

Test Report

T-0519-4900-00 JP

Type / Model Name: COR

FCC ID T2A-QMETRIXCOR

Product Description: Wireless Queue Sensor

Applicant: Ximes GmbH

EMC -- TEST REPORT

Test Report No. :	T-0519-4900-00 JP	2013-06-06
		Date of issue

Type / Model Name : COR

FCC ID : T2A-QMETRIXCOR

Product Description : Wireless Queue Sensor

Applicant : Ximes GmbH

Address : Hollandstr. 12/12

1020 Wien

AUSTRIA

Manufacturer : Ximes GmbH

Address : Hollandstr. 12/12

1020 Wien

AUSTRIA

Test Result according to the standards listed in clause 1 test standards:	POSITIVE
--	-----------------



Deutsche
Akkreditierungsstelle
D-PL-12141-01-01

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

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1 TEST STANDARDS

The tests were performed according to following standards:

FCC Part 15 Subpart A
October 2010

Code of Regulations Part 15 (Radio Frequency Devices), Subpart A
(General) of the Federal Communications Commission (FCC)

FCC Part 15 Subpart B
October 2010

Code of Regulations Part 15 (Radio Frequency Devices), Subpart B
(Unintentional Radiators) of the Federal Communications Commission
(FCC)

☐ Class A ☒ Class B

Applied Paragraphs: §15.107, §15.109

ANSI C63.4-2009

American National Standard for Methods of Measurement of Radio-
Noise Emissions from Low-Voltage Electrical and Electronic
Equipment in the Range of 9kHz – 40 GHz

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2 OVERVIEW TEST RESULT

Performed test(s)	Result		
	Passed	Failed	Not performed
Conducted disturbance	X		
Radiated disturbance (30 – 1000MHz)	X		

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3 SUMMARY

GENERAL REMARKS:

The EuT incorporates two RF modules (FCC ID: U6TZIGBIT-B0). These modules are not part of this test report. The highest internal oscillator frequency is 25MHz, according to FCC part 15 subclauses 15.33 and 15.109 the observed frequency range is 30MHz to 1000MHz for radiated emission measurement.

FINAL ASSESSMENT:

The equipment under test **fulfills** the EMC requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 2013-05-15

Testing concluded on : 2013-05-22

Checked by:

Tested by:

Wolfgang Straubinger

Jürgen Pessinger

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4 EQUIPMENT UNDER TEST

4.1 Photo documentation of the EuT



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4.2 Power supply system

Power supply voltage: 9-12V DC (external power supply)or
48V DC (Power over Ethernet)

4.3 Short description of the Equipment under Test (EuT)

Number of tested samples: 1
Serial number: none

Dimensions: L: 130mm W: 120mm H: 34mm

EuT operation mode:

The equipment under test was operated during the measurement under the following conditions:

- transceiving mode (information is sent via module 1 and received by module 2), external power supply

- transceiving mode (information is sent via module 1 and received by module 2), Power over Ethernet

EuT configuration:

The following interface cables and peripheral devices were connected during the measurements:

Interface cables:

Interface cable	Length [m]	Type	Line		Line termination
			shielded	unshielded	
DC power line*	1,5	2-wires	☐	☒	External power supply
LAN/POE**	0,5	8-wires	☒	☐	Router/PoE Midspan Port
USB	2	4-wires	☒	☐	open
Ant-1	0	1-wire	☒	☐	antenna
Ant-2	0	1-wire	☒	☐	antenna

* not connected if power supply via power over ethernet is used

** Router is directly connected to EuT if external power supply is used. If power over Ethernet is used the PoE midspan port is switched between router and EuT.

Peripheral devices:

Kind of equipment	Model and/or Manufacturer
External power supply	HCS-3304, Manson, emitel ID 01-02/50-13-001
Router	Fritz!Box WLAN3370, AVM GmbH, emitel ID 02-02/60-12-008
PoE midspan Port	Model 0226-001, PowerDsine Ltd.
Antenna	Supplied by client
Laptop	TECRA A2, Toshiba, emitel ID ,01-01/01-05-005

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5 TEST ENVIRONMENT

5.1 Address of the test laboratory

**emitel GmbH
Ohmstrasse 1
94342 STRASSKIRCHEN
DEUTSCHLAND**

Laboratory registration numbers:

DAkkS Registration number:	D-PL-12141-01-01
KBA Registration number:	KBA-P 00057-01
SNCH Registration number:	SNCH 001/2005
FCC Registration number:	765810
IC Registration number:	IC 5066A-1

5.2 Statement regarding the usage of logos at test reports

The logos of accreditation- and notification bodies displayed at this test reports are only valid for standards listed at the accreditation- or notification scope of emitel GmbH.

5.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature: 15-35 ° C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

All atmospheric pressure values refer to our Laboratory altitude of 324m.

5.4 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4-2 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer does have the sole responsibility for the continued compliance of the device.

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5.5 Measurement Protocol for FCC, VCCI and AUSTEL

5.5.1 GENERAL INFORMATION

5.5.1.1 Test Methodology

Conducted and radiated disturbance testing is performed according to the procedures in International Special Committee on Radio Interference (CISPR) Publication 22 (1997+A1:2000+A2:2002), European Standard EN 55022 (1998+A1:2000+A2:2003) and Australian Standard AS 3548 (which are based on CISPR 22).

The Japanese standard, "Voluntary Control Council for Interference (VCCI) by Data Processing Equipment and Electronic Office Machines, Technical Requirements" is technically equivalent to CISPR 22 (1997+A1:2000+A2:2002). For official compliance, a conformance report must be sent to and accepted by the VCCI.

In compliance with FCC Docket 92-152, "Harmonization of Rules for Digital Devices Incorporate International Standards", testing for FCC compliance may be done following the ANSI C63.4-2003 procedures and using the CISPR 22 Limits.

5.5.1.2 Measurement Error

The data and results referenced in this document are true and accurate. The reader is cautioned that there is some measurement variability due to the tolerances of the test equipment that can contribute to a nominal product measurement uncertainty. The measurement uncertainty was calculated for all measurements listed in this test report according to CISPR 16-4-2 and is documented in the emitel AG quality system according to DIN EN ISO/IEC 17025. Furthermore, component differences and manufacturing process variability of production units similar to that tested may result in additional product uncertainty. If necessary, refer to the test lab for the actual measurement uncertainty for specific tests. The manufacturer has the sole responsibility of continued compliance of the device.

5.5.1.3 Justification

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral into its characteristic impedance or left unterminated. When appropriate, the cables are manually manipulated with respect to each other to obtain maximum disturbances from the unit.

5.5.2 CONDUCTED DISTURBANCE

The final level, expressed in dB μ V, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the CISPR limit, which is equivalent to the Australian AS 3548 limit.

To convert between dB μ V and μ V, the following conversions apply:

$$\text{dB}\mu\text{V} = 20(\log \mu\text{V})$$

$$\mu\text{V} = \text{Inverse log}(\text{dB}\mu\text{V}/20)$$

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5.5.3 RADIATED DISTURBANCE

The final level, expressed in dB μ V/m, is arrived at by taking the reading from the EMI receiver (Level dB μ V) and adding the antenna correction factor and cable loss factor (Factor dB) to it. This is done automatically in the EMI receiver, where the correction factor are stored. This result then has the CISPR limit subtracted from it to provide the Delta which gives the tabular data as shown in the data sheets in section 5.2. The CISPR 22 limit is equivalent to the Australian AS 3548 limit.

Example:	CISPR B	Delta							
Frequency	Level	+	Factor	=	Final	-	Limit	=	CISPR B
(MHz)	(dB μ V)		(dB)		(dB μ V/m)		(dB μ V/m)		(dB)
37.19	10.2	+	12.0	=	22.2	-	40.0	=	-17.8

5.5.4 DETAILS OF TEST PROCEDURES

5.5.4.1 General Standard Information

The test methods used comply with CISPR Publication 22 (1997+A1:2000+A2:2002), EN 55022 (1998+A1:2000+A2:2003) and AS 3548 (1992) - "Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment" and with ANSI C63.4-2003 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

5.5.4.2 Conducted disturbance

Conducted disturbance on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi peak detection, and a Line Impedance Stabilization Network (LISN), with 50 Ω /50 μ H (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimetres above the floor and is positioned 40 centimetres from the vertical ground plane (wall) of the screen room. If the minimum passing margin appears to be less than 20 dB with a peak mode measurement, the emissions are remeasured using a tuned receiver with quasi peak and average detection and recorded on the data sheets.

5.5.4.3 Radiated disturbance

Radiated disturbance from the EUT are measured in the frequency range of 30 to 1000 MHz using a tuned receiver and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi peak detection and measurements above 1000 MHz are made with a 1 MHz/6 dB bandwidth and average/peak detection. Table top equipment is placed on a 1.0 X 1.5 meter non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Interface cables that are closer than 40 centimetres to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna was positioned 3, 10 or 30 meters horizontally from the EUT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters, measurement scans are made with both horizontal and vertical antenna polarizations and the EUT are rotated 360 degrees.

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6 TEST CONDITIONS AND RESULTS

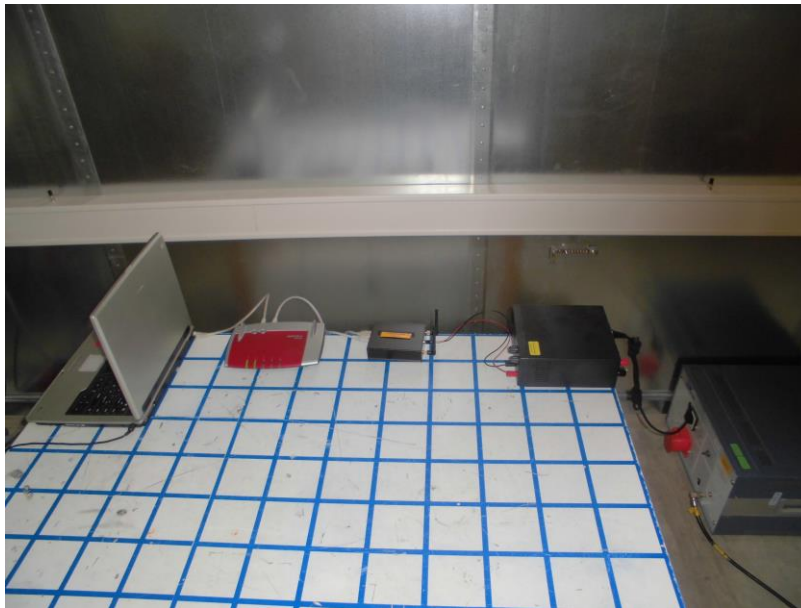
6.1 Conducted disturbance

For test instruments and accessories used see section 7 Part A 4.

6.1.1 Description of the test location

Test location: Shielded Room SK4

6.1.2 Photo documentation of the test set-up



6.1.3 Test specification

Environmental conditions: Temperature: ° C Humidity: % Atmospheric pressure: kPa

Frequency range: 0.15 MHz - 30 MHz

The test was carried out in the following operation mode(s):

- transceiving mode (information is sent via module 1 and received by module 2), external power supply
- transceiving mode (information is sent via module 1 and received by module 2), Power over Ethernet

6.1.4 Test result

Minimal margin to limit 7,7 dB at 4,152 MHz

The requirements are **FULFILLED**.

Remarks: The measurement was performed at the AC input of the external power supply and at the AC
input of the PoE midspan port.

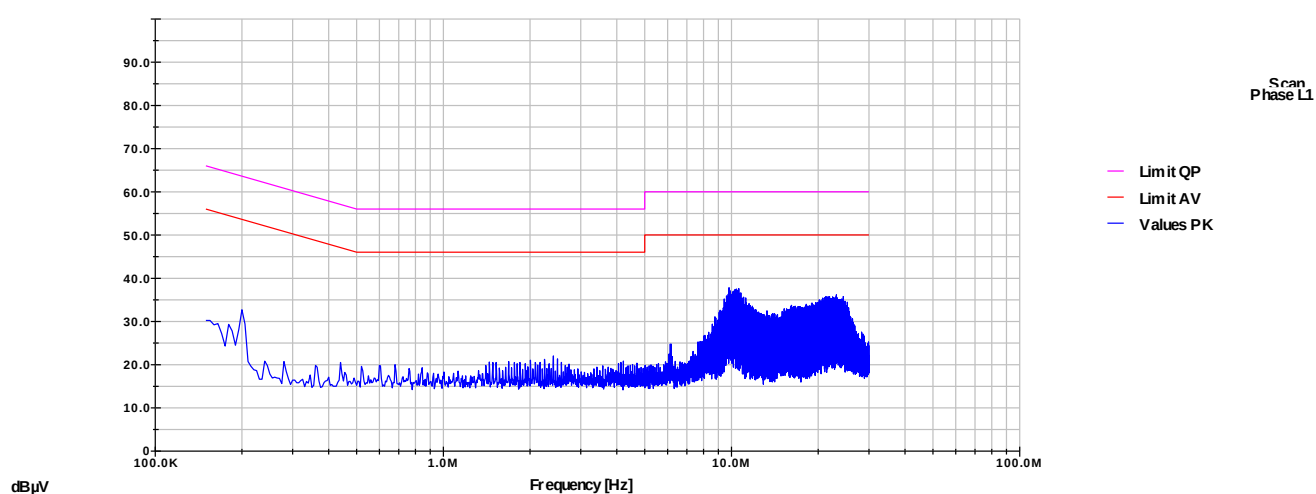
File No. **T-0519-4900-00 JP**

6.1.5 Test protocol

Test point: L1
 Operation mode: transceiving mode (information is sent via module 1 and received by module 2), external power supply
 Remarks: measurement performed at the input of the external power supply
 Date: 2013-05-15
 Tested by: Pessinger Jürgen

Result: SCAN

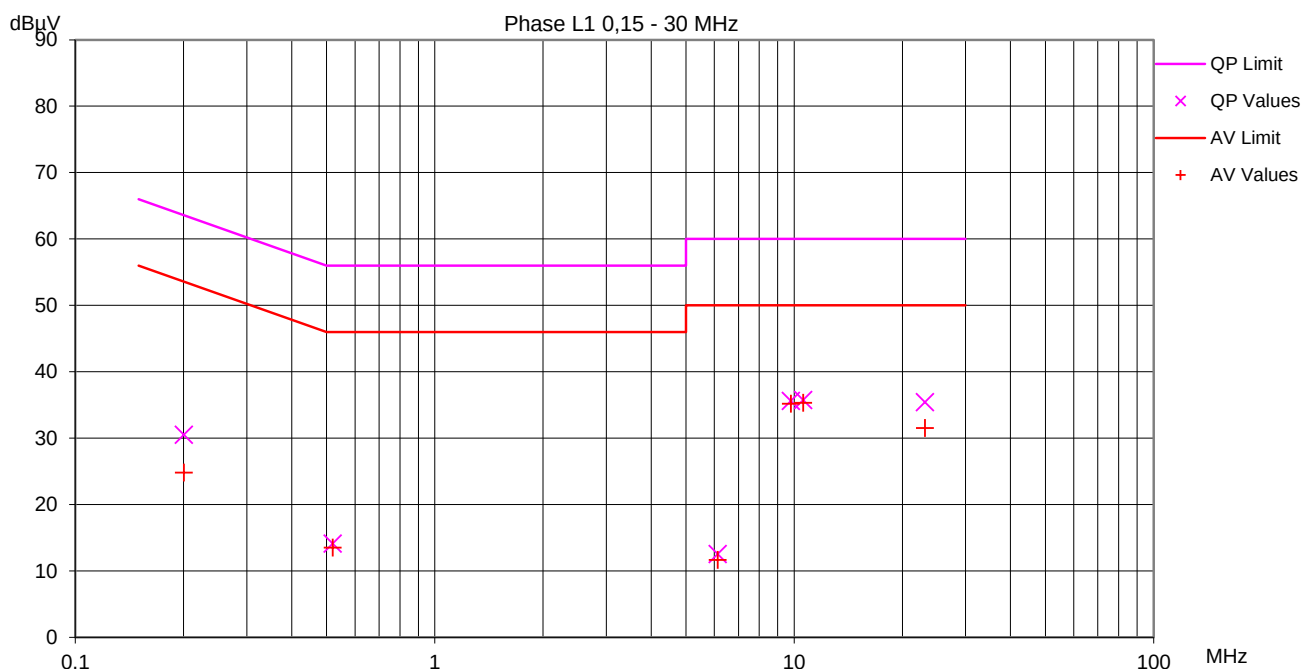
Start frequency [MHz]	Stop frequency [MHz]	Resolution bandwidth	step size	Measurement time	Detector
0.15	30	10 kHz	5 kHz	10 ms	Peak



File No. **T-0519-4900-00 JP**

Test point: L1
 Operation mode: transceiving mode (information is sent via module 1 and received by module 2), external power supply
 Remarks: measurement performed at the input of the external power supply
 Date: 2013-05-15
 Tested by: Pessinger Jürgen

Result: PASS



Minimum margin to limit: **14.7 dB**

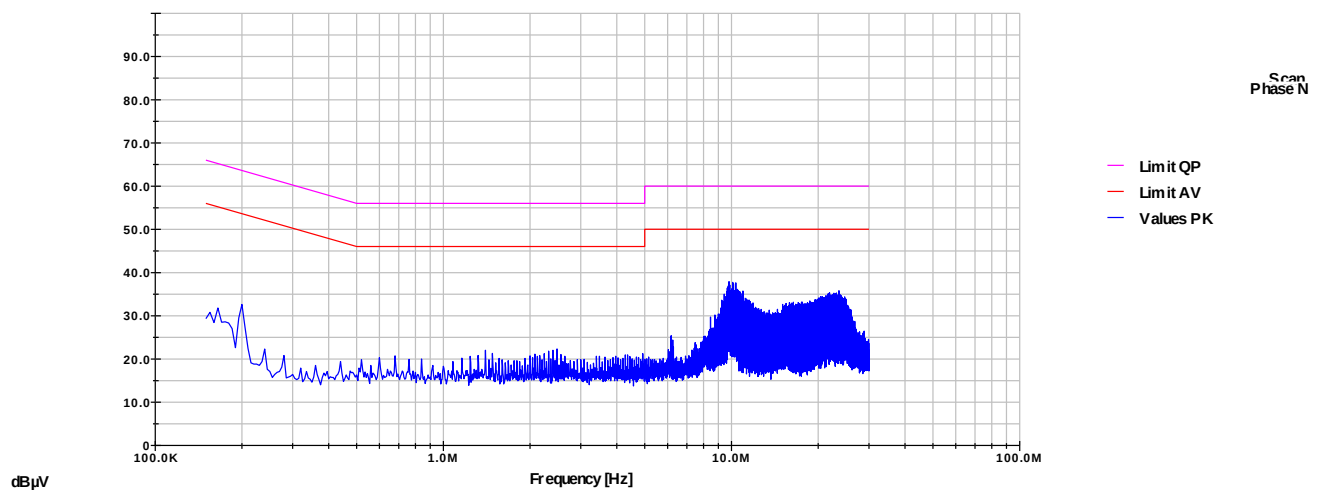
Frequency [MHz]	Reading [dBμV]		Correction [dB]	Values [dBμV]		Limit [dBμV]		Margin [dB]	
	QP	AV		QP	AV	QP	AV	QP	AV
0.200	30.3	24.6	0.2	30.5	24.8	63.6	53.6	33.1	28.8
0.521	13.9	13.3	0.2	14.1	13.5	56.0	46.0	41.9	32.5
6.128	12.3	11.4	0.3	12.6	11.7	60.0	50.0	47.4	38.3
9.801	35.3	34.9	0.3	35.6	35.2	60.0	50.0	24.4	14.8
10.595	35.4	35.0	0.3	35.7	35.3	60.0	50.0	24.3	14.7
23.128	34.9	31.0	0.5	35.4	31.5	60.0	50.0	24.6	18.5

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Test point: N
 Operation mode: transceiving mode (information is sent via module 1 and received by module 2), external power supply
 Remarks: measurement performed at the input of the external power supply
 Date: 2013-05-15
 Tested by: Pessinger Jürgen

Result: SCAN

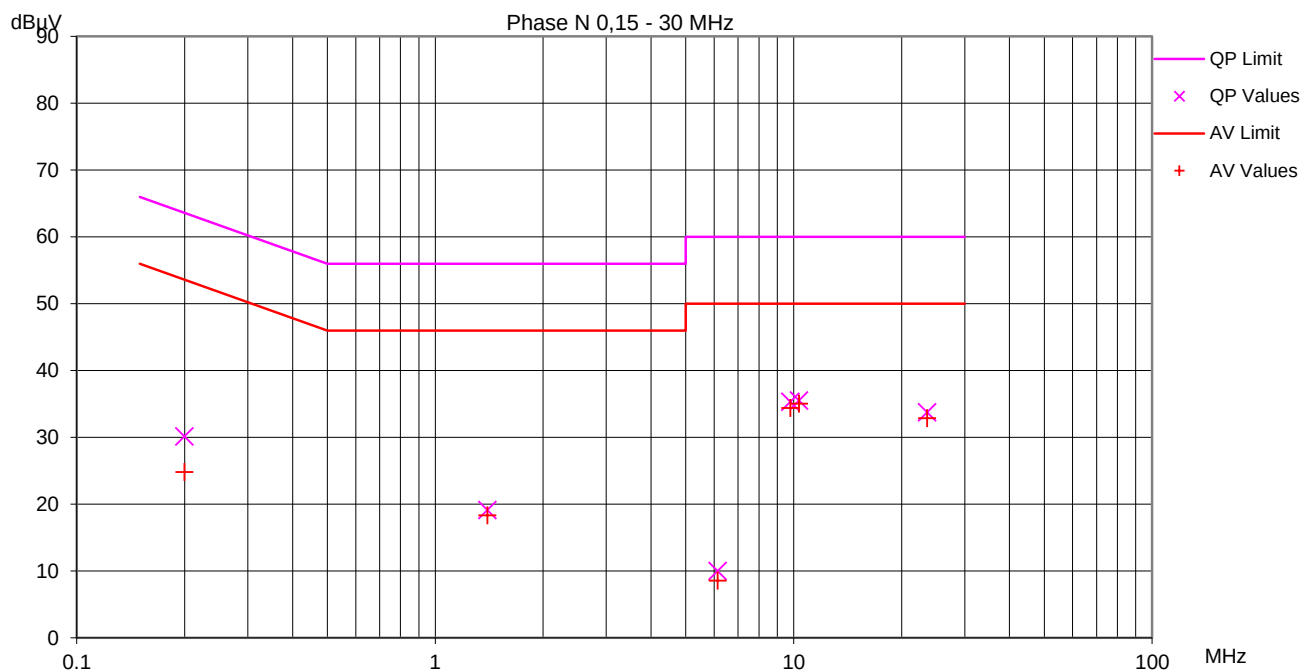
Start frequency [MHz]	Stop frequency [MHz]	Resolution bandwidth	step size	Measurement time	Detector
0.15	30	10 kHz	5 kHz	10 ms	Peak



File No. **T-0519-4900-00 JP**

Test point: N
 Operation mode: transceiving mode (information is sent via module 1 and received by module 2), external power supply
 Remarks: measurement performed at the input of the external power supply
 Date: 2013-05-15
 Tested by: Pessinger Jürgen

Result: PASS



Minimum margin to limit: 15.0 dB

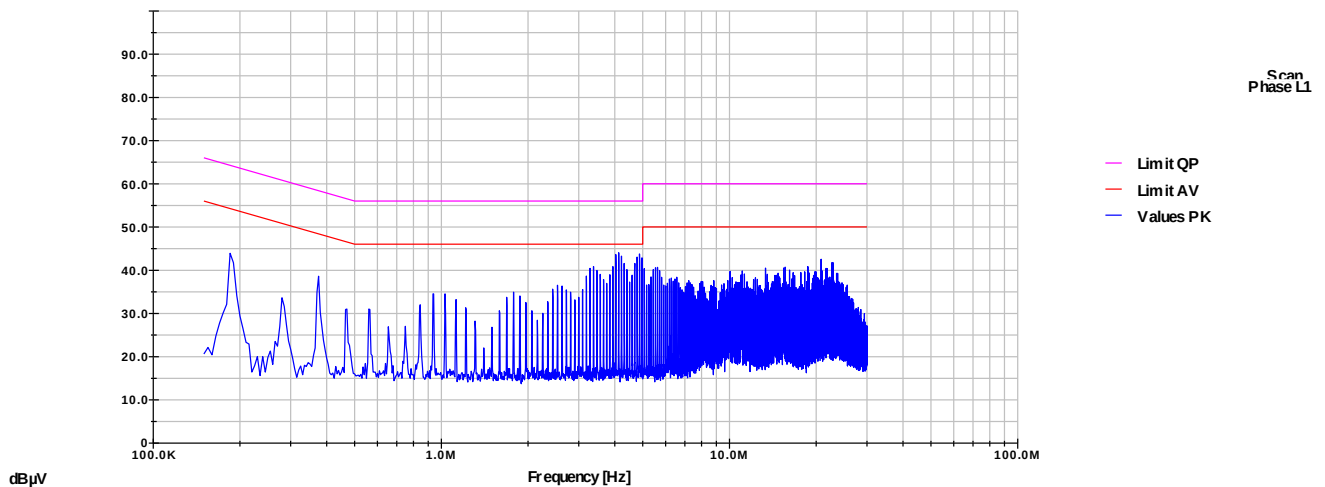
Frequency [MHz]	Reading [dBμV]		Correction [dB]	Values [dBμV]		Limit [dBμV]		Margin [dB]	
	QP	AV		QP	AV	QP	AV	QP	AV
0.200	29.9	24.6	0.2	30.1	24.8	63.6	53.6	33.5	28.8
1.398	18.9	18.1	0.2	19.1	18.3	56.0	46.0	36.9	27.7
6.137	9.7	8.3	0.3	10.0	8.6	60.0	50.0	50.0	41.4
9.801	35.0	34.1	0.3	35.3	34.4	60.0	50.0	24.7	15.6
10.351	35.2	34.7	0.3	35.5	35.0	60.0	50.0	24.5	15.0
23.602	33.2	32.3	0.5	33.7	32.8	60.0	50.0	26.3	17.2

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Test point: L1
 Operation mode: transceiving mode (information is sent via module 1 and received by module 2), Power over Ethernet
 Remarks: measurement performed at the input of the PoE midspan port
 Date: 2013-05-15
 Tested by: Pessinger Jürgen

Result: SCAN

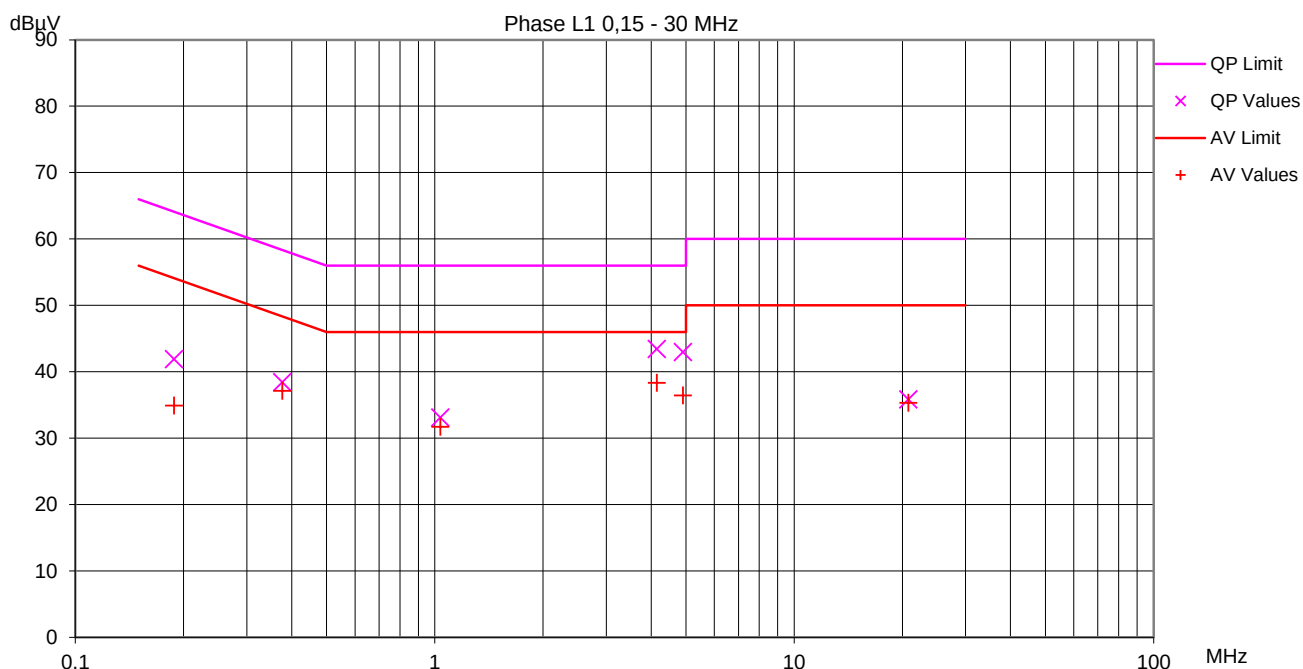
Start frequency [MHZ]	Stop frequency [MHZ]	Resolution bandwidth	step size	Measurement time	Detector
0.15	30	10 kHz	5 kHz	10 ms	Peak



File No. **T-0519-4900-00 JP**

Test point: L1
 Operation mode: transceiving mode (information is sent via module 1 and received by module 2), Power over Ethernet measurement performed at the input of the PoE midspan port
 Remarks:
 Date: 2013-05-15
 Tested by: Pessinger Jürgen

Result: PASS



Minimum margin to limit: 7.7 dB

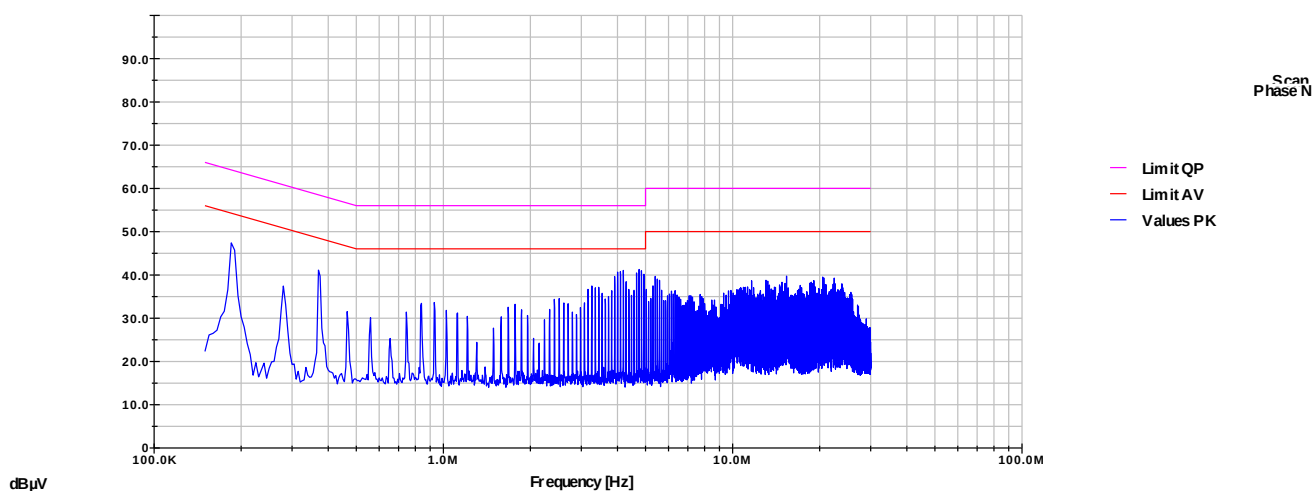
Frequency [MHz]	Reading [dBμV]		Correction [dB]	Values [dBμV]		Limit [dBμV]		Margin [dB]	
	QP	AV		QP	AV	QP	AV	QP	AV
0.188	41.7	34.7	0.2	41.9	34.9	64.1	54.1	22.2	19.2
0.377	38.2	36.9	0.2	38.4	37.1	58.3	48.3	19.9	11.2
1.038	32.9	31.5	0.2	33.1	31.7	56.0	46.0	22.9	14.3
4.152	43.2	38.1	0.2	43.4	38.3	56.0	46.0	12.6	7.7
4.908	42.7	36.2	0.2	42.9	36.4	56.0	46.0	13.1	9.6
20.793	35.3	34.8	0.5	35.8	35.3	60.0	50.0	24.2	14.7

File No. T-0519-4900-00 JP

Test point: N
 Operation mode: transceiving mode (information is sent via module 1 and received by module 2), Power over Ethernet
 Remarks: measurement performed at the input of the PoE midspan port
 Date: 2013-05-15
 Tested by: Pessinger Jürgen

Result: SCAN

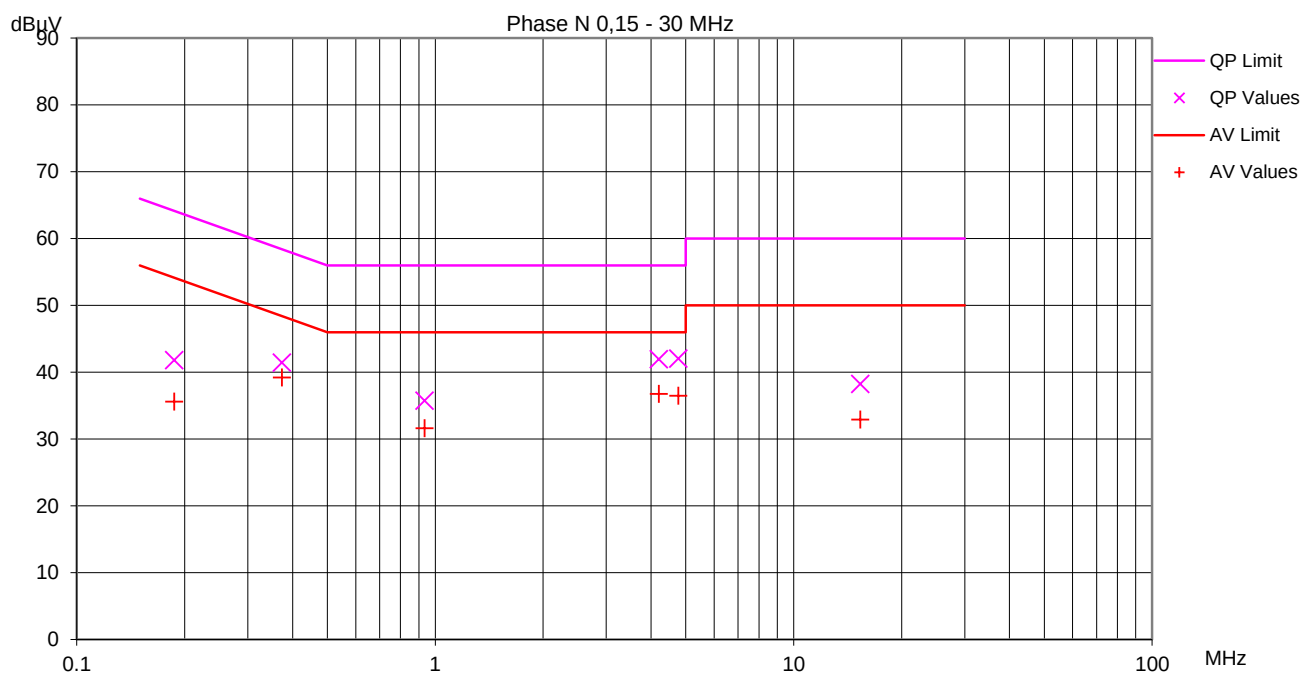
Start frequency [MHz]	Stop frequency [MHz]	Resolution bandwidth	step size	Measurement time	Detector
0.15	30	10 kHz	5 kHz	10 ms	Peak



File No. **T-0519-4900-00 JP**

Test point: N
 Operation mode: transceiving mode (information is sent via module 1 and received by module 2), Power over Ethernet
 Remarks: measurement performed at the input of the PoE midspan port
 Date: 2013-05-15
 Tested by: Pessinger Jürgen

Result: PASS



Minimum margin to limit: 9.2 dB

Frequency [MHz]	Reading [dBμV]		Correction [dB]	Values [dBμV]		Limit [dBμV]		Margin [dB]	
	QP	AV		QP	AV	QP	AV	QP	AV
0.187	41.6	35.4	0.2	41.8	35.6	64.2	54.2	22.4	18.6
0.374	41.2	39.0	0.2	41.4	39.2	58.4	48.4	17.0	9.2
0.935	35.5	31.4	0.2	35.7	31.6	56.0	46.0	20.3	14.4
4.211	41.7	36.5	0.2	41.9	36.7	56.0	46.0	14.1	9.3
4.774	41.8	36.2	0.2	42.0	36.4	56.0	46.0	14.0	9.6
15.358	37.8	32.5	0.4	38.2	32.9	60.0	50.0	21.8	17.1

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6.2 Radiated disturbance (electric field)

For test instruments and accessories used see section 7 Part A 5.

6.2.1 Description of the test location

Test location: OATS 3

Test distance: 3 metres

6.2.2 Photo documentation of the test set-up



6.2.3 Test specification

Environmental conditions: Temperature: ° C Humidity: % Atmospheric pressure: kPa

Frequency range: 30 MHz - 1000 MHz

The test was carried out in the following operation mode(s):

- transceiving mode (information is sent via module 1 and received by module 2), external power supply
- transceiving mode (information is sent via module 1 and received by module 2), Power over Ethernet

6.2.4 Test result

Minimal margin to limit 4,1 dB at 35,193 MHz

The requirements are **FULFILLED**.

Remarks: The highest internal oscillator frequency is 25MHz, according to FCC part 15 subclauses 15.33
and 15.109 the observed frequency range is 30MHz to 1000MHz.

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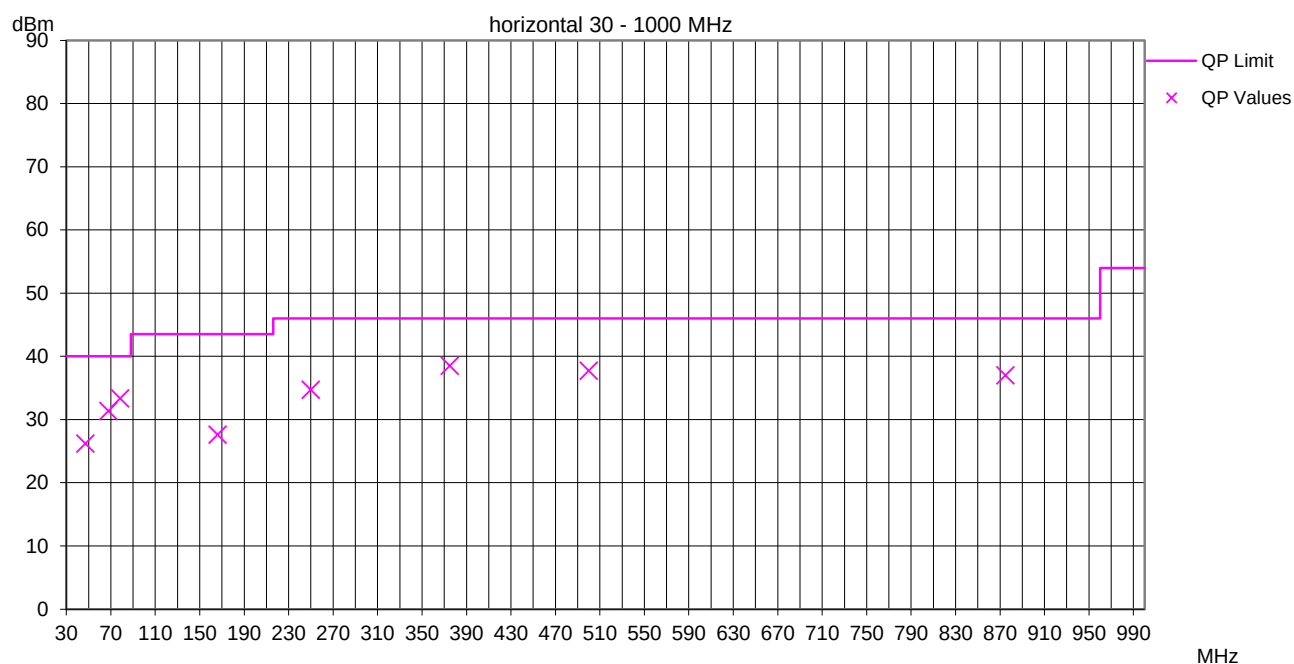
6.2.5 Test protocol

Operation mode: transceiving mode (information is sent via module 1 and received by module 2), external power supply Result: PASS

Remarks: none

Date: 2013-05-22

Tested by: Pessinger Jürgen



Minimum margin to limit: **6.7 dB**

Frequency [MHz]	Reading [dBμV] QP	Correction [dB]	Values [dBμV/m] QP	Limit [dBμV/m] QP	Margin [dB] QP
47.210	11.1	15.1	26.2	40.0	13.8
67.958	19.7	11.6	31.3	40.0	8.7
78.515	22.4	10.9	33.3	40.0	6.7
166.291	16.3	11.3	27.6	43.5	15.9
250.000	19.6	15.1	34.7	46.0	11.3
375.002	20.1	18.4	38.5	46.0	7.5
500.003	16.5	21.2	37.7	46.0	8.3
875.000	10.4	26.6	37.0	46.0	9.1

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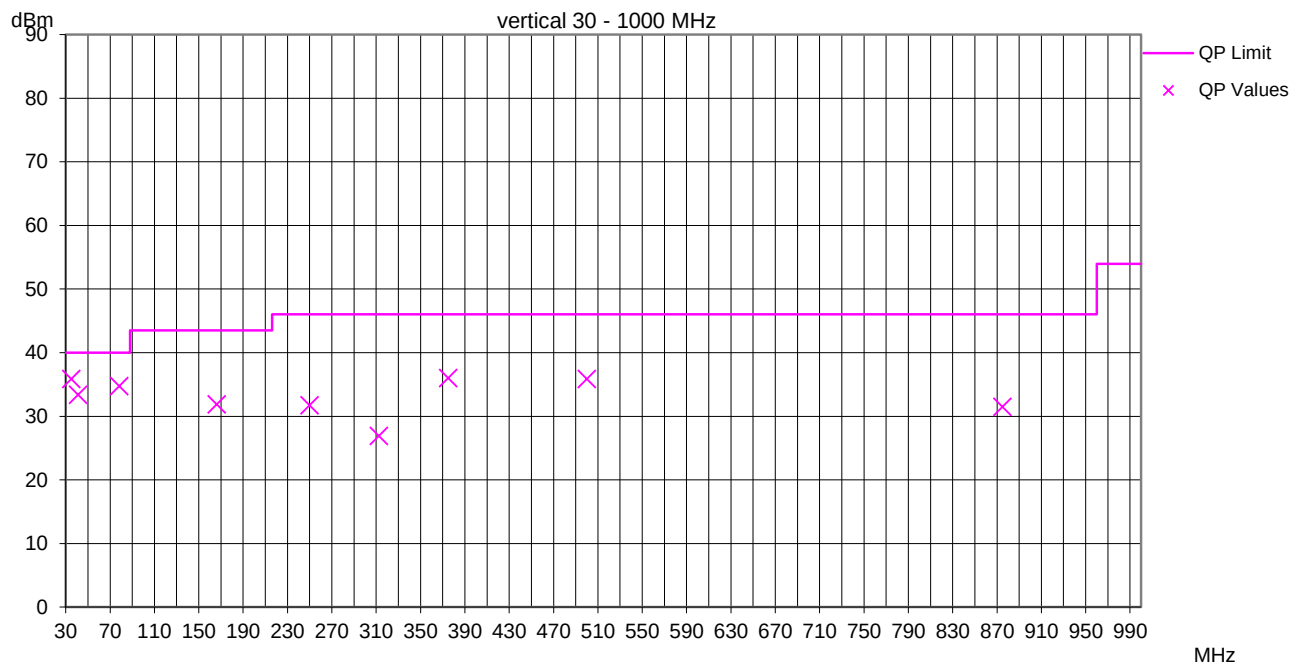
Operation mode: transceiving mode (information is sent via module 1 and received by module 2), external power supply

Result: PASS

Remarks: none

Date: 2013-05-22

Tested by: Pessinger Jürgen



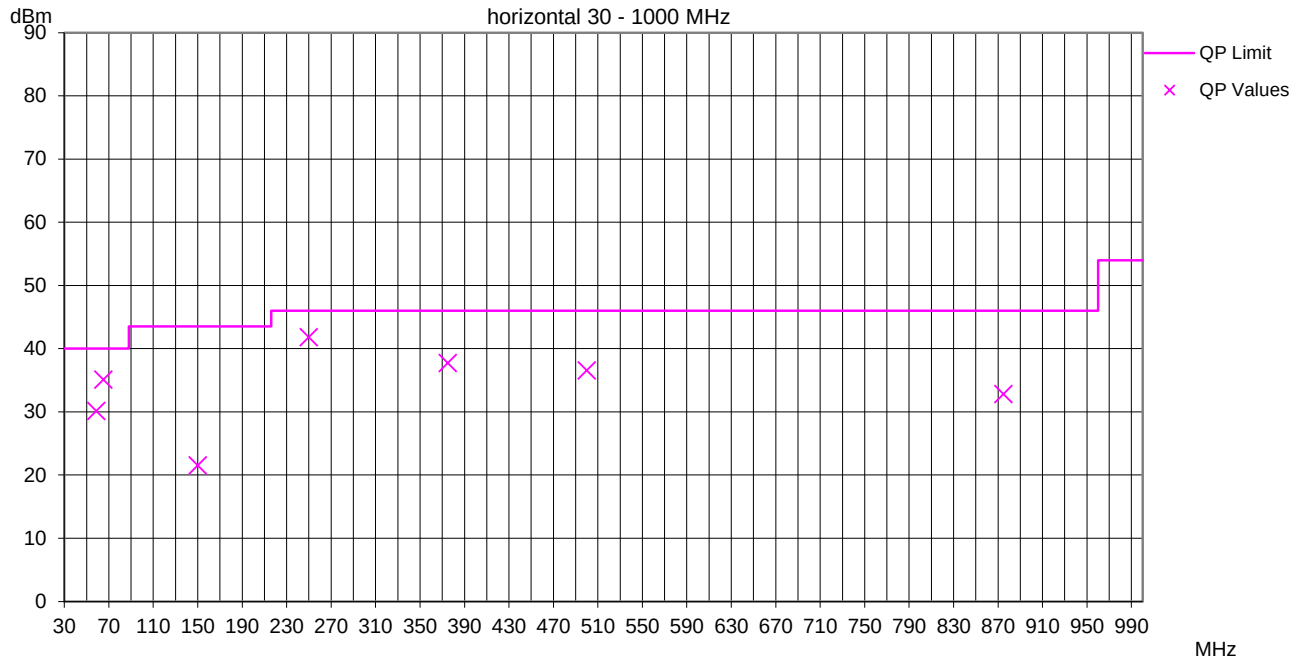
Minimum margin to limit: 4.1 dB

Frequency [MHz]	Reading [dBμV] QP	Correction [dB]	Values [dBμV/m] QP	Limit [dBμV/m] QP	Margin [dB] QP
35.193	21.7	14.2	35.9	40.0	4.1
41.270	18.6	14.8	33.4	40.0	6.6
78.498	23.8	10.9	34.7	40.0	5.3
166.291	20.6	11.3	31.9	43.5	11.6
250.000	16.6	15.1	31.7	46.0	14.3
312.497	10.1	16.8	26.9	46.0	19.1
375.000	17.6	18.4	36.0	46.0	10.0
500.008	14.6	21.2	35.8	46.0	10.2
875.000	4.9	26.6	31.5	46.0	14.6

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Operation mode: transceiving mode (information is sent via module 1 and received by module 2), Power over Ethernet
 Remarks: none
 Date: 2013-05-22
 Tested by: Pessinger Jürgen

Result: PASS



Minimum margin to limit: 4.2 dB

Frequency [MHz]	Reading [dBμV] QP	Correction [dB]	Values [dBμV/m] QP	Limit [dBμV/m] QP	Margin [dB] QP
58.859	16.2	13.9	30.1	40.0	9.9
65.119	22.9	12.2	35.1	40.0	4.9
150.000	10.9	10.6	21.5	43.5	22.0
249.999	26.7	15.1	41.8	46.0	4.2
375.000	19.3	18.4	37.7	46.0	8.3
500.003	15.3	21.2	36.5	46.0	9.5
874.982	6.2	26.6	32.8	46.0	13.3

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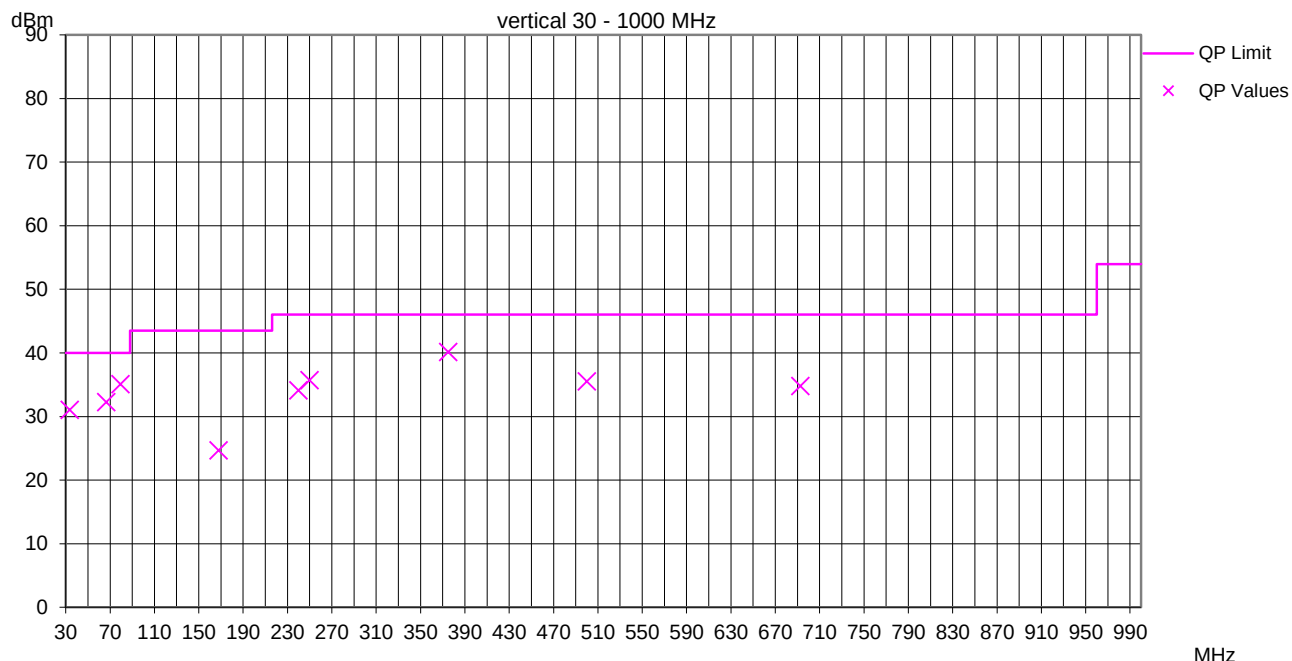
Operation mode: transceiving mode (information is sent via module 1 and received by module 2), Power over Ethernet

Result: PASS

Remarks: none

Date: 2013-05-22

Tested by: Pessinger Jürgen



Minimum margin to limit: 5.0 dB

Frequency [MHz]	Reading [dBμV] QP	Correction [dB]	Values [dBμV/m] QP	Limit [dBμV/m] QP	Margin [dB] QP
33.680	17.1	13.9	31.0	40.0	9.0
66.739	20.4	11.9	32.3	40.0	7.7
79.475	24.1	10.9	35.0	40.0	5.0
168.000	13.3	11.4	24.7	43.5	18.9
240.030	19.2	14.9	34.1	46.0	11.9
250.002	20.6	15.1	35.7	46.0	10.3
375.000	21.7	18.4	40.1	46.0	5.9
500.003	14.3	21.2	35.5	46.0	10.5
692.685	10.7	24.1	34.8	46.0	11.2

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7 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used, in addition to the test accessories, are calibrated and verified regularly.

Test ID	Model / Type	Kind of Equipment	Manufacturer		Equipment No.	
A 4	ESH 3	01-02/03-01-005	08/01/2014	08/01/2013	01/03/2014	01/03/2013
	ESH2-Z5	01-02/20-01-001	26/01/2014	26/01/2011		
	ESH 3 - Z 2	01-02/50-02-020	11/12/2013	11/12/2012		
	BNC-3000-N	01-02/50-07-008				
	N-5000-N	01-02/50-07-009				
	Tile Version 3.4K20	01-02/68-09-001				
	emitel ESW V31	01-02/68-09-002				
A 5	ESVP	01-02/03-01-002	18/03/2014	18/03/2013		
	HM 5012	01-02/11-01-001				
	VULB 9168	01-02/24-03-007	07/09/2015	07/09/2012		
	N-40000-N	01-02/50-05-043				
	N-30000-N	01-02/50-05-044				
	Tile Version 3.4K20	01-02/68-09-001				
	emitel ESW V31	01-02/68-09-002				

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