

# Test Report

*Electromagnetic Compatibility (EMC)*



Equipment Under Test: Aqsens Q-system Time-Resolved-Fluorescence Analyzer  
Model: AQ-QS01  
Type: -  
Manufacturer / Customer: Aqsens Oy  
Kaivokatu 8b  
00100 Helsinki  
FINLAND

**The equipment under test has been tested according to following standard(s)**

FCC CFR 47 Part 15 (October 2014)	Subpart B	Class B
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Date: 1 September 2015

Issued by:

  
Niko Kotsalo  
Testing Engineer

Date: 1 September 2015

Checked by:

  
Rauno Repo  
Testing Engineer

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## Equipment Under Test (EUT)

TRF analyzer

Model: AQ-QS01  
Serial no: -  
Software Version: 1.00  
Hardware Version: 1.05  
FCC ID: 2AGFC – CAG01

The Aqsens Q System is a TRF analyzer with RFID reader. Aqsens Q system has a mixer that is used to mix a water sample with test reagents and an analyzer that makes actual measurements. The measurements are transferred to the laptop for saving and visualization. Key components of analyzer electronics are a led light source for excitation of the sample and photomultiplier tube to count the photons emitted by the sample. The analyzer has also an inbuilt 13.57 MHz RFID reader for reading an RFID tag attached to the cassette. Information read from the tag is used to check the authenticity of the test kit.

## Type of the EUT

The EUT will be tested as a tabletop unit.

## Power requirements

Rated voltage: 12 VDC / 100-240 VAC, 50-60 Hz (tested with 115 VAC, 60 Hz)

## Cable lengths and types

Cable:	Length:	Type:
USB cable	1.0 m	Shielded
AC/DC converter cable	1.4 m	Unshielded
USB mouse cable (peripheral)	1.8 m	-
Ethernet cable (peripheral)	3.0 m	Unshielded

## Peripherals

- Laptop PC Acer V3-111 series (S/N NXMNTED019428121907612)
- Logitech USB mouse (connected to the laptop via USB cable)
- 3Com Etherlink III Network card (connected to the laptop via Ethernet cable)

**Disclaimer**

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## EUT Test Conditions During EMC-Testing

Configuration of the EUT system was made to correspond to actual assembling conditions as far as possible.

TRF analyzer was connected to the laptop with USB cable. Analyzer was connected to AC mains with AD/DC converter. During the tests analyzer was set to continuous measurement mode. Manufacturer's computer software was running in the laptop. Peripherals (USB mouse and a network card) were connected to the laptop.

## Photographs of the EUT



**Photograph 1.** The EUT.



**Photograph 2.** The AC/DC converter type plate.



**Photograph 3.** Ferrite ring on the AC/DC converter cable (Würth Elektronik 742 711 42).



**Photograph 4.** The EUT and test set-up for conducted emission test.



**Photograph 5.** The EUT and test set-up for radiated emission test (30MHz-1GHz).

## SUMMARY OF TESTING

Test Specification	Description of Test	Result
§15.107	Conducted emissions	PASS
§15.109	Radiated Emissions	PASS

## Test Facility

<input type="checkbox"/> Testing Location / address: FCC registration number: <b>90598</b>	SGS Fimko Ltd Särkiniementie 3 FI-00210, HELSINKI FINLAND
<input checked="" type="checkbox"/> Testing Location / address: FCC registration number: <b>178986</b> Industry Canada registration number: <b>8708A-2</b>	SGS Fimko Ltd Karakaarenkuja 4 FI-02610, ESPOO FINLAND

## Conducted Emissions In The Frequency Range 150 kHz - 30 MHz.

**Standard:** ANSI C63.4 (2009)  
**Tested by:** NKO  
**Date:** 16.7.2015 – 19.8.2015  
**Humidity:** 40 %  
**Temperature:** 20 °C  
**Barometric pressure:** 1006 hPa  
**Measurement uncertainty:**  $\pm 2.9$  dB Level of confidence 95 % (k = 2)

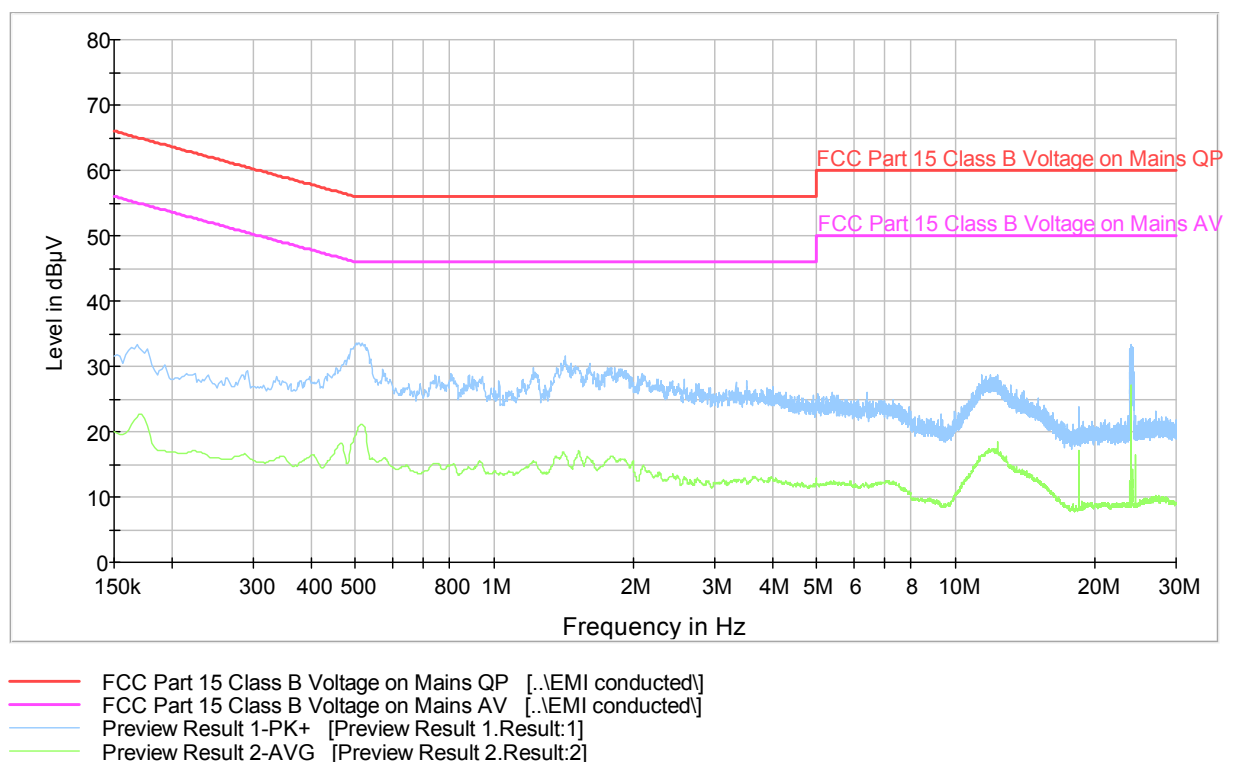
### Test Plan

Conducted disturbance voltage was measured with an artificial main network from 150 kHz to 30 MHz with 4.5 kHz steps and a resolution bandwidth of 9 kHz. Measurements were carried out with peak and average detectors from the phase(s) and neutral lines of the power supply cable. Emissions were measured from the analysers AC/DC converter power supply cable and from the supply cable of the laptop PC.

The EUT was working as described in the section “EUT Test Conditions”.

### Test results

Conducted Emission Mains FCC Part 15 Class B with ESH3-Z5 8019

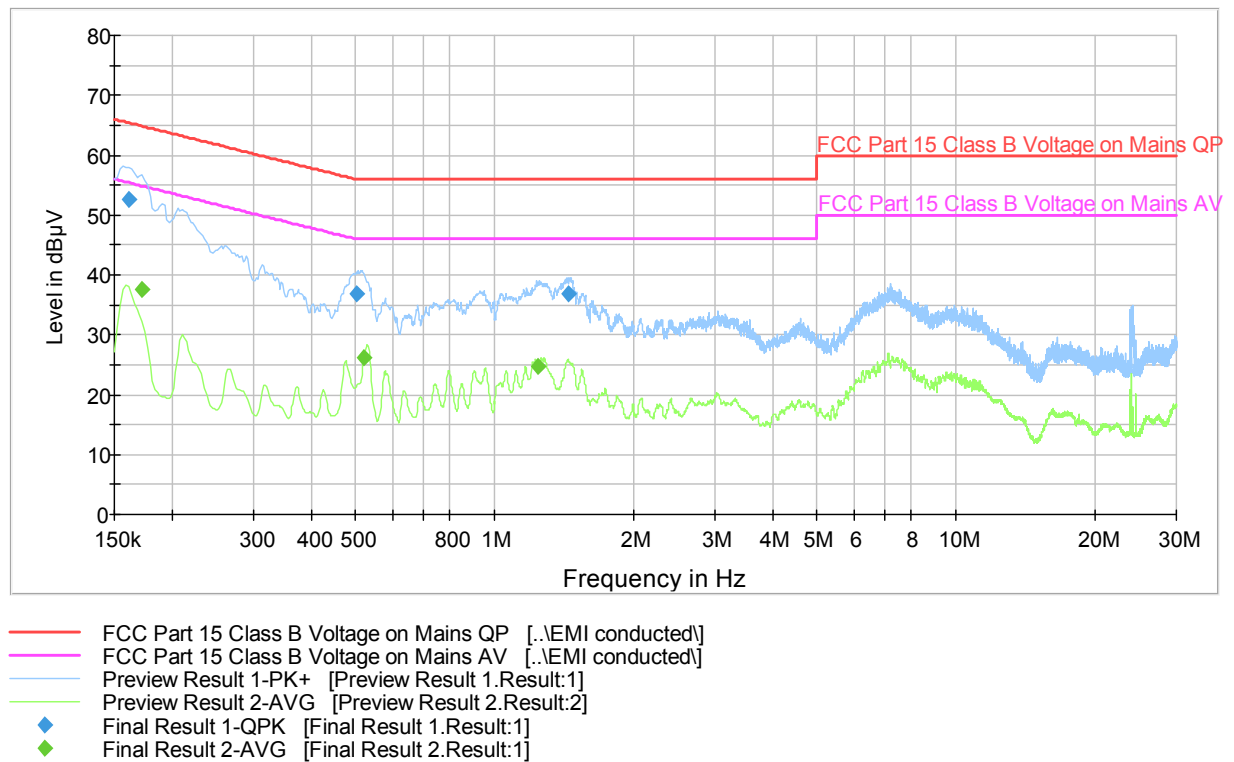


**Figure 1** The measured curves with peak-detector and average detector TRF measurement on. (TRF analyzer supply cable).

No final measurements were made because the emissions were more than 10dB from the limit.

## Conducted Emission Test

## Conducted Emission Mains FCC Part 15 Class B with ESH3-Z5 8019



**Figure 2.** The measured curves with peak-detector and average detector from laptop PCs supply cable EUTs TRF measurement on.

### Final measurements from the worst frequencies

**Table 1.** Final quasi-peak measurements from the worst frequencies from laptop PCs supply cable. (EUTs TRF measurement on).

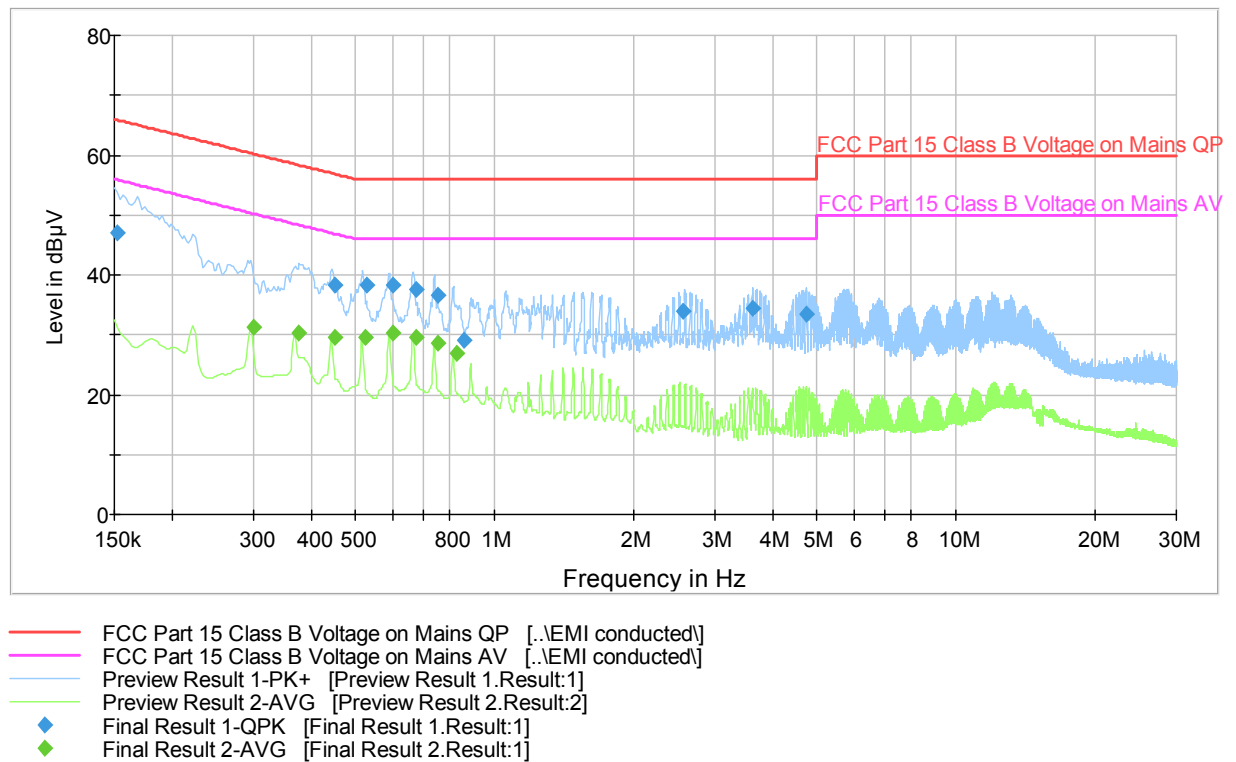
Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.161250	52.7	1000.0	9.000	GN	L1	10.8	12.7	65.4	
0.501000	37.0	1000.0	9.000	GN	L1	10.1	19.0	56.0	
1.443250	36.9	1000.0	9.000	GN	N	10.2	19.1	56.0	

**Table 2.** Final average measurements from the worst frequencies from laptop PCs supply cable. (EUTs TRF measurement on).

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.172500	37.6	1000.0	9.000	GN	L1	10.8	17.2	54.8	
0.521250	26.1	1000.0	9.000	GN	L1	10.1	19.9	46.0	
1.238500	24.7	1000.0	9.000	GN	N	10.2	21.3	46.0	

## Conducted Emission Test

Conducted Emission Mains FCC Part 15 Class B with ESH3-Z5 8019



**Figure 3.** The measured curves with peak-detector and average detector with EUTs mixer motor on. (TRF analyzer supply cable).

**Table 3.** Final quasi-peak measurements from the worst frequencies from laptop TRF analyzers supply cable. (EUTs TRF measurement on).

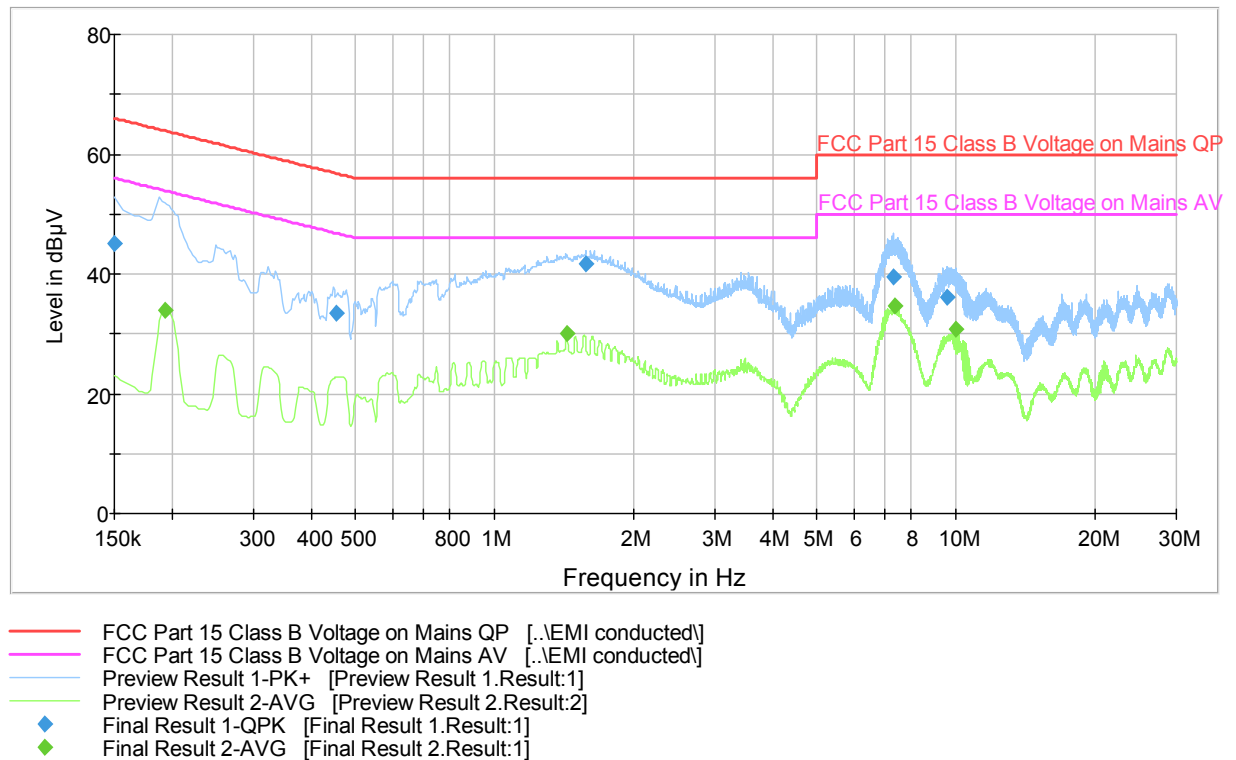
Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.152250	46.9	1000.0	9.000	GN	N	10.6	19.0	65.9	
0.451500	38.3	1000.0	9.000	GN	N	10.1	18.5	56.8	
0.528000	38.3	1000.0	9.000	GN	N	10.1	17.7	56.0	
0.602250	38.3	1000.0	9.000	GN	N	10.1	17.7	56.0	
0.676500	37.6	1000.0	9.000	GN	N	10.1	18.4	56.0	
0.755250	36.7	1000.0	9.000	GN	N	10.1	19.3	56.0	
0.858750	29.1	1000.0	9.000	GN	N	10.1	26.9	56.0	
2.559250	33.8	1000.0	9.000	GN	N	10.3	22.2	56.0	
3.614500	34.4	1000.0	9.000	GN	N	10.4	21.6	56.0	
4.744000	33.4	1000.0	9.000	GN	N	10.5	22.6	56.0	

**Table 4.** Final average measurements from the worst frequencies from laptop TRF analyzers supply cable. (EUTs TRF measurement on).

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.300750	31.3	1000.0	9.000	GN	N	10.5	18.9	50.2	
0.375000	30.3	1000.0	9.000	GN	L1	10.3	18.1	48.4	
0.449250	29.5	1000.0	9.000	GN	L1	10.2	17.4	46.9	
0.525750	29.5	1000.0	9.000	GN	L1	10.1	16.5	46.0	
0.602250	30.2	1000.0	9.000	GN	N	10.1	15.8	46.0	
0.676500	29.5	1000.0	9.000	GN	N	10.1	16.5	46.0	
0.753000	28.5	1000.0	9.000	GN	N	10.1	17.5	46.0	
0.829500	26.9	1000.0	9.000	GN	N	10.1	19.1	46.0	

## Conducted Emission Test

Conducted Emission Mains FCC Part 15 Class B with ESH3-Z5 8019



**Figure 4.** The measured curves with peak-detector and average detector with EUTs mixer motor on. (PCs supply cable).

**Table 5.** Final quasi-peak measurements from the worst frequencies from laptop PC supply cable. (Mixer motor on).

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.150000	45.1	1000.0	9.000	GN	N	10.6	20.9	66.0	
0.453750	33.5	1000.0	9.000	GN	N	10.1	23.4	56.8	
1.573750	41.6	1000.0	9.000	GN	N	10.2	14.4	56.0	
7.327000	39.6	1000.0	9.000	GN	L1	10.8	20.4	60.0	
9.579250	36.1	1000.0	9.000	GN	L1	11.0	23.9	60.0	

**Table 6.** Final average measurements from the worst frequencies from laptop PCs supply cable. (Mixer motor on).

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.192750	33.8	1000.0	9.000	GN	N	11.0	20.1	53.9	
1.434250	30.1	1000.0	9.000	GN	N	10.2	15.9	46.0	
7.390000	34.7	1000.0	9.000	GN	L1	10.8	15.3	50.0	
9.997750	30.9	1000.0	9.000	GN	L1	11.0	19.1	50.0	

Correction factor (dB) in the final result tables contains the sum of the transducers (cables + transient limiter + LISN).

QuasiPeak and Average values are the measured values corrected with the correction factor.

## Radiated Emissions In The Frequency Range 30 MHz - 1000 MHz.

<b>Standard:</b>	ANSI C63.4 (2009)	
<b>Tested by:</b>	JSU	
<b>Date:</b>	8.7.2014	
<b>Humidity:</b>	48 %	
<b>Temperature:</b>	18 °C	
<b>Barometric pressure:</b>	999 hPa	
<b>Measurement uncertainty:</b>	± 5.1 dB (30 – 200 MHz) ± 4.2 dB (200 – 1 000 MHz)	Level of confidence 95 % (k = 2).

### Test plan

The radiated emission measurements were done within a semi anechoic screened chamber. The EUT was placed on a table 0.8 m above the reflecting ground plane. The measurement distance was 3 meters. The worst interferences were determined during measurements by rotating the turntable and adjusting the antenna height. The measurements were done in horizontal and vertical antenna polarizations. The supply voltage to the turntable was fed through the filter.

### Radiated measurement settings

#### Preliminary testing:

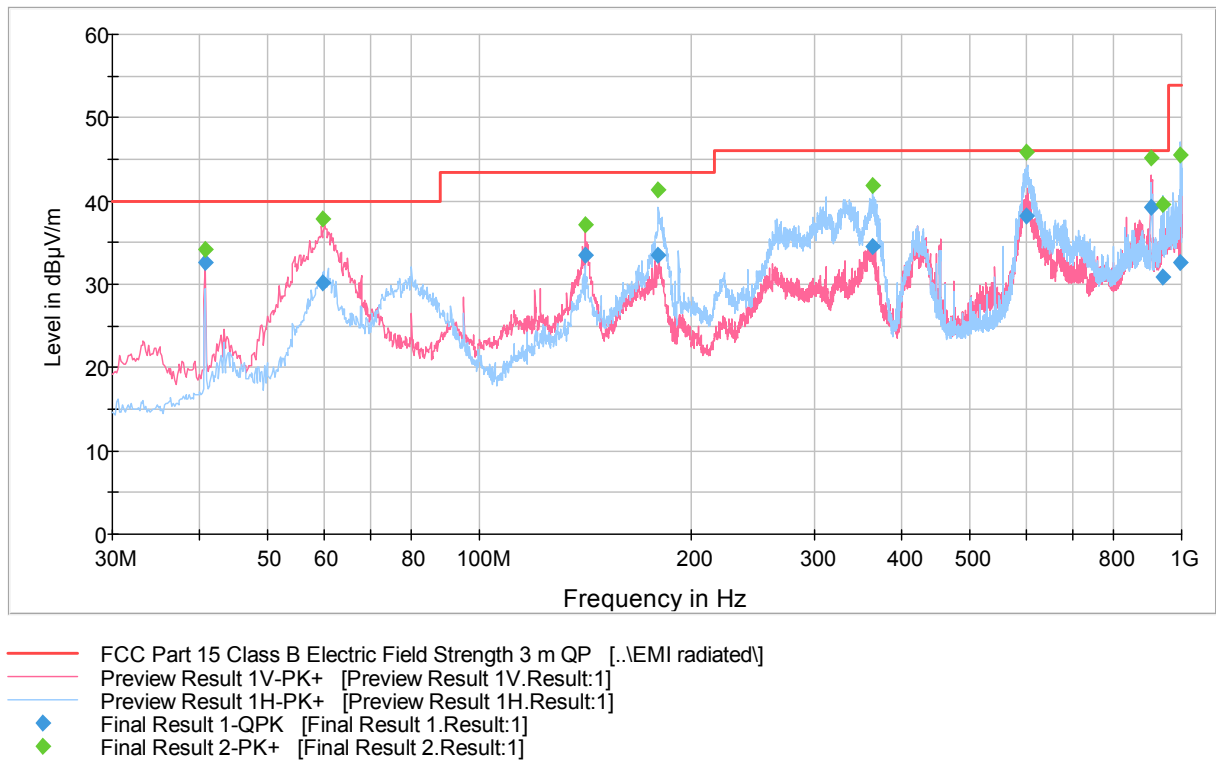
Turntable movement:	20 ° step
Turntable position:	10 ° to 350°
Antenna movement:	1.5 m step
Antenna height:	1.0 m to 4.0 m
Antenna polarization:	Vertical and horizontal

#### Final testing:

Turntable movement:	Continuous
Turntable position:	± 40 °
Antenna movement:	Continuous
Antenna height:	± 3 m
Antenna polarization:	Vertical and horizontal

## Measured Quasi-Peak Values In The Frequency Range 30 MHz - 1000 MHz.

Radiated Emission FCC Part 15 Class B 30-1000MHz 3m



**Figure 5.** Measured curve with peak-detector.

## Final measurements from the worst frequencies

**Table 7.** Final quasi-peak measurement from the worst frequencies

Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)	Comment
40.685000	32.6	1000.0	120.000	100.0	V	290.0	14.1	7.4	40.0	
59.905000	30.2	1000.0	120.000	100.0	V	330.0	13.8	9.8	40.0	
141.585000	33.6	1000.0	120.000	100.0	V	139.0	14.1	9.9	43.5	
179.615000	33.4	1000.0	120.000	159.0	H	250.0	12.9	10.1	43.5	
363.045000	34.5	1000.0	120.000	100.0	H	279.0	16.7	11.5	46.0	
601.995000	38.2	1000.0	120.000	365.0	H	99.0	22.6	7.8	46.0	
903.205000	39.3	1000.0	120.000	100.0	V	142.0	26.8	6.7	46.0	
942.005000	30.9	1000.0	120.000	100.0	H	342.0	27.4	15.1	46.0	
996.975000	32.7	1000.0	120.000	100.0	H	334.0	27.9	21.2	53.9	

Correction factor (dB) in the final result tables contains the sum of the transducers (antenna + amplifier + cables).

QuasiPeak values are measured values corrected with the correction factor.

**TEST EQUIPMENT**

<b>Manufacturer</b>	<b>Type</b>	<b>Serial no</b>	<b>Cal. date</b>	<b>Cal. due</b>
<b>ROHDE &amp; SCHWARZ</b>				
EMI Test receiver	ESU 26	100185	24.09.2014	24.09.2015
Test software	EMC32	Ver. 8.30.0	-	-
LISN	ESH2-Z5	863794/013	14.10.2014	14.10.2015
LISN	ESH2-Z5	863794/014	14.10.2014	14.10.2015
Transient limiter	ESH3-Z2	#1	24.10.2014	24.10.2015
<b>C &amp; O</b>				
Thermometer	-	8376	11.02.2015	11.02.2016
<b>SCHWARZBECK</b>				
Antenna (30 MHz - 1 GHz)	VULB9168	9168-503	04.11.2014	04.05.2016
<b>DEISEL</b>				
Antenna mast	MA 240 T	240/394/96	-	-
Tilt option	KE 220	220/307/96	-	-
Controller	HD 100	100/413/96	-	-
Turntable	DS 420	420/420/96	-	-
<b>CALIFORNIA INSTRUMENTS</b>				
Power Supply	5001 iX Series II	58209	-	-