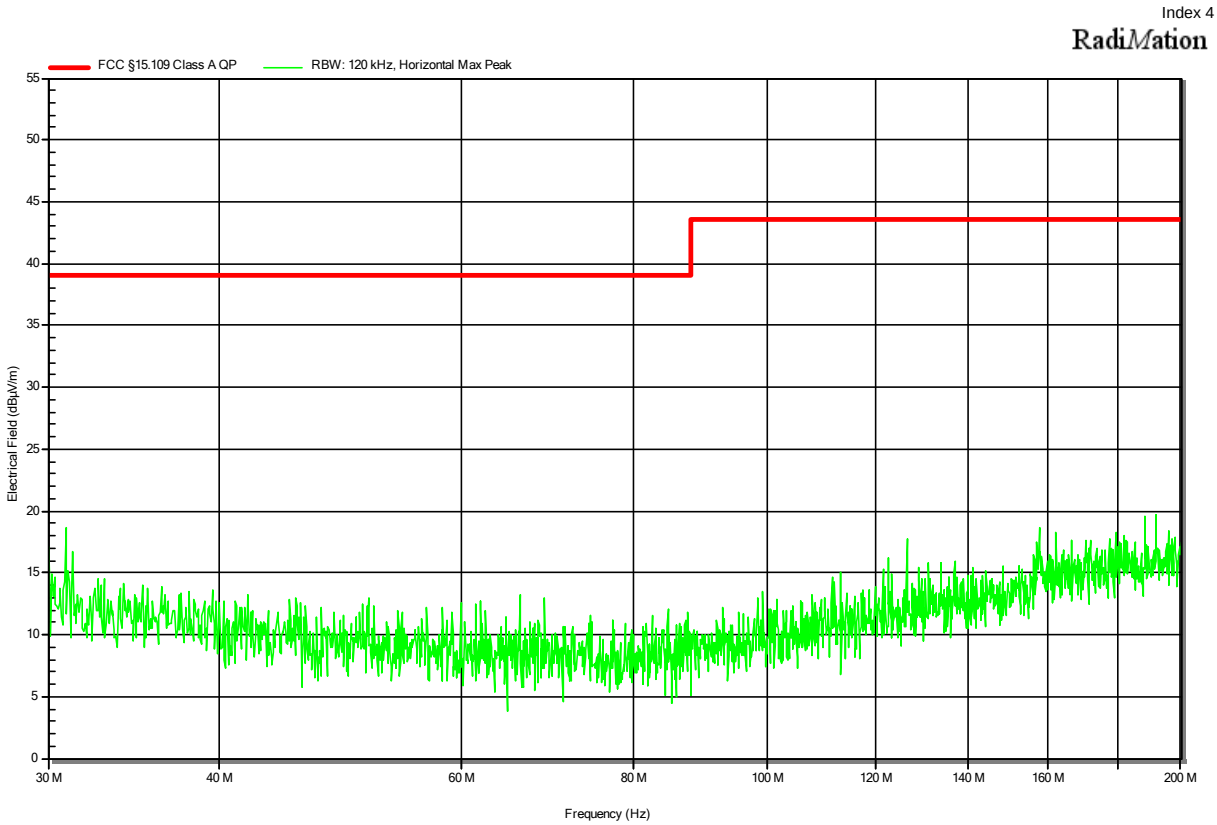
Test setup with antenna HL233


Test setup with antenna BBHA9120D


2.1.8 Records

Radiated emissions
according to FCC part 15B, ICES-003

Project Number:	G0M-2003-8874
Applicant:	NewTec GmbH
Model Description:	Industrial Gateway
Model:	NTSecureGateway
Test Sample ID:	29948
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Engel
Test Date:	2020-09-25
Operating Conditions:	ambient temperature: 23°C power input: 24 V DC
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement Distance:	3m, converted to 10m
Mode:	1
Note 1:	Height 1 m, angle 180°



Radiated emissions
according to FCC part 15B, ICES-003

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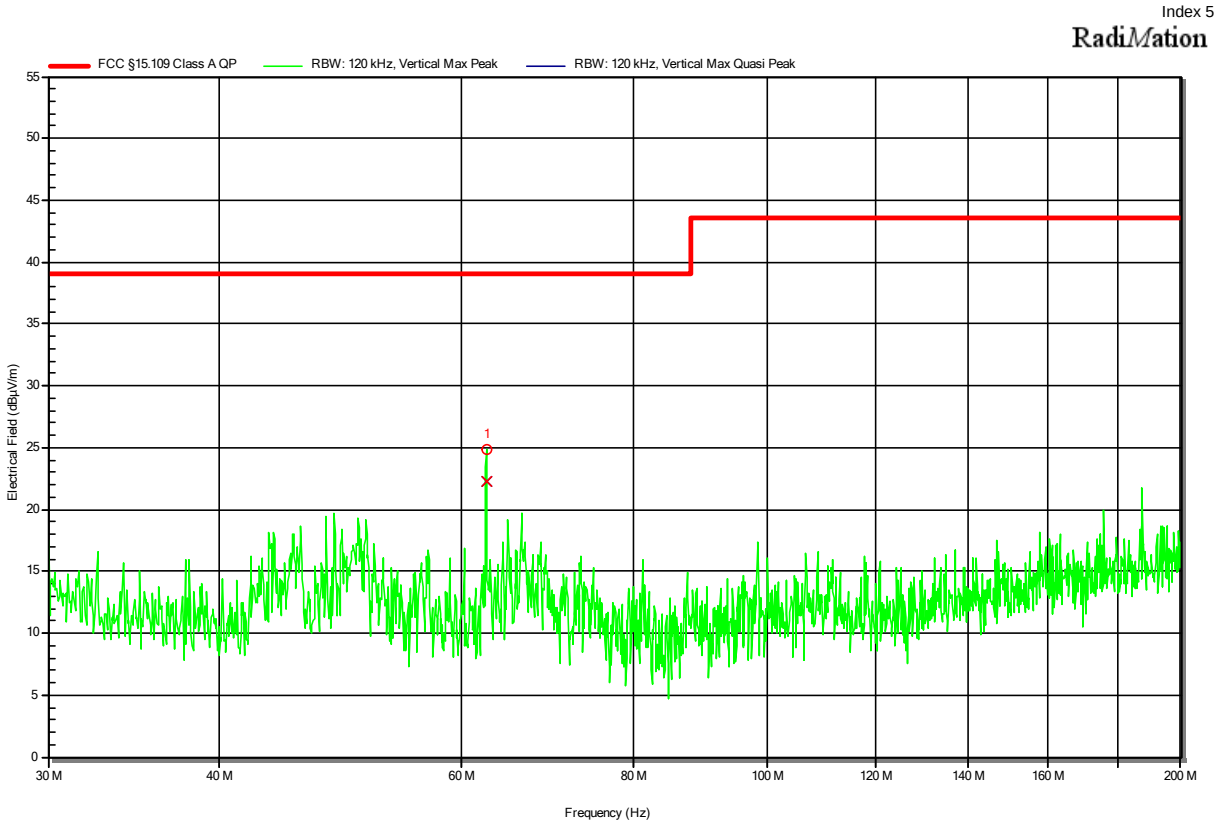
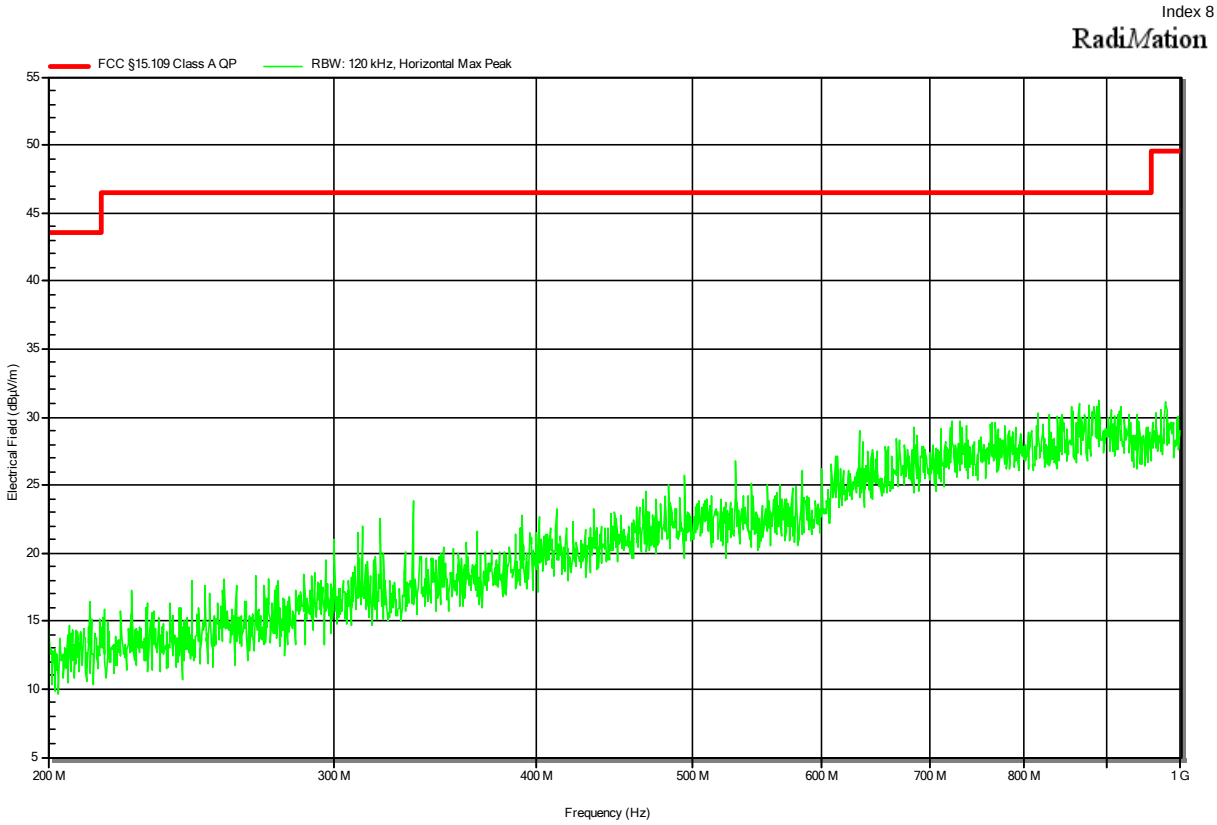
Model Description:	Industrial Gateway
Model:	NTSecureGateway
Test Sample ID:	29948
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Engel
Test Date:	2020-09-25
Operating Conditions:	ambient temperature: 23 °C power input: 24 V DC
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement Distance:	3m, converted to 10m
Mode:	1



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	62.505 MHz	22.22 dBµV/m	39.08 dBµV/m	-16.87 dB	Pass	0 degrees	1.4 m

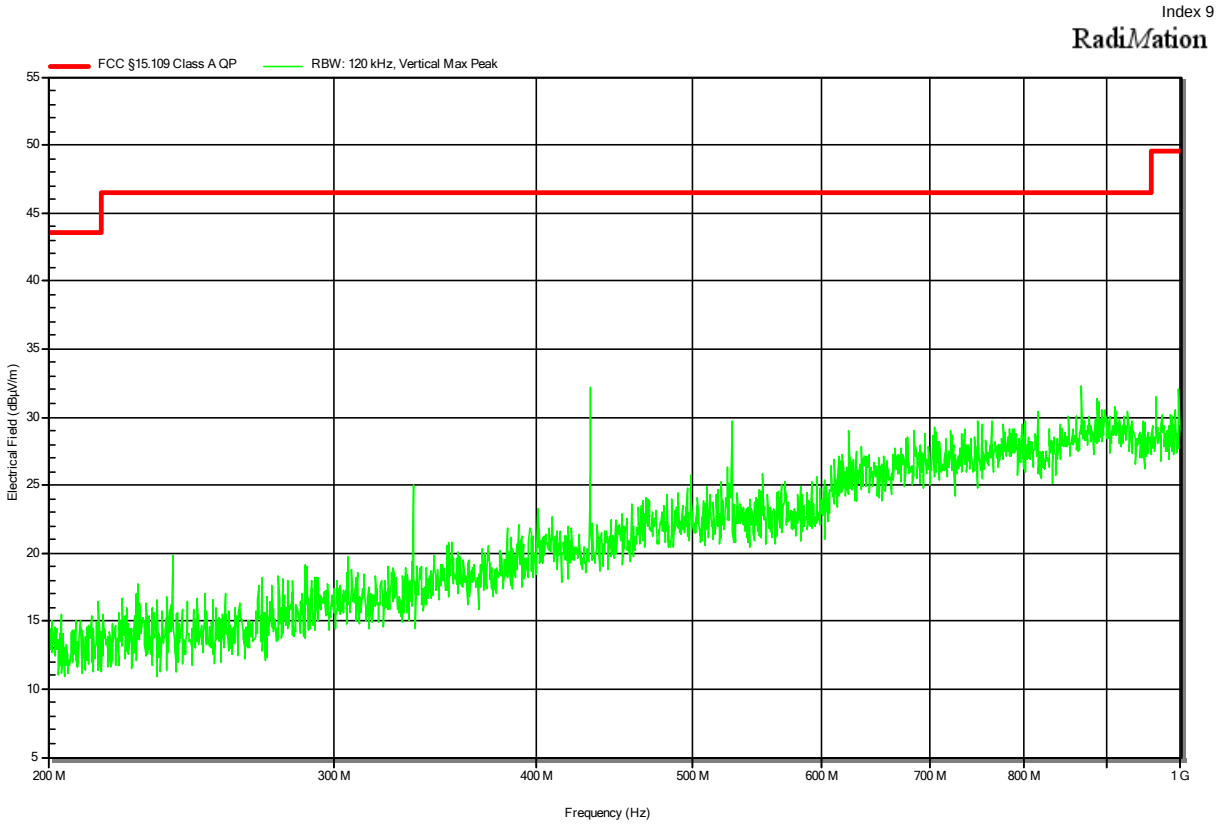
Radiated emissions
according to FCC part 15B, ICES-003

Project Number:	G0M-2003-8874
Applicant:	NewTec GmbH
Model Description:	Industrial Gateway
Model:	NTSecureGateway
Test Sample ID:	29948
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Engel
Test Date:	2020-09-25
Operating Conditions:	ambient temperature: 23°C power input: 24 V DC
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement Distance:	3m, converted to 10m
Mode:	1
Note 1:	Height 1m, angle 0°



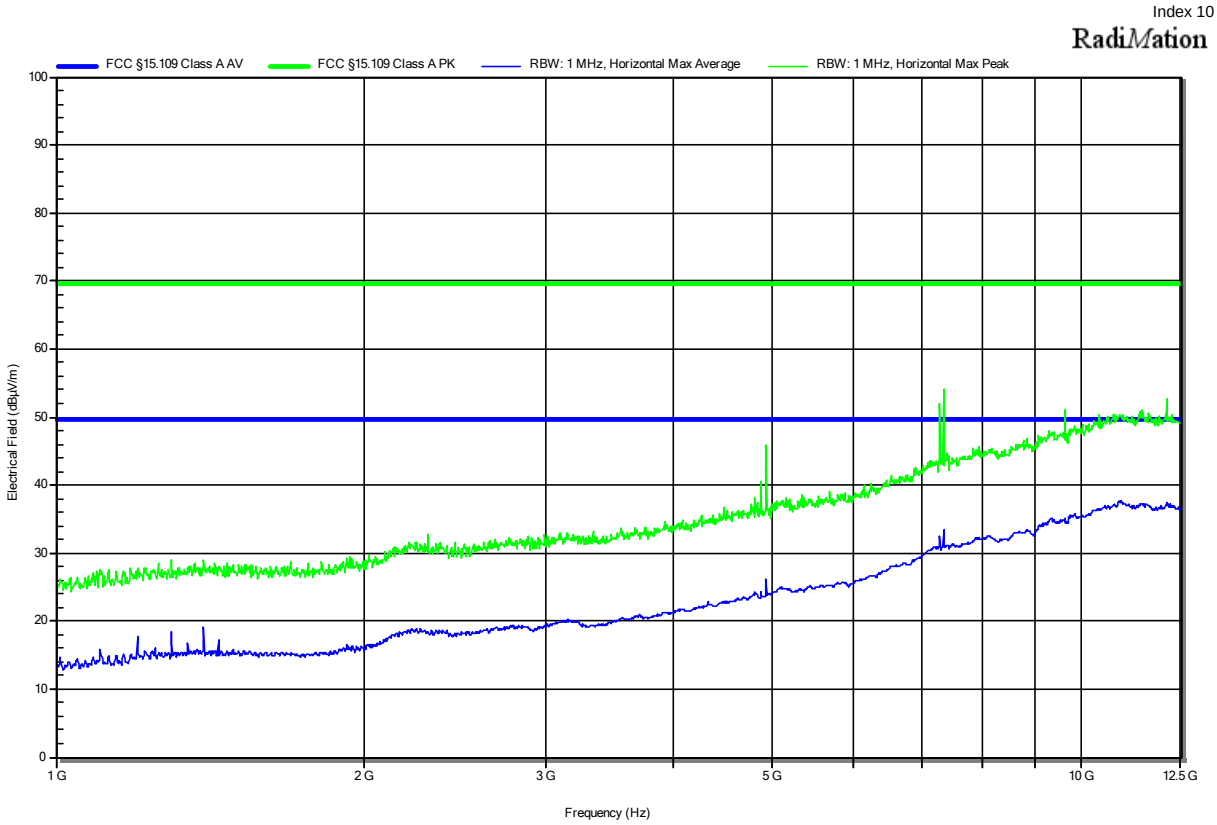
Radiated emissions
according to FCC part 15B, ICES-003

Project Number:	G0M-2003-8874
Applicant:	NewTec GmbH
Model Description:	Industrial Gateway
Model:	NTSecureGateway
Test Sample ID:	29948
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Engel
Test Date:	2020-09-25
Operating Conditions:	ambient temperature: 23°C power input: 24 V DC
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement Distance:	3m, converted to 10m
Mode:	1
Note 1:	Height 1.14 m, angle 8°



Radiated emissions
according to FCC part 15B, ICES-003

Project Number:	G0M-2003-8874
Applicant:	NewTec GmbH
Model Description:	Industrial Gateway
Model:	NTSecureGateway
Test Sample ID:	29948
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Engel
Test Date:	2020-09-25
Operating Conditions:	ambient temperature: 23°C power input: 24 V DC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement Distance:	3m, converted to 10m
Mode:	1
Note 1:	Height 1 m, angle 0°



Radiated emissions
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Operating Conditions:	ambient temperature: 23°C power input: 24 V DC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement Distance:	3m, converted to 10m
Mode:	1
Note 1:	Height 1 m, angle 0°

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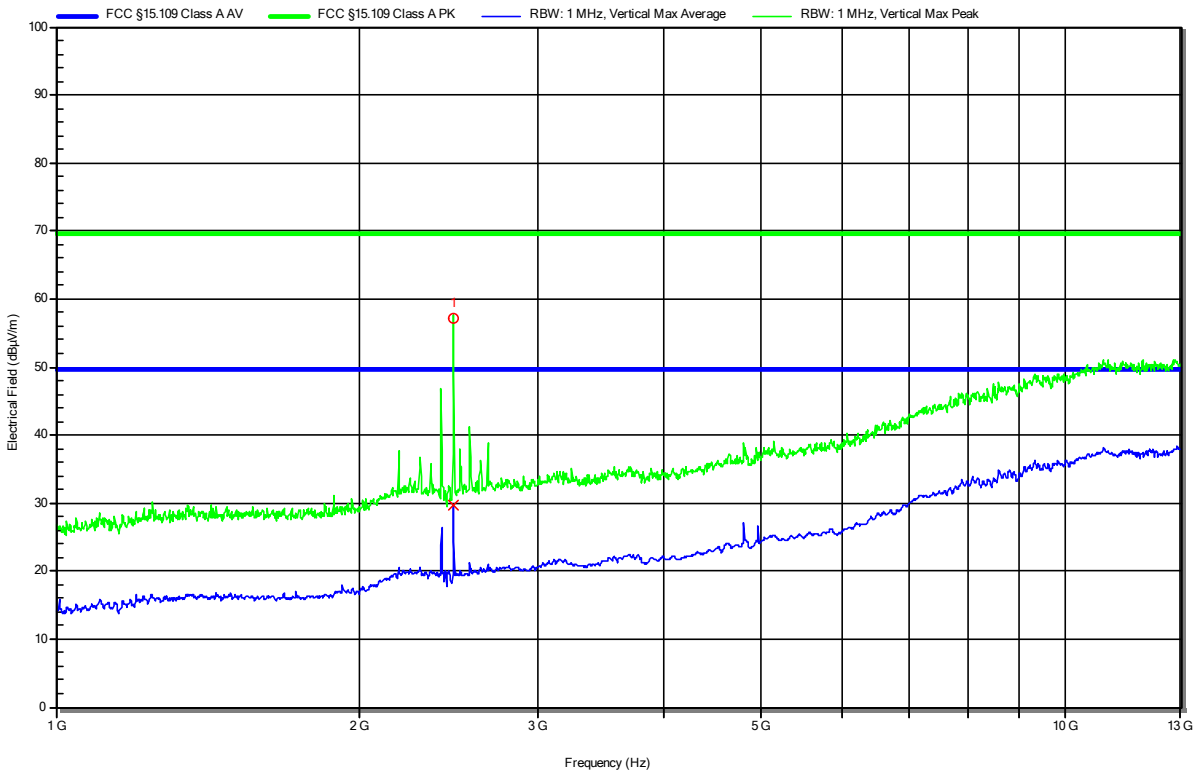
RadiMation



Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Angle	Height
1	2.474 GHz	57.17 dBµV/m	69.54 dBµV/m	-12.37 dB	Carrier signal ISM band 2.4 GHz		

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height
1	2.474 GHz	29.63 dBµV/m	49.54 dBµV/m	-19.91 dB	Carrier signal ISM band 2.4 GHz		

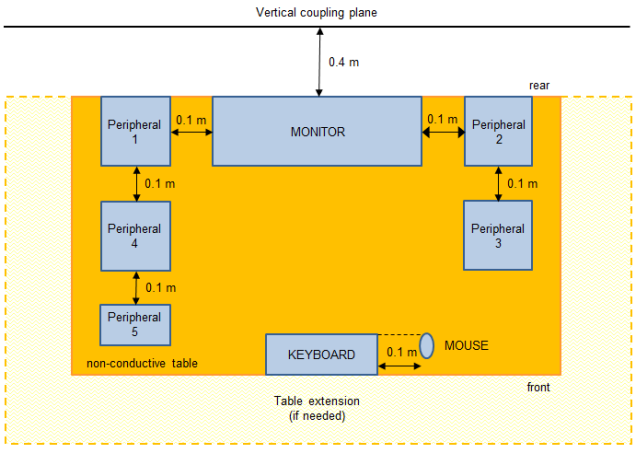
2.2 Test Conditions and Results - Conducted emissions acc. to ANSI C63.4

2.2.1 Information

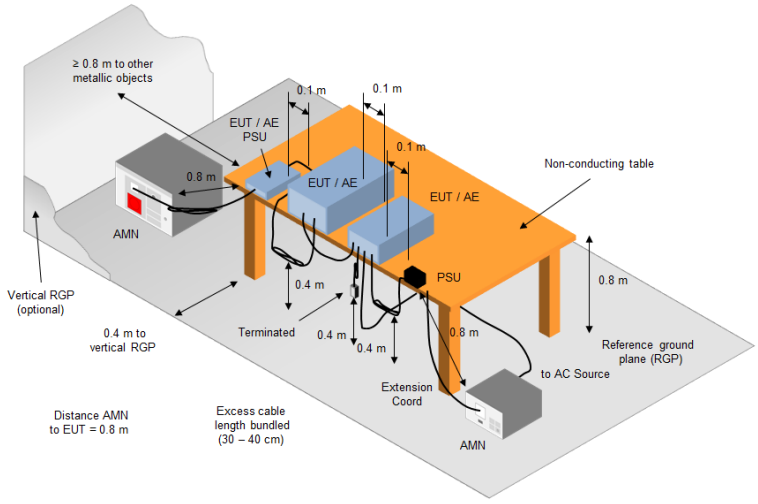
Test Information	
Reference	FCC 15.107, ICES-003, 6.1
Reference method	ANSI C63.4:2014+A1:2017 Section 12
Measurement range	150 kHz to 30 MHz
Equipment class	Class A
Equipment type	Table top
Temperature [°C]	23
Humidity [%]	52
Operator	Manuel Engel
Date	2020-09-25

2.2.2 Setup

Equipment placement



Test Setup



2.2.3 Equipment

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

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
AMN	Schwarzbeck	NSLK 8127	EF01592	2020-07	2021-07
AMN	R&S	ESH3-Z5	EF00036	2019-07	2021-07
Pulse Limiter	R&S	ESH3-Z2	EF01063	2020-07	2021-07
EMI Test Receiver	R&S	ESR 7	EF00943	2020-07	2021-07
Programmable AC Source	Chroma ATE Inc.	61604	EF01068	2020-07	2021-07
Climatic Sensor	Embedded Data Systems, LLC.	2800100000254 17E	EF01054	2020-03	2021-03

2.2.4 Procedure

Exploratory measurement

1. The EUT was placed on a non conductive table 0.8 m above the reference ground plane and 0.4 m away from the vertical conducting plane (ANSI C63.4: 2014 item 7.3.1)
2. The power cord that is normally supplied or recommended by the manufacturer was connected to the LISN.
3. The distance between the outer edge of the EUT and the LISN shall be set to 0.8 m. A longer power cord shall be bundled to this length (bundling shall not exceed 40 cm in length).
4. The LISN measurement port was connected to a measurement receiver
5. I/O cables were bundled not longer than 0.4 m
6. Measurement was performed in the frequency range 0.15 – 30MHz on each current-carrying conductor
7. To maximize the emissions the cable positions were manipulated
8. The worst configuration of EUT and cables is shown on a test setup picture at item 1.3

Final measurement

1. The EUT was placed on a non conductive table 0.8 m above the reference ground plane and 0.4 m away from the vertical conducting plane (ANSI C63.4: 2014 item 7.3.1)
2. The power cord that is normally supplied or recommended by the manufacturer was connected to the LISN.
3. The distance between the outer edge of the EUT and the LISN shall be set to 0.8 m. A longer power cord shall be bundled to this length (bundling shall not exceed 40 cm in length).
4. The LISN measurement port was connected to a measurement receiver
5. The EUT and cable arrangement were based on the exploratory measurement results
6. The test data of the worst-case conditions were recorded and shown on the next pages

2.2.5 Limits

Class A		
Frequency [MHz]	Quasi-peak Limit [dBµV]	Average Limit [dBµV]
0.15 - 0.5	79	66
0.5 - 30	73	60

2.2.6 Results

AC power line conducted emissions					
Port	Coupling	Operational mode	EUT Configuration	Verdict	Remark
Power supply	AMN	1	2	PASS	-

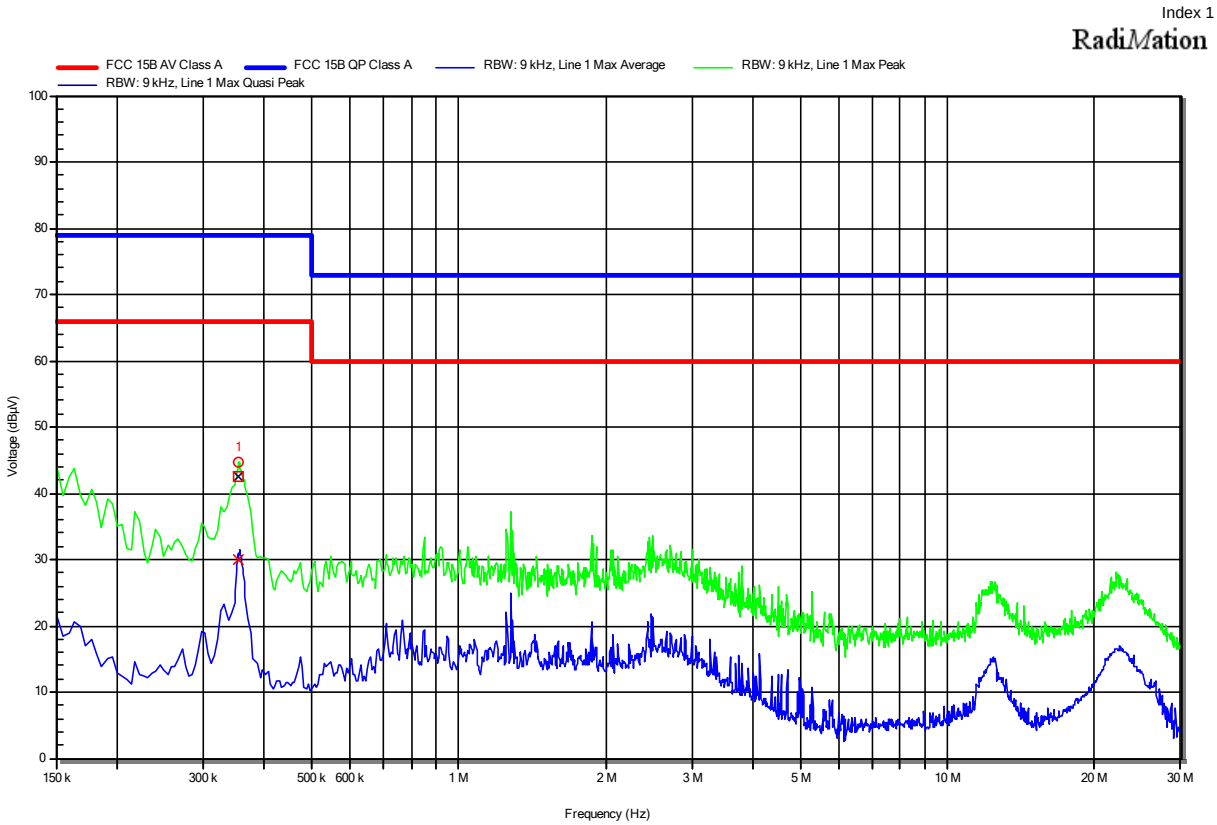
2.2.7 Setup Photos

Test setup

2.2.8 Records

Conducted emissions at the mains power port according to FCC part 15B, ICES-003

Project Number:	G0M-2003-8874
Applicant:	NewTec GmbH
Model Description:	Industrial Gateway
Model:	NTSecureGateway
Test Sample ID:	29948
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Engel
Test Date:	2020-09-25
Operating Conditions:	ambient temperature: 23°C power input: 120 V 60 Hz
LISN:	Schwarzbeck NSLK 8127 L
Mode:	1, configuration 2
Applied to Port:	AC mains
Note 1:	Device powered with external AC/DC converter

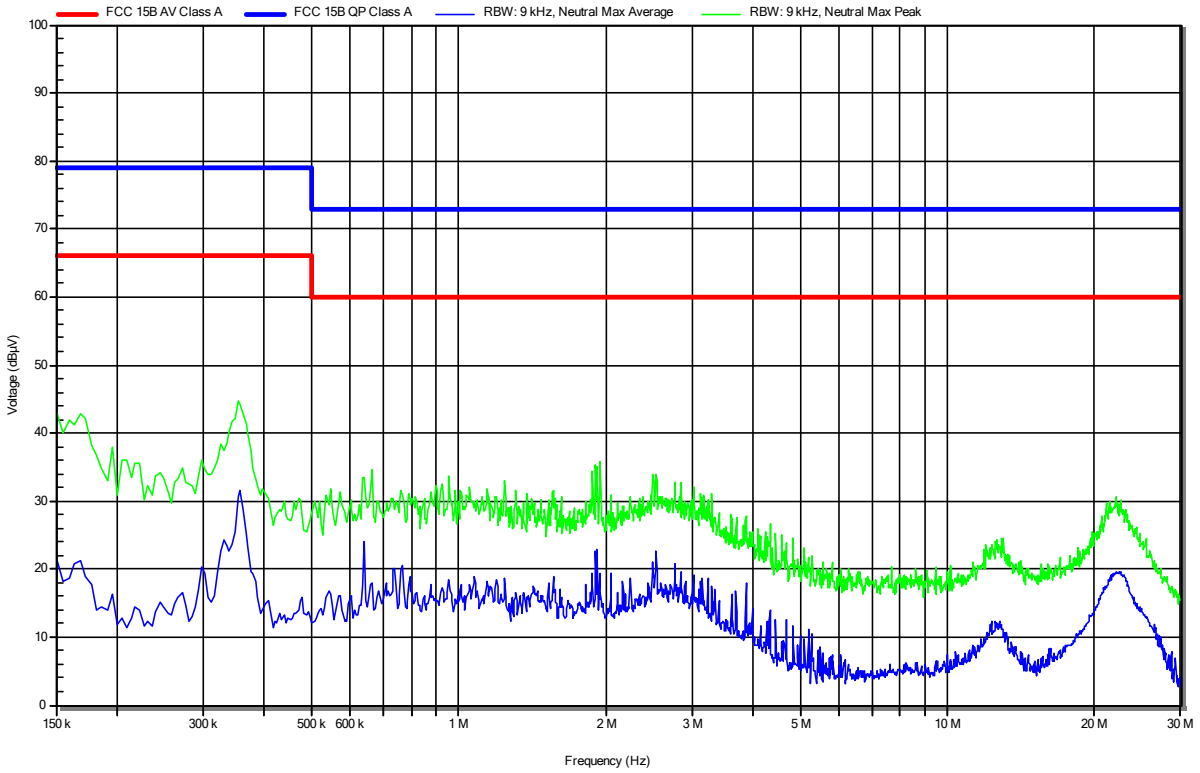


Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	LISN
1	354.75 kHz	42.57 dBµV	79 dBµV	-36.43 dB	Pass	Line 1

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	354.75 kHz	30.06 dBµV	66 dBµV	-35.94 dB	Pass	Line 1

Conducted emissions at the mains power port according to FCC part 15B, ICES-003

Project Number:	G0M-2003-8874
Applicant:	NewTec GmbH
Model Description:	Industrial Gateway
Model:	NTSecureGateway
Test Sample ID:	29948
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Engel
Test Date:	2020-09-25
Operating Conditions:	ambient temperature: 23°C power input: 120 V 60 Hz
LISN:	Schwarzbeck NSLK 8127 N
Mode:	1, configuration 2
Applied to Port:	AC mains
Note 1:	Device powered with external AC/DC converter

Index 2

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