

FCC Test Report for Part 15B, sections 15.109 (a) and 15.107 (a)

Product name : IQ2.0
Applicant : SALTO Systems, S.L.
FCC ID : UKCIQ2
ISED ID : 10088A-IQ2

Test report No. : 170600688 09 Ver 2.00

Laboratory information

Accreditation

Telefication is designated by the FCC as an Accredited Test Firm for compliance testing of equipment subject to Certification under Parts 15 & 18. The Designation number is: NL0001

The Industry Canada registration number for the 3 meter test chamber of Telefication is: 4173A-1.

Documentation

Telefication complies with the accreditation criteria for test laboratories as laid down in ISO/IEC 17025:2005. The accreditation covers the quality system of the laboratory as well as the specific activities as described in the authorized annex bearing the accreditation number L021 and is granted on 30 November 1990 by the Dutch Council For Accreditation (RvA: Raad voor Accreditatie).

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Testing Location

Test Site	Telefication BV
Test Site location	Edisonstraat 12a 6902 PK Zevenaar The Netherlands Tel. +31889983600 Fax. +31316583189
Test Site FCC	NL0001

Revision History

Version	Date	Remarks	By
v0.50	14-11-2017	First draft	PS
v1.00	06-03-2018	Initial issue	PS
v2.00	23-03-2018	Updated clause 1.4 with output power, type of modulation and emission designator. Updated clause 1.6 with variant information.	PS

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1 General Description

1.1 Applicant

Client name: Salto systems, S.L.
Address C/Arkotz 9 Pol. Lanbarren, Oiartzun
Zip code: 20180
Telephone: +34 943344550
Contact name: j.imedio@saltosystems.com
E-mail: Mr. Juan Imedio

1.2 Manufacturer

Manufacturer name: Salto systems, S.L.
Address: C/Arkotz 9 Pol. Lanbarren, Oiartzun
Zip code: 20180
Contact name:: j.imedio@saltosystems.com
E-mail: Mr. Juan Imedio

1.3 Tested Equipment Under Test (EUT)

Product name: IQ2.0
Brand name: SALTO
Product type: Data transmission equipment operating in the 2.4 GHz band
FCC ID: UKCIQ2
ISED ID 10088A-IQ2
Model(s): IQ222, IQ223, IQ224
Software version: --
Hardware version: --
Date of receipt 07-08-2017
Tests started: 16-11-2017
Testing ended: 06-03-2018

1.4 Product specifications of Equipment under test

Frequency range (MHz)	ZigBee: 2405 – 2480; WiFi: 2412 – 2462 BLE: 2402 – 2480
Maximum output power to antenna (dBm)	ZigBee: +5; WiFi : +19 BLE: +8
Antenna type	ZigBee: chip; WiFi: chip BLE: chip
Antenna gain (dBi)	ZigBee: 0.5; WiFi: 0.5; BLE: 1.0
Type of modulation	ZigBee: O-QPSK, DSSS WiFi: acc. to 802.11 b/g/n BLE: GFSK, FHSS
Emission designator	Zigbee: G1D BLE: F1D

1.5 Modification of the Equipment Under Test (EUT)

PoE version only

To minimise radiated emissions in the VHF band two capacitors (2x 4.7 nF) were added:
One between pins 3 and 7 of the PoE module, type Ag9905M, and the other between pins 3 and 5 of the same module.

1.6 Observations and remarks

The IQ2.0 comes in three variants depending on the type of power supply:

IQ222: BLE + IEEE802.15.4 + Wifi (no PoE)

IQ223: BLE + IEEE802.15.4 (PoE)

IQ224: BLE + IEEE802.15.4 (no PoE)

1.7 Environmental conditions

Test date	16-11-2017	11-01-2018
Ambient temperature	21 °C	21 °C
Humidity	45 % RH	45 % RH

1.8 Measurement Standard(s)

- ANSI C63.4:2014

1.9 Applicable Standard(s)

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standard(s):

- FCC Part 15B, sections 15.109 (a) and 15.107 (a)

1.10 Conclusions

The sample of the product showed NO NON-COMPLIANCES to the specifications stated in paragraph 1.9 of this report.

The results of the test as stated in this report, are exclusively applicable to the product items as identified in this report. Telefication accepts no responsibility for any properties of product items in this test report, which are not supported by the tests as specified in paragraph 1.9 "Applicable standards".

All tests are performed by:

Name : ing. P.A. Suringa

Review of test methods and report by:

Name : ing R. van Barneveld

The above conclusions have been verified by the following signatory:

Date : 23-03-2018

Name : ing. K.A. Roes

Function : Coordinator Radio Laboratory

Signature :



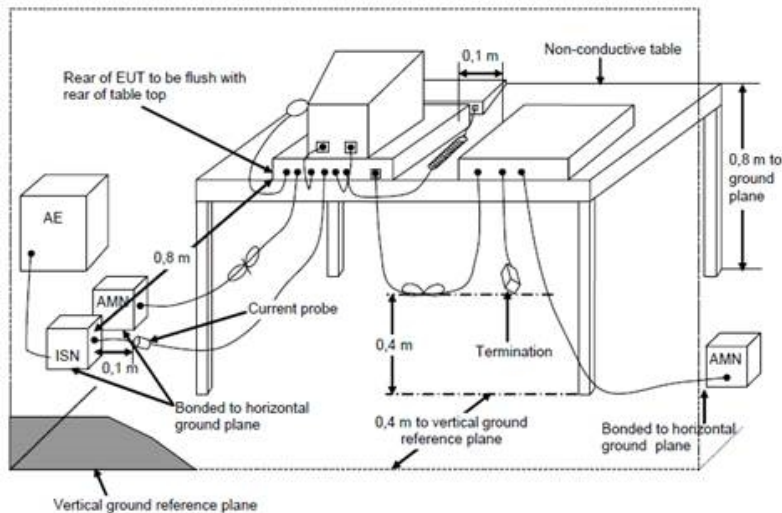
2 Test configuration of the Equipment Under Test

2.1 Test mode

The applicant provided test mode firmware for the EUT, in which it was possible to configure the EUT into different test channels.

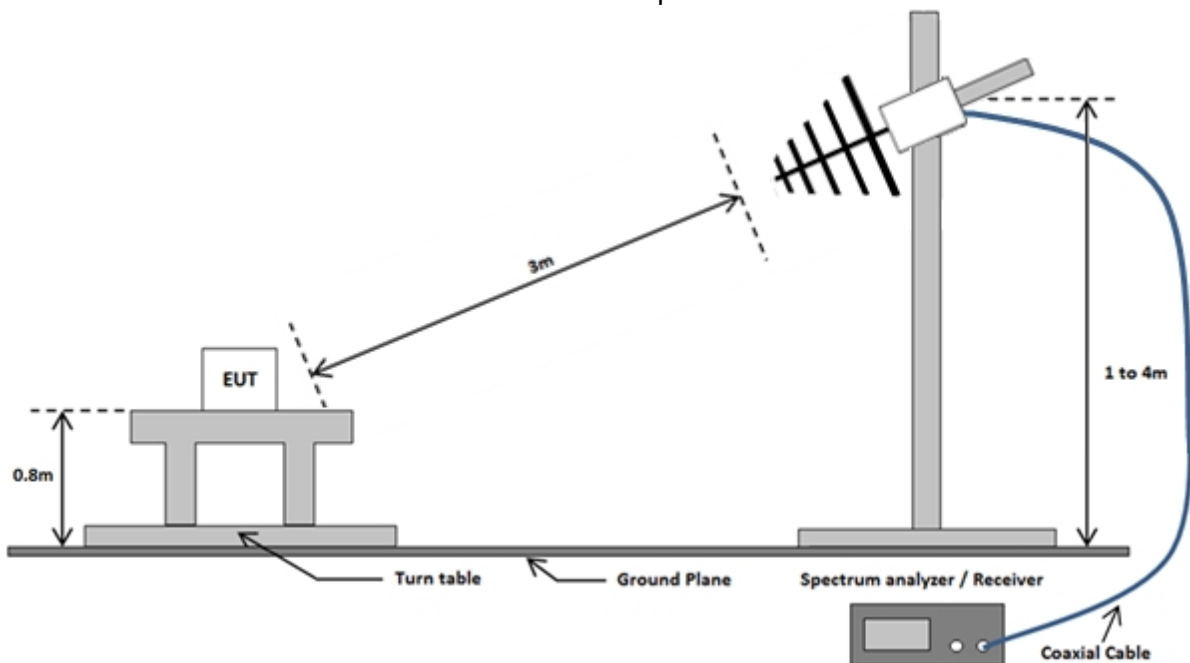
2.2 Test setups

AC Conducted

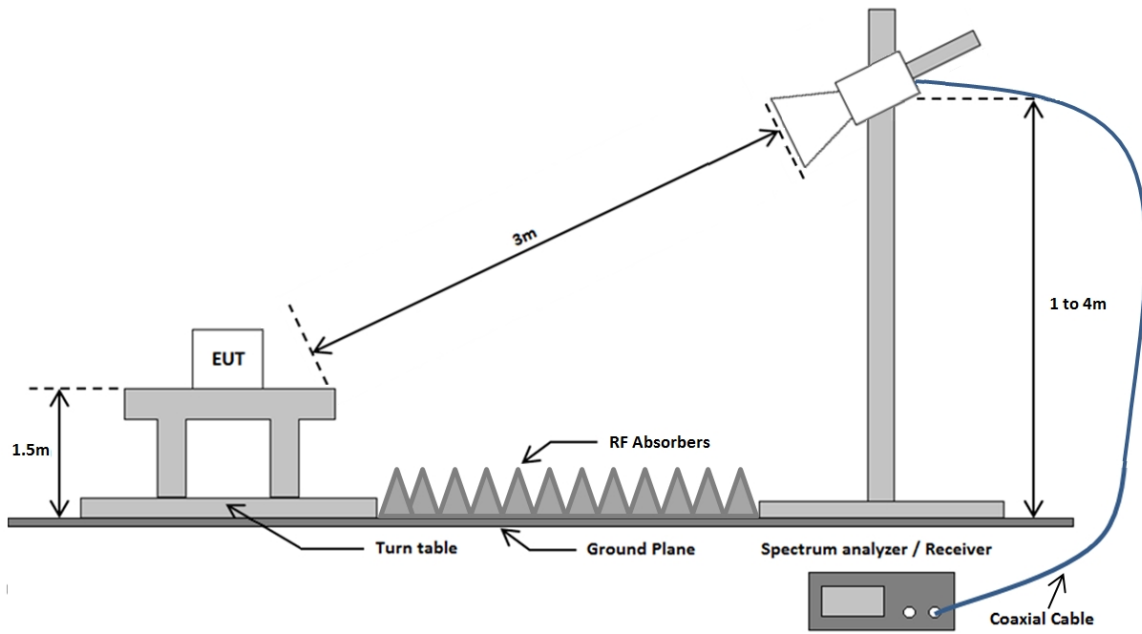


Radiated

Radiated emissions test setup 30 MHz - 1 GHz



Radiated emissions test setup above 1 GHz



2.3 Equipment used in the test configuration

Description	Manufacturer	Model	ID	Used at Par.
Spectrum Analyzer	Rohde & Schwarz	FSP40	TE11125	3.1
Biconilog Antenna	Chase	CBL6112A	TE00967	3.1
Horn Antenna	EMCO The Electro – Mechanics Co	3115	TE00531	3.1
Pre amplifier	Miteq	AFS42-041001800-28-10P-42	TE11132	3.1
SAC Chamber	Comtest Engineering BV	-	TE00861	3.1
Artificial Mains network (AMN)	Rohde & Schwarz	ESH 2-Z5	TE00130	3.2, 3.3
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	TE00756	3.2, 3.3
AC Source	Chroma	61601	TE02001	3.1, 3.2, 3.3
Measurement software	DARE!!	Radimation	2016.2.8	3.1, 3.2, 3.3
EMI receiver	Rohde & Schwarz	ESCI	TE11128	3.1, 3.2
EMI receiver	Rohde & Schwarz	ESR7	TE01220	3.3

3 Test results

3.1 Radiated spurious emissions measurement (incl. restricted band spurious emissions)

3.1.1 Limits

Field strengths of radiated emissions from unintentional radiators at 3 meters distance shall not exceed the following values:

Frequency (MHz)	Field strength ($\mu\text{V}/\text{m}$)	Measurement distance(m)
30 -88	100	3
88 - 216	150	3
216-960	200	3
Above 960	500	3

3.1.2 Measurement instruments

The measurement instruments are listed in chapter 2.3 of this report.

3.1.3 Test setup

The test setup is as shown in chapter 2.2 of this report.

3.1.4 Test procedure

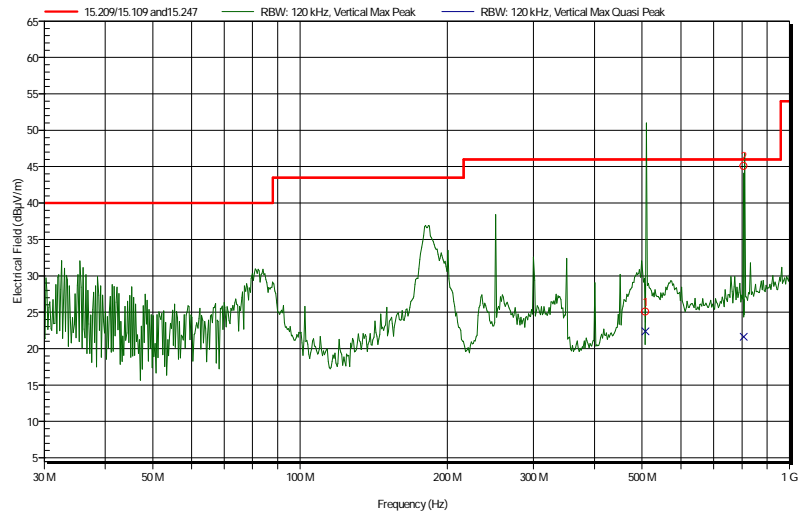
The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequencies above 1000 MHz.

Emission limits above 1000 MHz are based on measurements using an average detector.

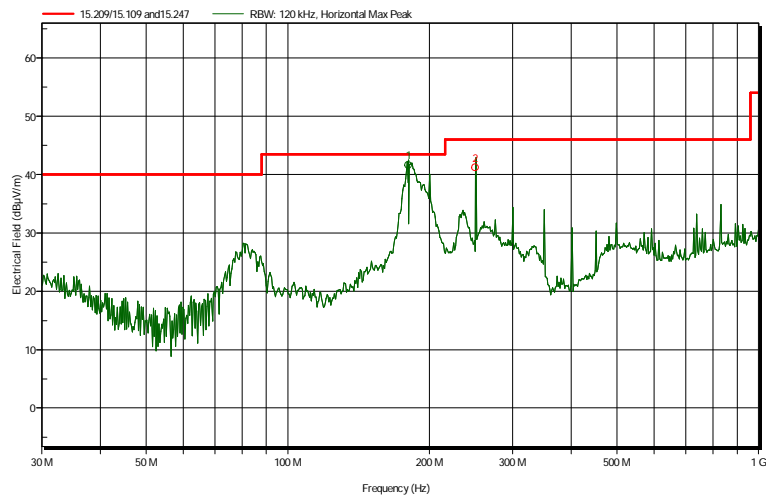
3.1.5 Plots of the Radiated Spurious Emissions Measurement (PoE version)

30 – 1000 MHz

Vertical polarization



Horizontal polarization



Measured peaks Vertical 30 – 1000 MHz

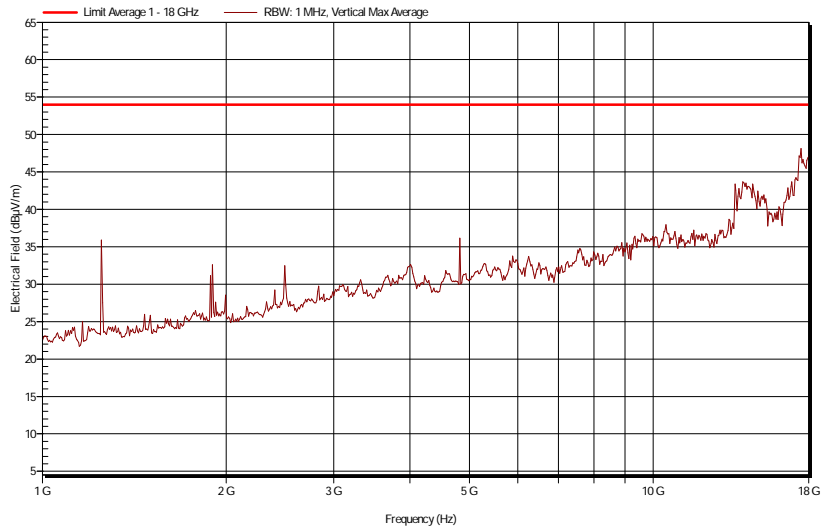
Frequency	Polarization	Height	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference
507,828 MHz	Vertical	1,5 m	22,4 dBµV/m	46 dBµV/m	-23,6 dB
807 MHz	Vertical	1,5 m	21,6 dBµV/m	46 dBµV/m	-24,4 dB

Measured peaks Horizontal 30 – 1000 MHz

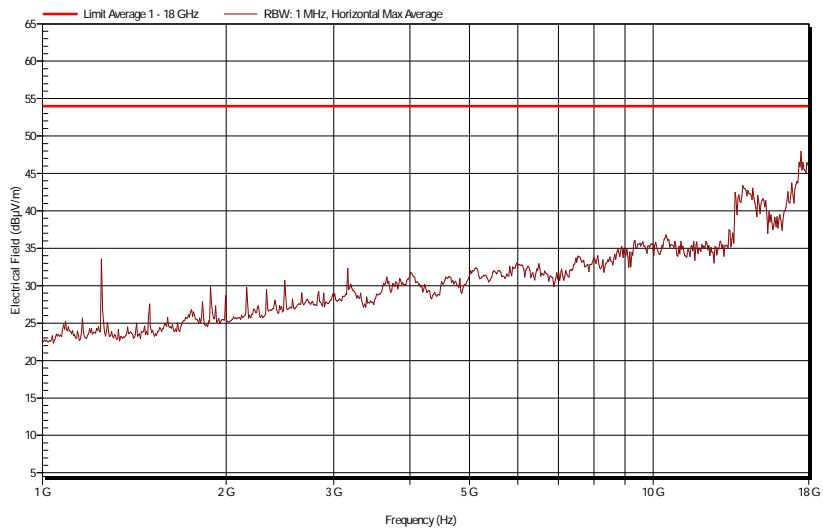
Frequency	Polarization	Height	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference
180,258 MHz	Horizontal	2,5 m	40,9 dBµV/m	43,5 dBµV/m	-2,6 dB
250,014 MHz	Horizontal	1,5 m	40,8 dBµV/m	46 dBµV/m	-5,2 dB

1 – 18 GHz

Vertical polarization



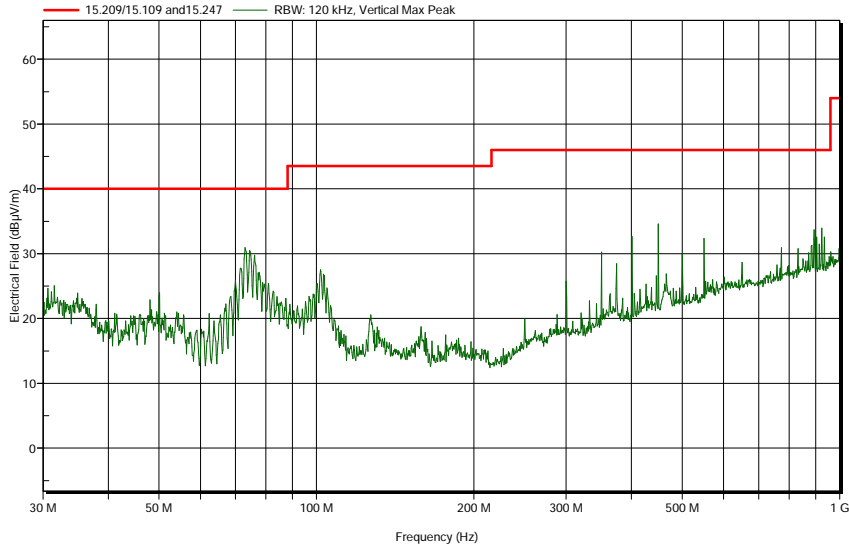
Horizontal polarization



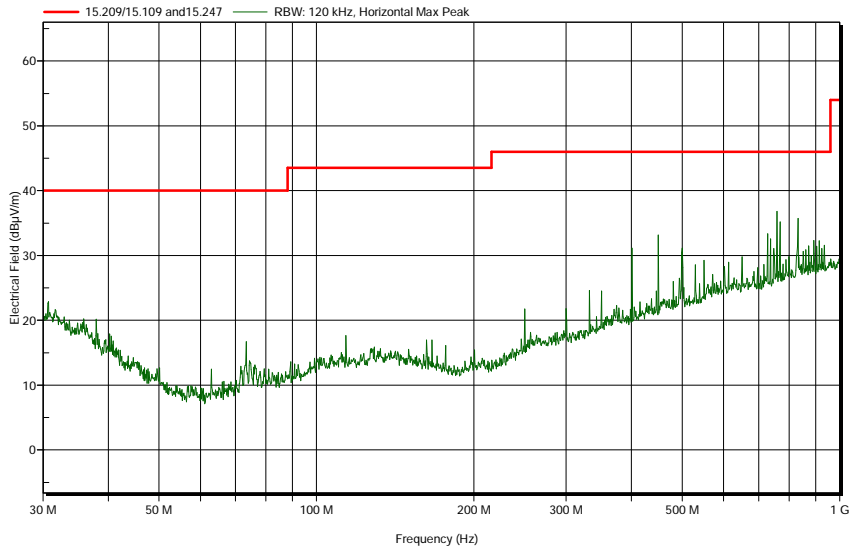
3.1.6 Plots of the Radiated Spurious Emissions Measurement (non-PoE version)

30 – 1000 MHz

Vertical polarization

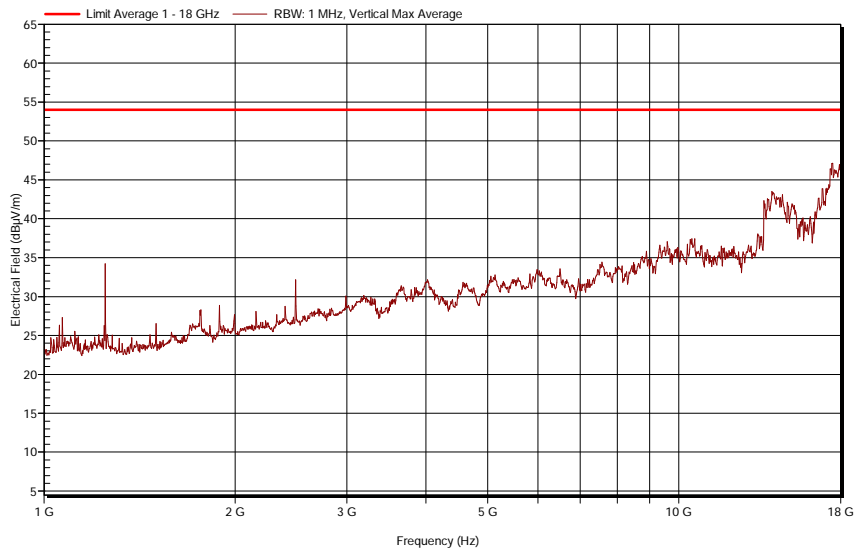


Horizontal polarization

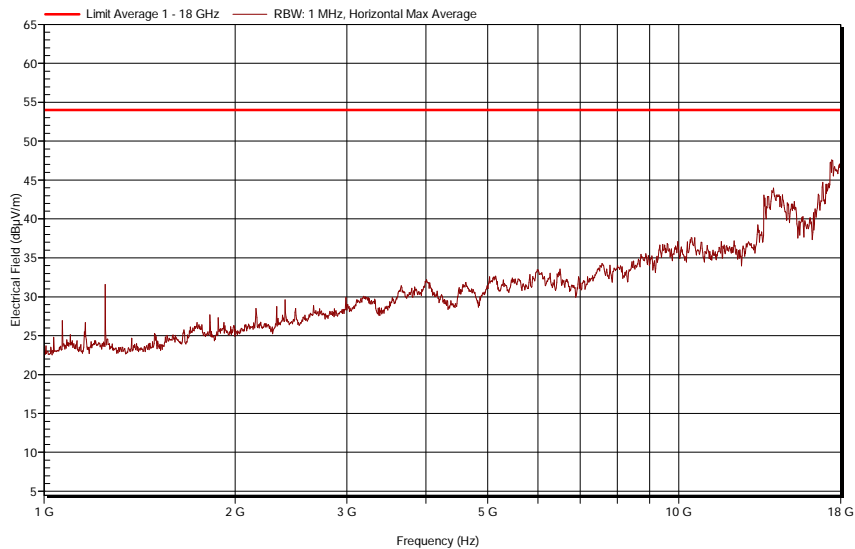


1 – 18 GHz

Vertical polarization



Horizontal polarization



3.1.7 Measurement Uncertainty

Measurement uncertainty Radiated emissions below 1 GHz

Horizontal polarization	
30 – 200 MHz	4.5 dB
200 – 1000 MHz	3.6 dB
Vertical polarization	
30 – 200 MHz	5.4 dB
200 – 1000 MHz	4.6 dB

Measurement uncertainty Radiated emissions above 1 GHz

1000- 18000 MHz	5.7 dB
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3.2 AC mains conducted emissions measurement (non-PoE version)

3.2.1 Limit

According to 15.107 (a)

Except for class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

*Decreases with the logarithm of the frequency.

3.2.2 Measurement instruments

The measurement instruments are listed in chapter 2.3 of this report.

3.2.3 Test setup

The test setup is as shown in chapter 2.2 of this report.

3.2.4 Test procedure

According to ANSI C63.4: 2014, section 13.3.

3.2.5 Test results and plots of the AC conducted mains measurement

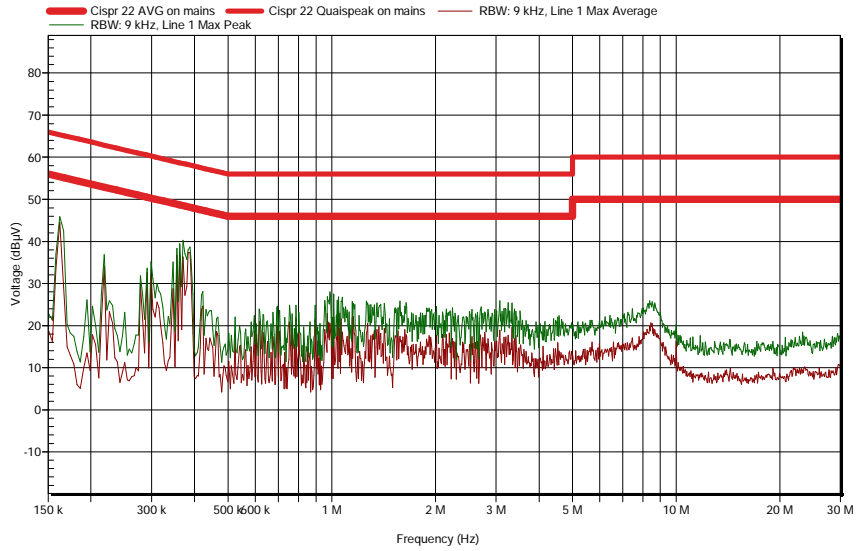
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3.2.6 Measurement uncertainty

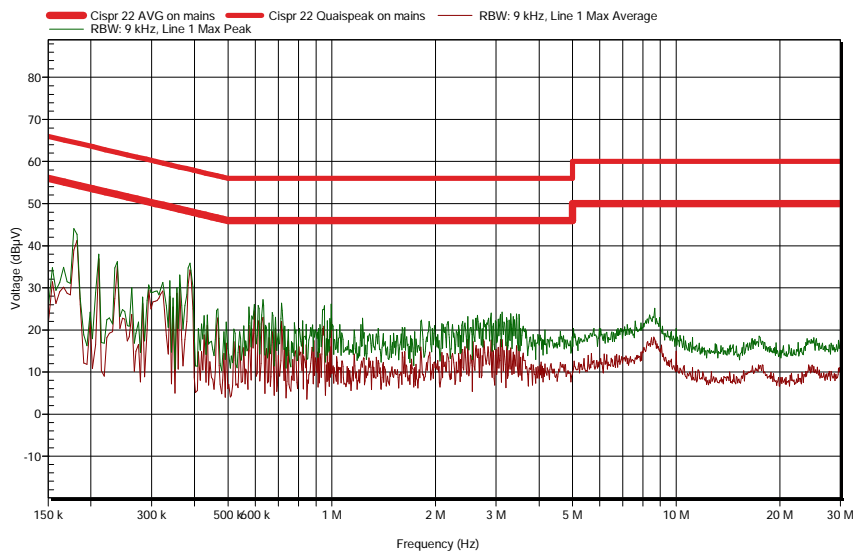
+/- 3.6 dB.

3.2.7 Plots of the AC conducted spurious measurement

Phase



Neutral



3.3 AC mains conducted emissions measurement (PoE version)

3.3.1 Limit

According to 15.107 (a)

Except for class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

*Decreases with the logarithm of the frequency.

3.3.2 Measurement instruments

The measurement instruments are listed in chapter 2.3 of this report.

3.3.3 Test setup

The test setup is as shown in chapter 2.2 of this report.

3.3.4 Test procedure

According to ANSI C63.4: 2014, section 7

The sample is power supplied by the PoE (power over Ethernet) injector.

The test is performed on the AC terminals of the PoE injector, while a ping test is running on the Ethernet connection.

3.3.5 Test results and plots of the AC mains conducted emissions measurement

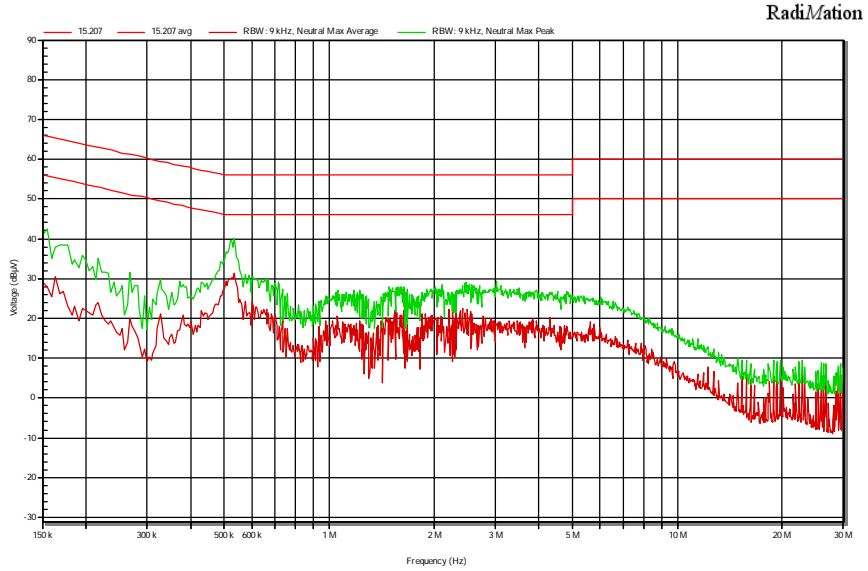
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3.3.6 Measurement uncertainty

+/- 3.6 dB

3.3.7 Plots of the AC mains conducted emissions measurement

Phase 110 Vac 60 Hz



Neutral 110 Vac 60 Hz

