"Dirty power" from new electricity meters: Key to a health problem?

by Einar Flydal, MSc, MTS* and Else Nordhagen, PhD†, 6th of April 2022

A new technical test report shows that the new “smart” electricity meters that have been rolled out in Norway and in other countries, in homes and at workplaces, pollute the electricity grid in the buildings with more "dirty electricity" than do old meters. Thereby, the new meters have the potential to be a health problem - even when they are “un-smartened”, i.e., with the radio transmitters in the meters removed or silenced. "Dirty electricity" is an industry term for several types of electrical noise spreading through power lines and creating or impacting electromagnetic fields around them.

The test report is part of the evidence to be used in a case for the appeal court in Oslo, Norway, in September 2022 to underpin that the 10 plaintiffs' claims that they may have health issues from "smart" utility meters even when the microwave transmitter is turned off or removed, cannot be "evidently unfounded".

As an introduction to the test report, we here explain what we did, and refer to scientific findings demonstrating that these test results may have significant health relevance.

What we did and what science shows

We collected 23 different models of electricity meters, produced between 1985 and 2019, and got them tested to compare the “dirty electricity” produced from them. The company EMF Consult AS tested the amount of dirty electricity from the different meters, concluding in the report that the new meters create more dirty electricity than do older models.

- The amounts of dirty current are particularly significant at frequencies *outside* the spectrum tested for CE approval, which follows the EU's certification norms, says cybernetics and electrical engineer Odd Magne Hjortland, who is the report's author. The thresholds specified in the relevant norms are found as straight lines in the report’s graphs. - The fact that the AMS meters are located just where the house's wiring network spreads out into the house, causes this noise to spread out effectively in the building, so that, in principle, you live inside a three-dimensional antenna that emits electromagnetic pulses in step with the noise. The noise will be amplified when several meters are installed in the same transformer circuit, which is the normal situation, Hjortland continues.

Sound engineer Erik Avnskog has also worked with the topic of electric noise for a number of years, both due to him having been a music studio owner and music producer, as well as later as an electro-hypersensitive searching for technical filtering of this noise. Avnskog tells us that such noise may indeed be problematic. We know from other test measuring we have initiated, that the noise increases upwards and past the frequencies tested in the test here presented.

It is well documented that very low frequencies consisting of “bursts” or “pulses” or “spikes” or “peaks” found in such “dirty electricity”, may affect biology, e.g. by impacting metabolism and alter

* cand. polit. (political science) and Master of Telecom Strategy, retired from R&D and strategy at Telenor ASA, and from university teaching (NTNU). Corresponding author. Email: einar.flydal@gmail.com

† dr.scient (informatics), retired from R&D and ICT development at Telenor ASA, and from university teaching (UiO)

the brain's sleep pattern, by opening cell wall calcium channels (VGCCs) resulting in increased production of oxidants (ROS), and by creating extra signalling in the nervous system. Such effects happen even at very weak pulses, as long as they reach the "right" frequencies, i.e. pulse rhythms that charged di-poled proteins or other elements in the body naturally respond to.

Experience tells that some individuals are far more sensitive to such impacts others and react acutely, others only after some time, or never. The measurement test results in this new report may therefore explain why some people experience health problems from new smart meters - even when they have been exempted and removed from the new meters' radio transmitters, even though others do not react at all.

Among the typical acute reactions to electromagnetic fields (EMFs) are diffuse symptoms, such as fatigue, tinnitus, joint pain, "brain fog" and insomnia. These are among the symptoms that the US diplomats recently reported, referenced in media around the world. A research committee appointed by the US National Research Council found that EMF pulses were the most probable cause. The increase in such "noise" in society, "drowning out" nature's own electrical pulses to which we are adapted, raises concern among some researchers. They predict growth in health problems for such reasons.

In Norway, customers with a medical certification that they have acute health problems from electromagnetic fields, are exempted from the instalment of a radio transmitter in the new electricity smart meters, named AMS (Automatic Metering System) meters. In cases of exemption from the AMS functionality the electricity grid companies are not obliged to replace the old meter, but still insist to do so, even with the transmitter removed or deactivated, with threats of power outage if not accepted. They claim "dirty electricity" cannot possibly be a health problem, referring to The Norwegian Radiation Protection Authority's regulations.

There are no relevant statistics collected in Norway, but both experience and research in other countries indicate that a significant number of people with "diffuse" health problems have got them *after the* AMS meter was installed. The basic documents on which Norwegian radiation protection is based (eg NIPH report 2012: 3) do not deny such effect to be possible, and such reactions to exposure below current Norwegian and Western standards are generally recognized in many countries and solidly proven for a long time. Still, The Norwegian Radiation Protection Authority, claims health problems from such "dirty electricity" cannot occur, or are, in case they do, not to be considered health issues ...

Some more details

As to written sources on dirty electricity and its biological effects, sources of various quality abound, however most from a purely technical interference perspective, and under the technical term EMC (electromagnetic compatibility).

For our collection of references in Scandinavian and English relevant as to electricity (utility) smart meters and put together for the court case mentioned, you may look up the references (with links) found in our Norwegian only book "Smartmålerne, skitten strøm, pulser og helsa" ("Smart meters, dirty electricity, pulses and health", 2021, 285 pages). You may download the book for free. See references no.s 142 to 183 and graphs found from page 115. (If wished, use Google Translate or similar to get a rough translation of text.)

Among possible mechanisms, the opening of cell walls' calcium channels, causing increased oxidant production, is well known as a cause of many very different medical symptoms, both acute and over

time, minor and more severe. Several different environmental stressors can trigger these channels (VGCCs) to open. That *the pulsation from an AMS meter's radio signals* (brand Aidon) can open cell walls' calcium channels, has recently been demonstrated in a simple note with calculations that we asked the German physicist Klaus Scheler to make, based on current radio-physical and biophysical knowledge. Scheler based the calculus on transmitter logs provided by us, and model work done by Panagopoulos et al .. Scheler explains the model and its practical application in a comprehensive academic paper where he puts together many "puzzle pieces" from practical and theoretical research. In spring 2021, he translated this paper into English and sent it to us for free use and distribution. We have put the two texts, the German and English versions, together into one document. We are not aware of any tests or calculations as to whether dirty electricity can have such impact, but see no reasons why it should not.

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From the sources referred to in this introduction to the technical test report, it seems difficult to avoid drawing the conclusion that the widespread use of new smart meters, even when without transmission, imposes on humans, as well as other biological systems, an environmental stressor with often “diffuse”, but still significant impacts on public health – and that possible mechanisms behind, with adverse endpoints, are at least in part known and established in biophysics and medicine, but still denied by radiation authorities.

Below you find EMF Consult’s report in full.

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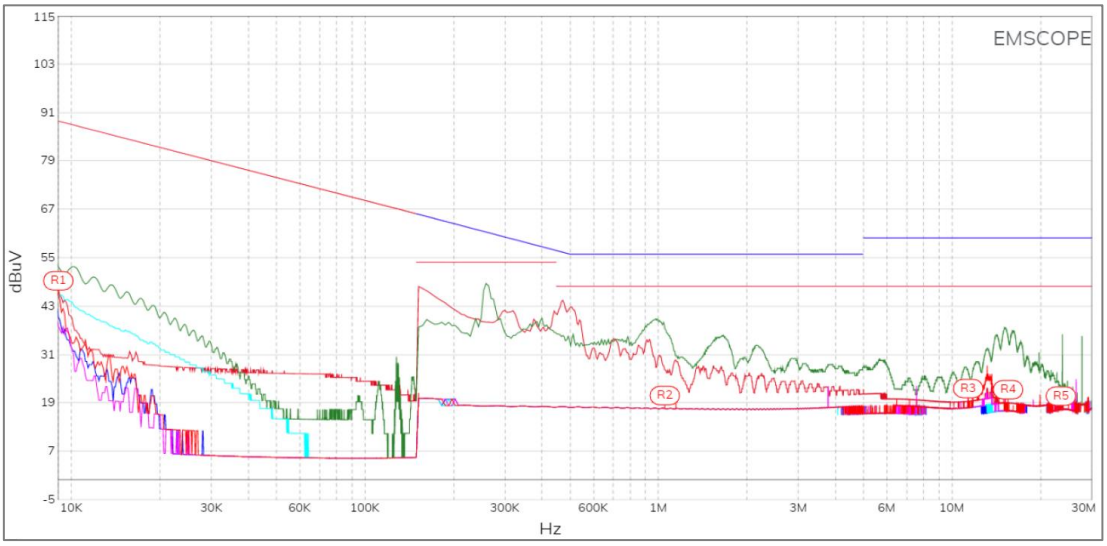
PDF for free re-publication. This text is Version 2.0 and can be downloaded together with EMF Consult’s report from https://einarflydal.com/?smd_process_download=1&download_id=73602

or, in short: https://bit.ly/3Dhtzp5

(Previous versions of this text were posted at http://einarflydal.com
in Norwegian 19.102022, and
in English 28.03.2022.)

TEST OF CONDUCTED EMISSION («DIRTY ELECTRICITY») FROM DIFFERENT GENERATIONS OF ELECTRICITY METERS





Test performed by EMF CONSULT AS
Test engineer: Odd Magne Hjortland (B.Sc.)

(Revision 02)

www.emf-consult.no

EMF Consult AS
Kjærranveien 14
3180 Nykirke
Norway

Tel: (+47) 32 87 94 05
E-mail: info@emf-consult.no
Web: emf-consult.no
VAT. no.: NO 920 194 044

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Document history – Date and revision

02	06.04.2022	Clarification on reference levels (p.8) and whether EUT's had active communication module installed during test (p.7).	OMH
01	10.03.2022	First English version issued	OMH
Revision	**Date**	**Description**	**Sign**

Purpose

To measure conducted emission to identify voltage noise, or so called “dirty electricity”, from a selection of different generations of electricity meters commonly used in Norway. The purpose was to determine if there are differences in the amounts of conducted emission (voltage noise) produced by the various models of electricity meters.

Client

The NGO “Foreningen for EMF-Reform” / Einar Flydal, Sagadammen 20, 0884 Oslo

Background

Through the campaign "Vi tar smartmålerne for retten!” (“We take the smart meters to court!"), the NGO “Foreningen for EMF-Reform” is engaged in the work of finding sustainable and healthy solutions regarding electromagnetic radiation from electricity meters. As a part of this effort, the stakeholder wanted to test the claim that new AMS meters - whether with or without a communication module installed - produce more voltage noise than previous generations of both analogue and digital electricity meters.

The motivation for this study is that some people who have had a new meter installed, but with the communication module removed or silenced, still believe they experience physical problems from the new meter. Their claim is that the voltage noise from the power supply in the AMS meter itself is the problem. Reference is also made to research literature on health effects from such voltage noise.

“Foreningen for EMF-Reform” therefore requested EMF CONSULT to test several generations of electricity meters that are in use in Norway to find out if there is any basis in the claim that new AMS meters make more voltage noise than former models, and that it spreads from the meter and on to the electrical wiring in the home.

The Client wanted to investigate the following two questions:

1. Does constructive interference occur when several identical electricity meters are installed in the same transformer circuit?
2. Do older analogue and digital electricity meters make less electromagnetic voltage noise than new automatic smart electricity meters?

Conclusions

The measurement results show that both the Kamstrup and Aidon smart meters tested separately meet the test requirements in accordance with EMC / EMI standard CISPR 32 and the requirements of the previous VDE 0871 standard.

Nevertheless, the measurement results show that the examined new automatic electricity meters (AMS) make significantly more voltage noise than the older analogue and digital electricity meters that were examined (see p. 9).

Within the frequency range 150kHz - 30MHz (CISPR 32), the noise level of the analogue and digital electricity meters does not exceed the reference level at approx. 18dBµV (zero load). Both the Kamstrup and Aidon AMS meters examined have a quasi-peak (QP) of 49dBµV. This is a 31dB µV

difference, which corresponds to approx. 35 times stronger voltage noise from the new smart meters (AMS), compared to older analogue and digital meter models.

The reason for this seems to be that the older analogue meters do not have built-in electronics that use switch-mode power supplies (SMPS) and that those older digital meters using switch-mode power supplies use better filter technology to filter out this voltage noise.

It was also found that when several identical smart meters are installed within the same transformer circuit (sub-station), constructive interference occurs, which increases the voltage noise (see p. 8).

In installations with up to several hundred identical electricity meters within the same transformer circuit, the voltage noise from the new smart meters will in theory be able to generate voltage noise exceeding the limits set for such equipment when tested alone in EMC laboratories. This is similar to the problem observed with LED lighting, where approved LED-products, when installed in a system together with several other identical products, generate constructive interference disturbing other technical equipment/installations in the vicinity.

EMI standards for IT and multimedia equipment

For many years, power-supply products marketed for communications and information technology (IT) end equipment within the EU have complied with the well-known European Standard EN 55022, derived principally from the CISPR 22 product standard, with the Conformité Européenne (CE) Declaration of Conformity (DoC) for external power supplies referencing EN 55022 to demonstrate compliance to the essential requirements of the EU's EMC Directive 2014/30/EU.

Recently, however, CISPR 22/EN 55022 was subsumed into CISPR 32/EN 55032. This new emissions standard covers multimedia equipment and becomes effective as a harmonized standard in compliance with the EMC directive. More specifically, any product previously tested under EN 55022 that ships into the EU after March 2, 2017 must now meet the requirements of EN 55032. Equipment intended primarily for use in a residential environment must meet Class B limits, with all other equipment complying with Class A.

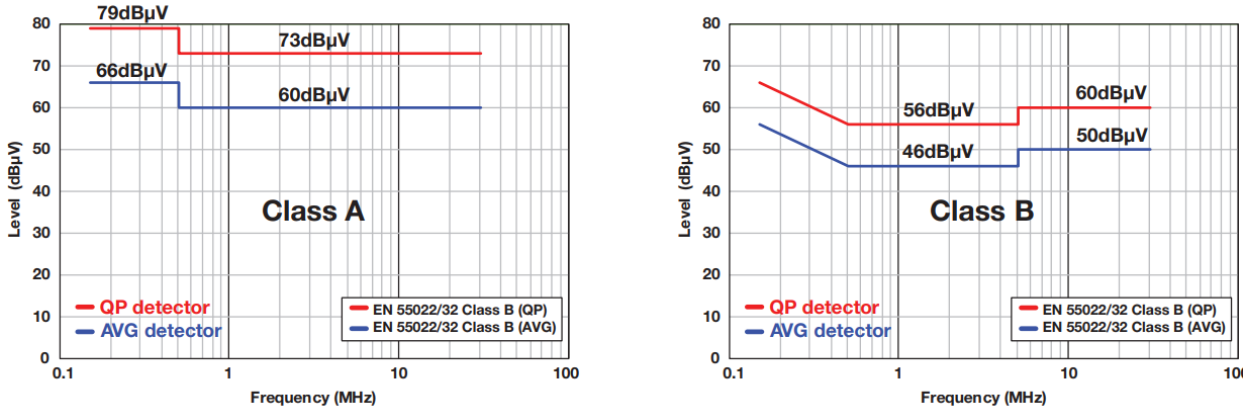


Figure caption: The figure above shows the EN 55022/32 class A and class B limits for conducted emission (wired voltage noise); with quasi-peak (QP) and average (AVG) signal measurement over the frequency range 150kHz to 30MHz. Both quasi-peak and average limits must be met.

Almost all CISPR-based test standards used for CE approval of equipment specify limits for conducted emission measured from 150kHz up to 30MHz.

The guidelines electronic equipment needs to comply with only cover the range from 150 kHz and up to 30MHz. However, this does not imply that voltage noise below 150 kHz cannot cause health and/or environmental problems. High energy voltage noise and transients transmitted on the electricity mains network are mainly generated in the range from 10kHz to 150kHz. This report therefore also includes this frequency range in its measurements and evaluations.

It is important to point out that the EMC requirements covered by the test standards are primarily set to ensure that technical equipment works as intended and that it is not damaged. Pulse patterns are not assessed, only signal strength. Possible health effects are not considered, only technical.

CISPR 32: 2015 (150kHz-30MHz), or any equivalent standard, which is used by all manufacturers of electricity meters, and which is the basis for the measurement results in this report, applies to multimedia equipment (MME) as defined in the standard's section 3.1.24. The standard covers two classes MME (class A and class B). Here we only look at class B, as electricity meters are equipment that is primarily intended for use in residential environments.

VDE 0871-B: 1985 (10kHz-30MHz), a German EMC directive for interference generated by information technology equipment. The standard was replaced by EN 55022 (150 kHz up to 30 MHz) from 01.01.1996 throughout Europe. This means that voltage noise in the range 10 kHz-150 kHz is no longer considered in relation to CE approval of equipment. However, voltage noise in this frequency range causes significant interference to adjacent devices/equipment and can also lead to the destruction of sensitive control systems, computers, and components.

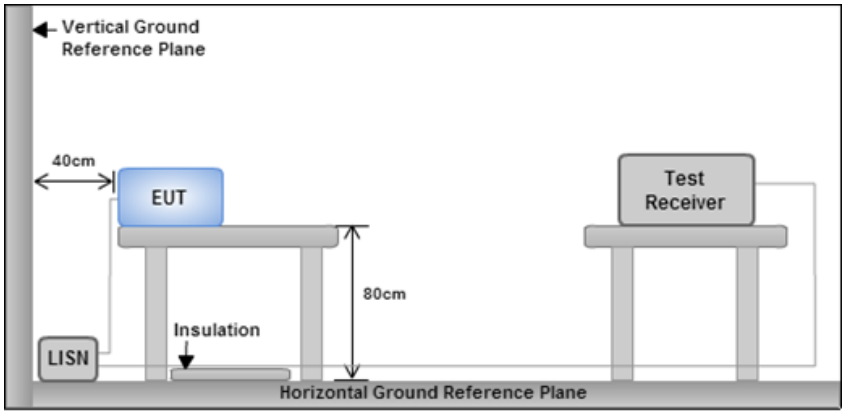
The client wanted to compare the voltage noise from the electricity meters with this previous standard because:

- The range 2kHz - 150kHz currently seems to be inadequately regulated ("grey zone").
- Within this range, a lot of voltage noise from electronic power supplies (SMPS), frequency converters, car chargers, photovoltaic systems, LED lighting, dimmers, etc.. is found.
- Previous measurements of voltage noise from AMS, made by the German company Bajog Electronics GmbH on our request, had showed that there was voltage noise within this grey zone not covered by the CISPR 32 standard, according to which AMS-meters are tested and certified.

Methods and Measurements

The EMI measurements have been carried out in a room where all external electromagnetic interference has been reduced to a minimum. A certified EMC / EMI lab has not been used, but a room with brick walls covered with metal plates on the wall and floor and grounded according to the standard layout for the CISPR 32 test. A galvanic isolator and EMI / RFI filter are installed on the mains power supply to prevent conducted voltage noise from outside affecting the measurement results. Furthermore, a separate isolating transformer has been used to prevent earth-leakage current from the LISN units from activating the earth-leakage circuit breaker. (LISN stands for Line Impedance Stabilized Network.)

The measuring instrument used is a CISPR-approved EMZER-EMSCOPE Dual-mode EMI receiver with built-in LISN for measuring conducted voltage noise in the frequency range 9 kHz - 110 MHz. EMSCOPE can measure Peak, Quasi Peak and Average signal. Resolution bandwidth filters (RBW) used in our measurements are at 200 Hz and 9 kHz, respectively (ref. CISPR 32).



*In this context, **EUT** (Equipment Under Test) are different models of electricity meters.*
***Test Receiver** and **LISN** are in our test setup combined in the EMZER-EMSCOPE.*



The test setup with EMZER-EMSCOPE to the right and electricity meter to the left on the table.

EMF CONSULT does not have an EMC / EMI-certified measurement laboratory and does not strive for this. The tests in this report are nevertheless based on measurement specific requirements in the CISPR 32 and VDE 0871 standards and performed with certified and approved measuring equipment in accordance with the requirements of the standards.

Test objects - Equipment under test (EUT)

The client supplied the following electricity meters for analysing, to find out how much conducted voltage noise each one generated back onto the electric wiring in the home.

Producer	Model	Production year	Type
Ganz	GH36	1985	Analogue
AEG	B114W	1992	Analogue
Schlumberger	G1V6hJ6	1994	Analogue
Enermet	SK320XE	1992	Digital
Elektrisk Produksjon	DDS3008	1999	Digital
Enermet	420i	2002	Digital
Enermet	E420-s	2004	Digital
Kamstrup	658-282-OK-40	2006	Digital
Kamstrup	686-162-QR-40	2006	Digital
Aidon	5550	2006	Smart meter - 2. gen
Kamstrup Omnipower	684-11-31B-N24-3101-040	2019	Smart meter - 4. gen

In total, approx. 20 electricity meters were handed in and tested. Several of the analog and digital electricity meters had identical results to the ones in the selection above and are therefore omitted from the overview.

To get the best possible basis for comparison, the client wanted to compare the three new models of smart meters (AMS) from Aidon, Kamstrup and Nuri/Kaifa that are used today in Norway with older models of analogue and digital electricity meters that have been and still are in use in Norwegian homes.

The client could not get hold of an electricity meter from Nuri/Kaifa. Nuri/Kaifa was therefore excluded from the test. The client also failed to procure the 4th generation Aidon AMS meter that is installed today. In our tests, the 2nd generation Aidon smart meter was used, as we assume, based on other test reports we have on the 4th generation Aidon smart meter, that this has a power supply (SMPS) and a voltage noise response almost identical to the latest 4th generation Aidon meters.

NOTE: The main purpose of the test was to verify whether the new “smart” electricity meters without the communication module installed or active generated higher values of conducted emission (“dirty electricity”) than older models of analogue and digital electricity meters. All the new smart meters (Aidon and Kamstrup Omnipower) were therefor tested with the communication module removed, or silenced. Only in one of the tests, where we tested if constructive interference occurs when several identical electricity meters are installed in the same transformer circuit, we activated the communication module in one of the Kamstrup Omnipower meters to see whether the communication module generated more conducted noise when installed and active. See Task 1 for the result.

Results

The measurement results show that the tested Kamstrup and Aidon smart meters each meet the test requirements in accordance with the current EMC / EMI standard CISPR 32 and the requirements of the previous VDE 0871B standard. The results of the measurements related to the two questions the client wanted to study, are as follows:

Task 1 - Constructive interference

Does constructive interference occur when several identical electricity meters are installed in the same transformer circuit?

Findings: Constructive interference occurs when several identical current meters are connected in the same transformer circuit. The graph below shows the voltage noise levels from three different measurements made with 1, 2 and 3 identical meters connected, respectively:



The upper threshold values (vertical axis) given for the different frequencies (horizontal axis) in the standards used are the straight red and blue lines in the middle of the picture:

- *Blue line: CISPR 32 class B, quasi-top (QP)*
- *Red line: VDE 0871 class B, quasi-top (QP)*

The blue graph at the bottom of the picture is the reference level at zero load, without any equipment under test (EUT) connected.

***NOTE:** The reference zero level and the two lines indicating the threshold values of the standards used in the tests applies to all subsequent measurement reports / graphs referred to in this report.*

<u>The measurement result clearly shows that the conducted voltage noise increases when several identical smart meters (AMS) are connected in the same transformer circuit.</u>

- Red graph shows voltage noise with 1 pc. Kamstrup Omnipower AMS connected
- Green graph shows voltage noise with 2 pcs. Kamstrup Omnipower AMS connected
- Turquoise graph shows voltage noise with 3 pcs. Kamstrup Omnipower AMS connected

Pink graph shows that the conducted voltage noise on the wiring increases when the RF transmitter on the AMS meter is active (transmitting).

NOTE: The test shows how the conducted voltage noise from the smart meter(s) increases when several smart meters are installed within the same transformer circuit (sub-station). It is important to notice that the conducted voltage noise from a smart meter can create constructive interference with voltage noise from other electronic equipment in a home, and with other equipment connected to the same transformer circuit.

Task 2 - Comparison of old and new electricity meters

Do older analogue and digital electricity meters make less conducted voltage noise than new smart electricity meters?

Findings: Old analogue and digital electricity meters make less conducted voltage noise than new smart electricity meters (AMS).



The upper threshold values for the standards used are the straight red and blue lines in the middle of the picture:

- *Blue: CISPR 32 class B, quasi-top (QP)*
- *Red: VDE 0871 class B, quasi-top (QP)*

It is clear from the measurements that the new automatic electricity meters (AMS), both from Kamstrup and Aidon, make significantly more conducted voltage noise than the older analogue and digital electricity meters.

- Red graph at the top show voltage noise from Aidon AMS, page 22 of the measurement report.
- Green graph shows voltage noise from Kamstrup AMS, page 23 of the measurement report.
- Turquoise graph shows voltage noise from Enermet digital electricity meter, page 18 of the metering report.
- Pink graph shows voltage noise from Kamstrup digital electricity meter, page 20 of the metering report.
- Red graph at the bottom show voltage noise from the Schlumberger analogue meter, page of the meter report 15.

Blue graph at the bottom of the picture (reference level at zero load) is hidden under the graphs from the analogue and digital electricity meters and shows that there is close to zero voltage noise from these old meters.

Within the frequency range 150kHz - 30MHz (CISPR 32), the analogue and digital electricity meters are at the reference zero level with approx. 18dBµV. Both the Kamstrup and Aidon smart meters have a quasi-peak (QP) of 49dBµV. This is a 31dBµV difference which corresponds to approx. 35 times stronger conducted voltage noise.

The reason for this difference in conducted voltage noise seems to be that the older analogue meters do not have electronics that use switch-mode power supplies (SMPS) and that the older digital meters that use switch-mode power supplies use better filter technology to filter out the voltage noise. Newer smart meters have built-in power supplies and data processors that create more voltage noise, while having less efficient noise filters.



Analogue mechanical meter with rotary dial, without built-in power supply.



Digital meter with built-in power supply and efficient noise filter with large X-capacitors.



Smart meter with built-in power supply and processor capacity that creates more voltage noise while having less efficient noise filters.

Test report – Equipment under test (EUT)

3 ea. Kamstrup Omnipower – constructive interference

Test how several meters in the same transformer circuit increase the conducted voltage noise. The test result also shows that there is more voltage noise when radio module (RF) is active/transmitting.

See page 8 for more information.

REPORT - VDE 0871 Class B og CISPR 32 Class B

Test Conditions

EUT: 1, 2 og 3 stk 3ph Omnipower AMS

Op Cond: Conductive emission

Operator:EMF Consult

Test Spec: VDE0871B + CISPR32B

Date (YYYY/MM/DD): 2021/09/15

Extra compliance: Fewer than 6 emissions are within the defined margin.

Her ser vi hvordan flere målere i samme trafokrets øker den ledningsbundne støyen. Vi ser også at det er mer ledningsbunden støy når RF er aktiv/sender.

Scan Settings

Instrument: EMSCOPE

Software version: 2.43

EMSCOPE SN: 0341100012414166

Freq start: 9 kHz

Freq stop: 30 MHz

RBW: 200Hz - 9kHz

Losses: Internal LISN

Dwell time: 2 sec



Measurement Plot



5 types of 3-phase power meters - comparison analogue, digital and AMS

Comparison of three generations of electricity meters to check if old analogue and digital electricity meters generate less conducted voltage noise than new automatic smart meters (AMS).

See page 9 for more information.

REPORT - VDE 0871 Class B og CISPR 32 Class B

Test Conditions

EUT: 5 typer 3ph strømmålere
Op Cond: Conductive emission
Operator:EMF Consult
Test Spec: VDE0871B + CISPR32B
Date (YYYY/MM/DD): 2021/09/15
Extra compliance: Fewer than 6 emissions are within the defined margin.
Sammenligning av analog, digital og ny AMS

Scan Settings

Instrument: EMSCOPE
Software version: 2.43
EMSCOPE SN: 0341100012414166
Freq start: 9 kHz
Freq stop: 30 MHz
RBW: 200Hz - 9kHz
Losses: Internal LISN
Dwell time: 2 sec



Measurement Plot



Traces:
T1 REF QPK Frze T2 Aidon555 QPK Frze T3 KamOmni QPK Frze T4 Enerm420 QPK Frze T5 KamsDIG QPK Frze T6 SchluANA QPK Frze

Limits:
VDE 0871 Class B og CISPR 32 Class B: QP

Analogue electricity meter 3-ph Ganz GH36 (1985)

REPORT - VDE 0871 Class B og CISPR 32 Class B

Test Conditions

EUT: 3 ph analog GH36

Op Cond: Conductive emission

Operator:EMF Consult

Test Spec: VDE0871B + CISPR32B

Date (YYYY/MM/DD): 2021/09/15

Extra compliance: Fewer than 6 emissions are within the defined margin.



Scan Settings

Instrument: EMSCOPE

Software version: 2.43

EMSCOPE SN: 0341100012414166

Freq start: 9 kHz

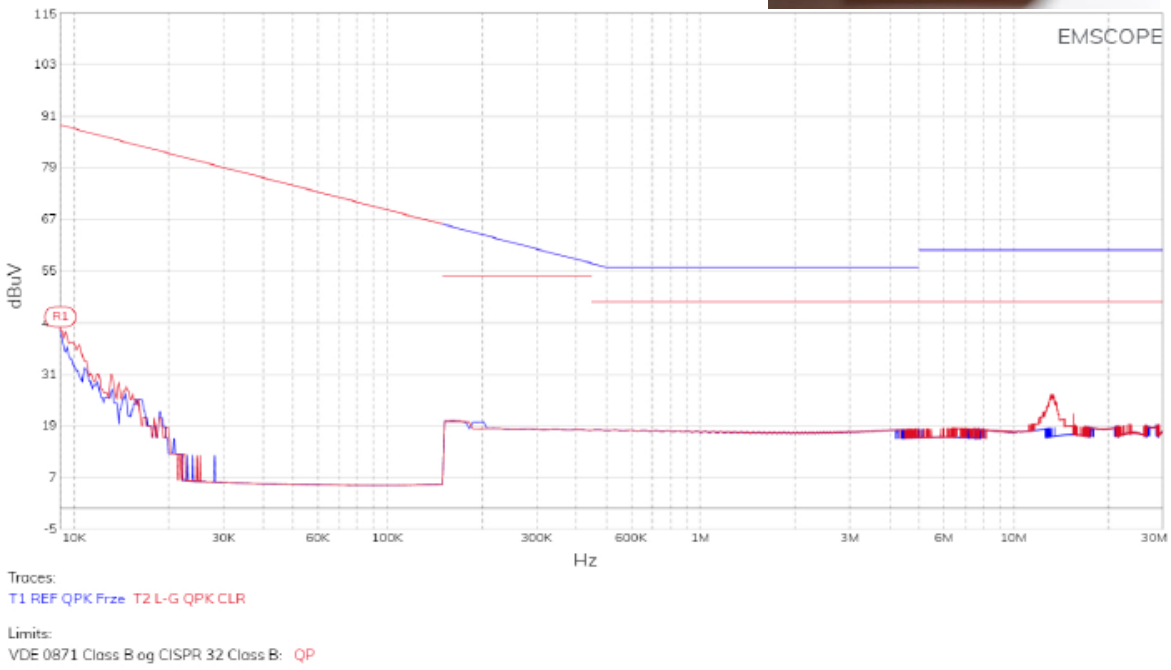
Freq stop: 30 MHz

RBW: 200Hz - 9kHz

Losses: Internal LISN

Dwell time: 2 sec

Measurement Plot



There is virtually zero conducted voltage noise from the analogue electricity meter. The red graph shows the voltage noise level from the electricity meter, and this is identical to the blue reference level.

NOTE: The small top on the right side of the graph at 13MHz is due to a measurement error and does not come from the power meter

Analogue electricity meter 3-ph AEG B114W (1992)

REPORT - VDE 0871 Class B og CISPR 32 Class B

Test Conditions

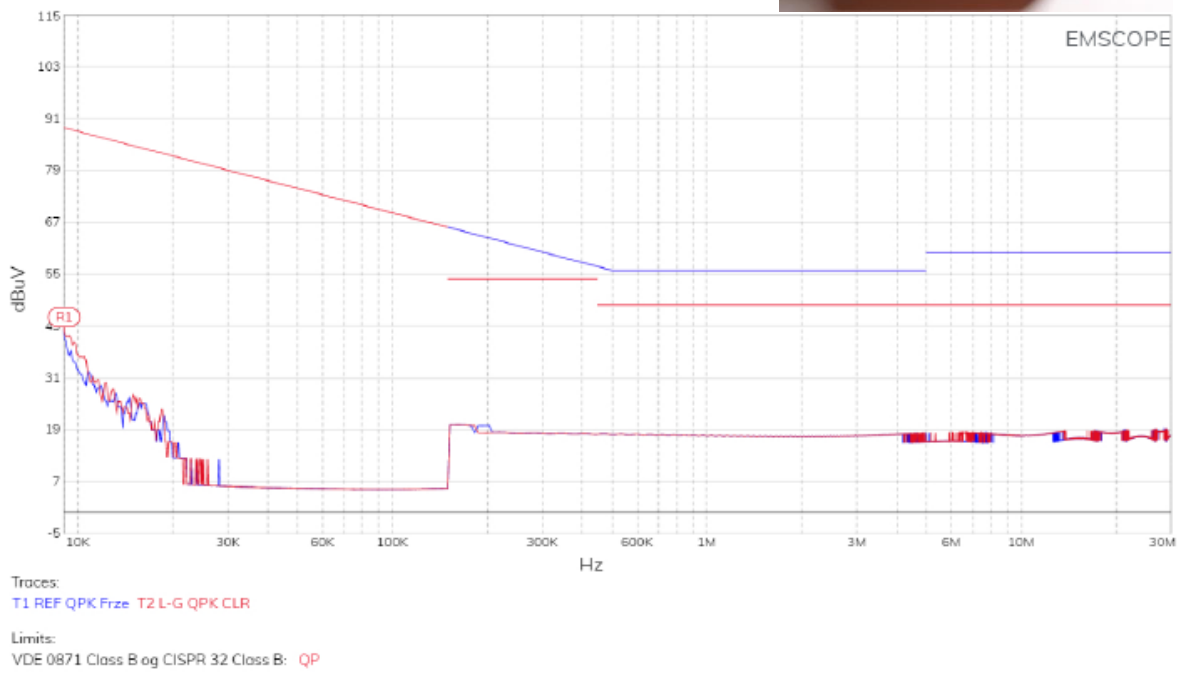
EUT: 3 ph analog B114W
Op Cond: Conductive emission
Operator:EMF Consult
Test Spec: VDE0871B + CISPR32B
Date (YYYY/MM/DD): 2021/09/15
Extra compliance: Fewer than 6 emissions are within the defined margin.



Scan Settings

Instrument: EMSCOPE
Software version: 2.43
EMSCOPE SN: 0341100012414166
Freq start: 9 kHz
Freq stop: 30 MHz
RBW: 200Hz - 9kHz
Losses: Internal LISN
Dwell time: 2 sec

Measurement Plot



There is virtually zero conducted voltage noise from the analogue electricity meter. The red graph shows the voltage noise level from the electricity meter, and this is identical to the blue reference level.

Analogue electricity meter 3-ph Schlumberger G1V6hJ6 (1994)

REPORT - VDE 0871 Class B og CISPR 32 Class B

Test Conditions

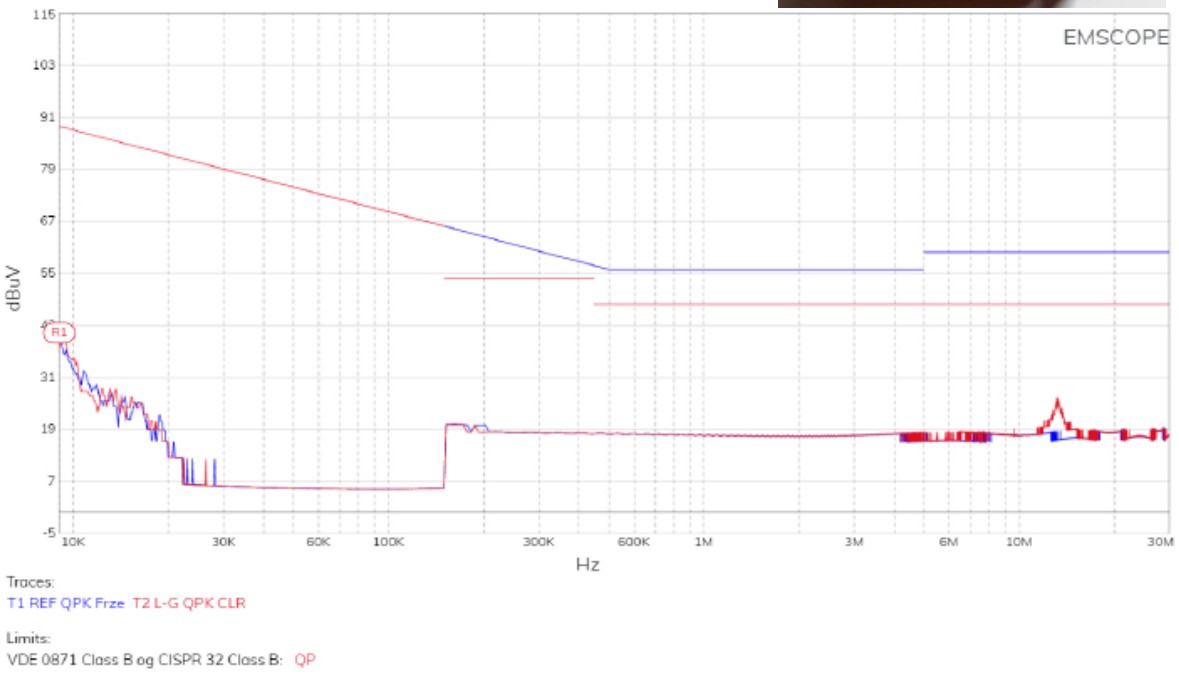
EUT: 3 ph analog G1V6hJ6
Op Cond: Conductive emission
Operator:EMF Consult
Test Spec: VDE0871B + CISPR32B
Date (YYYY/MM/DD): 2021/09/15
Extra compliance: Fewer than 6 emissions are within the defined margin.



Scan Settings

Instrument: EMSCOPE
Software version: 2.43
EMSCOPE SN: 0341100012414166
Freq start: 9 kHz
Freq stop: 30 MHz
RBW: 200Hz - 9kHz
Losses: Internal LISN
Dwell time: 2 sec

Measurement Plot



There is virtually zero conducted voltage noise from the digital electricity meter. The red graph shows the voltage level from the electricity meter, and this is identical to the blue reference level.

NOTE: The small top on the right side of the graph at 13MHz is due to a measurement error and does not come from the power meter.

Digital electricity meter 3-ph Enermet SK320XE (1992)

REPORT - VDE 0871 Class B og CISPR 32 Class B

Test Conditions

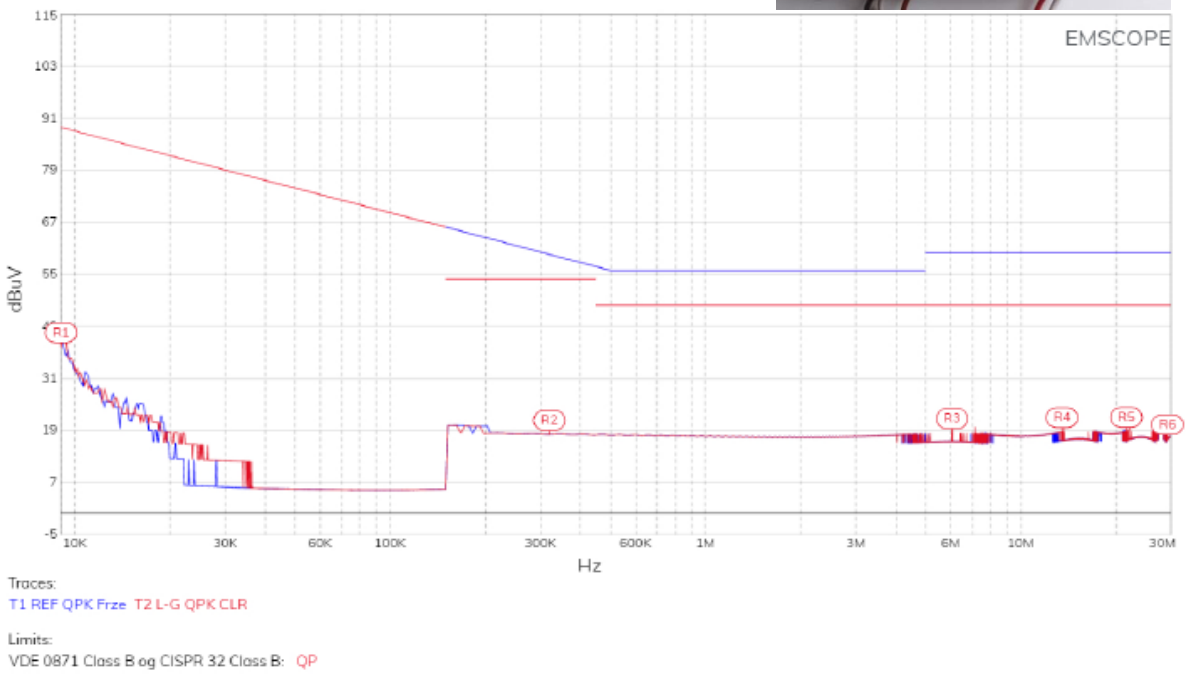
EUT: 3 ph digital SK320XE
Op Cond: Conductive emission
Operator:EMF Consult
Test Spec: VDE0871B + CISPR32B
Date (YYYY/MM/DD): 2021/09/15
Extra compliance: Fewer than 6 emissions are within the defined margin.



Scan Settings

Instrument: EMSCOPE
Software version: 2.43
EMSCOPE SN: 0341100012414166
Freq start: 9 kHz
Freq stop: 30 MHz
RBW: 200Hz - 9kHz
Losses: Internal LISN
Dwell time: 2 sec

Measurement Plot



There is virtually zero conducted voltage noise from the digital electricity meter. The red graph shows the voltage level from the electricity meter, and this is identical to the blue reference level.

Digital electricity meter 3-ph Elektrisk Produksjon DDS3008 (1999)

REPORT - VDE 0871 Class B og CISPR 32 Class B

Test Conditions

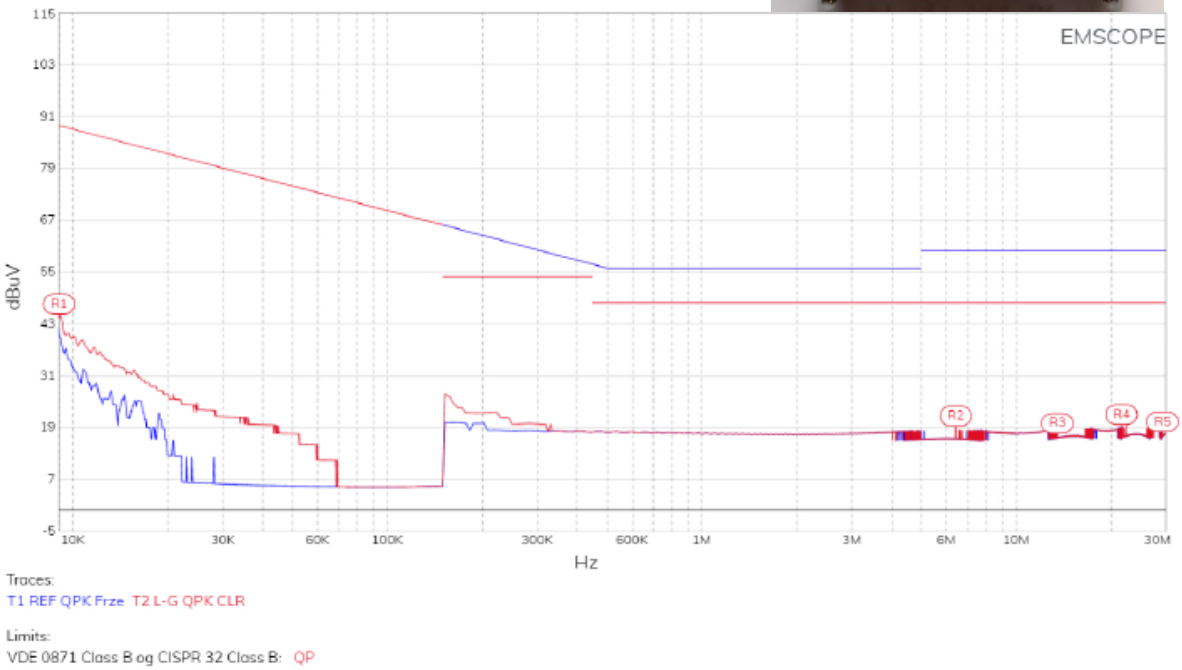
EUT: 3 ph digital DDS3008
Op Cond: Conductive emission
Operator:EMF Consult
Test Spec: VDE0871B + CISPR32B
Date (YYYY/MM/DD): 2021/09/15
Extra compliance: Fewer than 6 emissions are within the defined margin.



Scan Settings

Instrument: EMSCOPE
Software version: 2.43
EMSCOPE SN: 0341100012414166
Freq start: 9 kHz
Freq stop: 30 MHz
RBW: 200Hz - 9kHz
Losses: Internal LISN
Dwell time: 2 sec

Measurement Plot



There is some low-frequency conducted voltage noise from the digital electricity meter in the frequency range of 10-70kHz and 150-300kHz. The red graph shows the voltage level from the electricity meter, and this is identical to the blue reference level in the frequency range of 300kHz – 30MHz.

Digital electricity meter 3-ph Enermet 420i (2002)

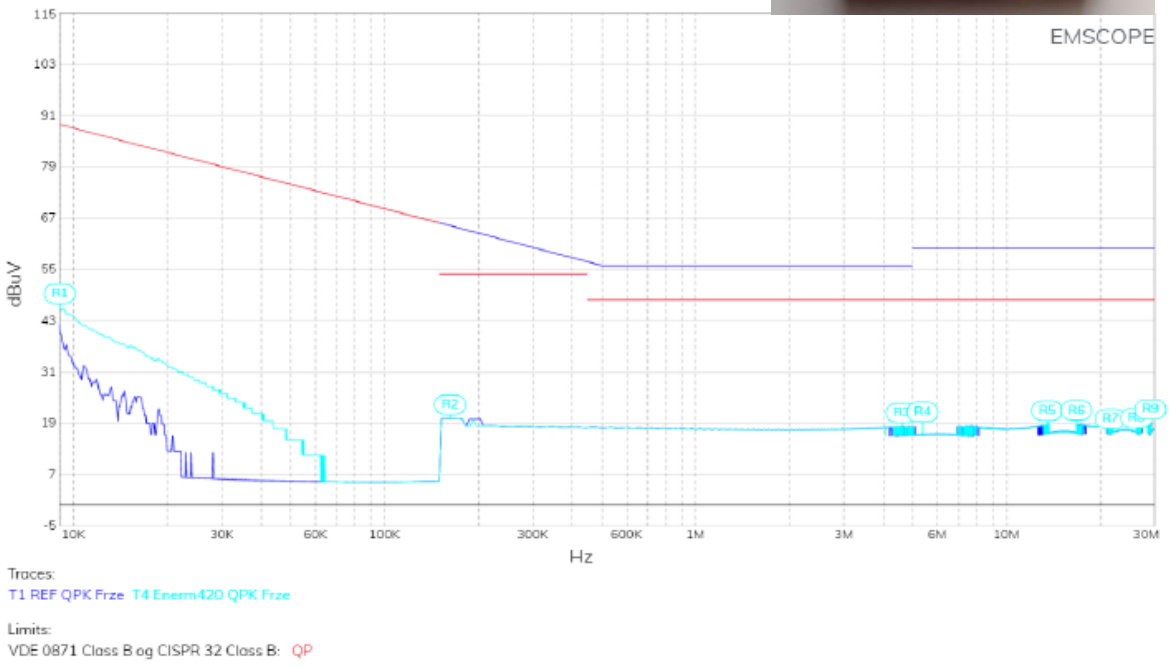
REPORT - VDE 0871 Class B og CISPR 32 Class B

Test Conditions
EUT: 3ph Digital måler 420i
Op Cond: Conductive emission
Operator:EMF Consult
Test Spec: VDE0871B + CISPR32B
Date (YYYY/MM/DD): 2021/09/15



Scan Settings
Instrument: EMSCOPE
Software version: 2.43
EMSCOPE SN: 0341100012414166
Freq start: 9 kHz
Freq stop: 30 MHz
RBW: 200Hz - 9kHz
Losses: Internal LISN
Dwell time: 2 sec

Measurement Plot



Traces:
T1 REF QPK Frze T4 Enerm420 QPK Frze

Limits:
VDE 0871 Class B og CISPR 32 Class B: QP

There is some low-frequency conducted voltage noise from the digital electricity meter in the frequency range of 10-70kHz. The turquoise graph shows the voltage level from the electricity meter, and this is identical to the blue reference level in the frequency range of 150kHz – 30MHz.

Digital electricity meter 3-ph Enermet E420-s (2004)

REPORT - VDE 0871 Class B og CISPR 32 Class B

Test Conditions

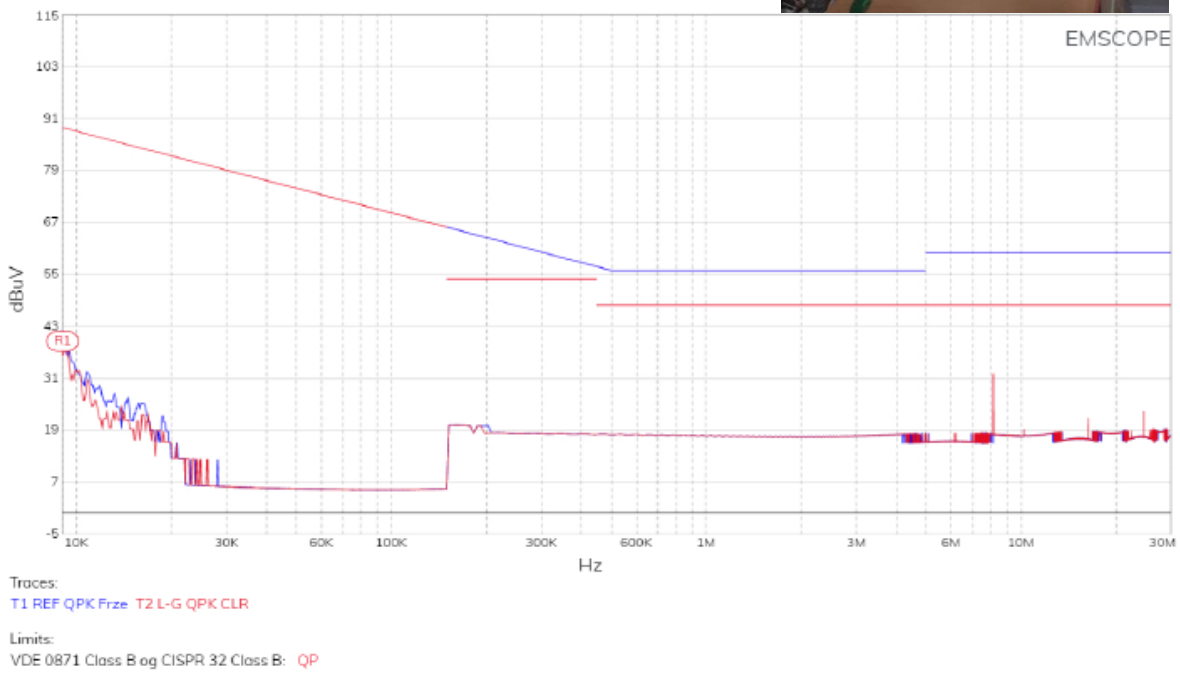
EUT: 3 ph digital E420S
Op Cond: Conductive emission
Operator:EMF Consult
Test Spec: VDE0871B + CISPR32B
Date (YYYY/MM/DD): 2021/09/15
Extra compliance: Fewer than 6 emissions are within the defined margin.



Scan Settings

Instrument: EMSCOPE
Software version: 2.43
EMSCOPE SN: 0341100012414166
Freq start: 9 kHz
Freq stop: 30 MHz
RBW: 200Hz - 9kHz
Losses: Internal LISN
Dwell time: 2 sec

Measurement Plot



There is virtually zero conducted voltage noise from the digital electricity meter. The red graph shows the voltage level from the electricity meter, and this is identical to the blue reference level.

Digital electricity meter 3-ph Kamstrup 658-282-OK-40 (2006)

REPORT - VDE 0871 Class B og CISPR 32 Class B

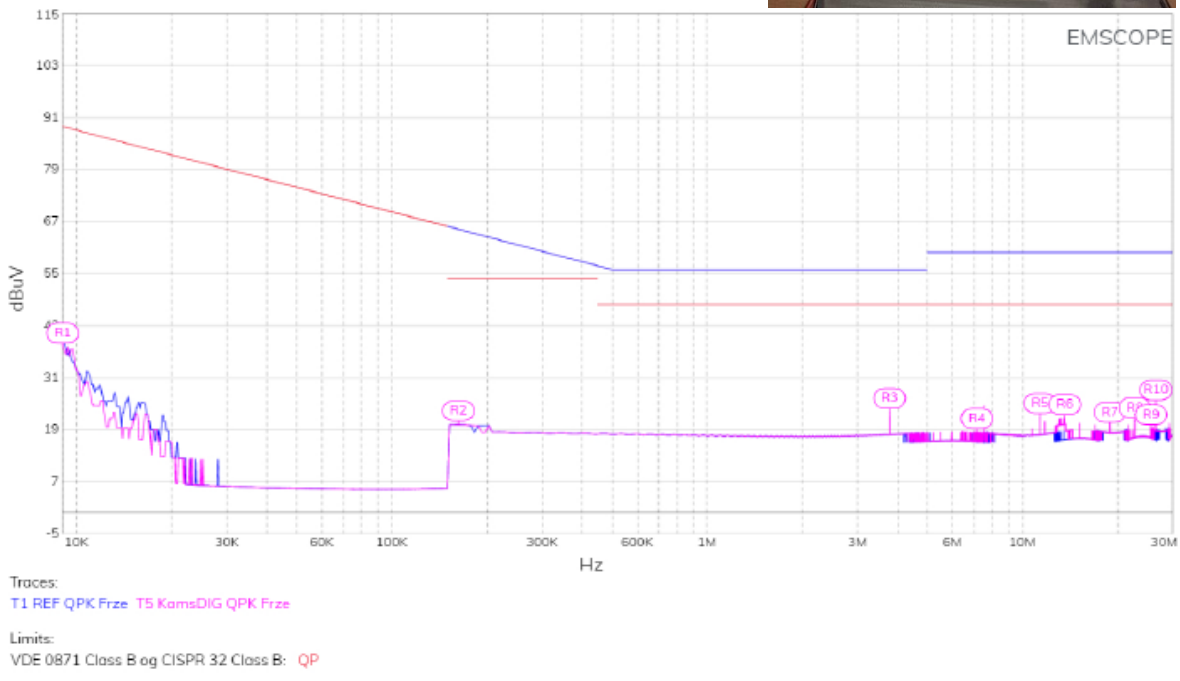
Test Conditions
EUT: 3ph Digital måler
Op Cond: Conductive emission
Operator:EMF Consult
Test Spec: VDE0871B + CISPR32B
Date (YYYY/MM/DD): 2021/09/15

658-282-OK-40



Scan Settings
Instrument: EMSCOPE
Software version: 2.43
EMSCOPE SN: 0341100012414166
Freq start: 9 kHz
Freq stop: 30 MHz
RBW: 200Hz - 9kHz
Losses: Internal LISN
Dwell time: 2 sec

Measurement Plot



Traces:
T1 REF QPK Frze T5 KamsDIG QPK Frze

Limits:
VDE 0871 Class B og CISPR 32 Class B: QP

There is virtually zero conducted voltage noise from the digital electricity meter. The pink graph shows the voltage level from the electricity meter, and this is identical to the blue reference level.

Digital electricity meter 1-ph Kamstrup 686-162-QR-40 (2006)

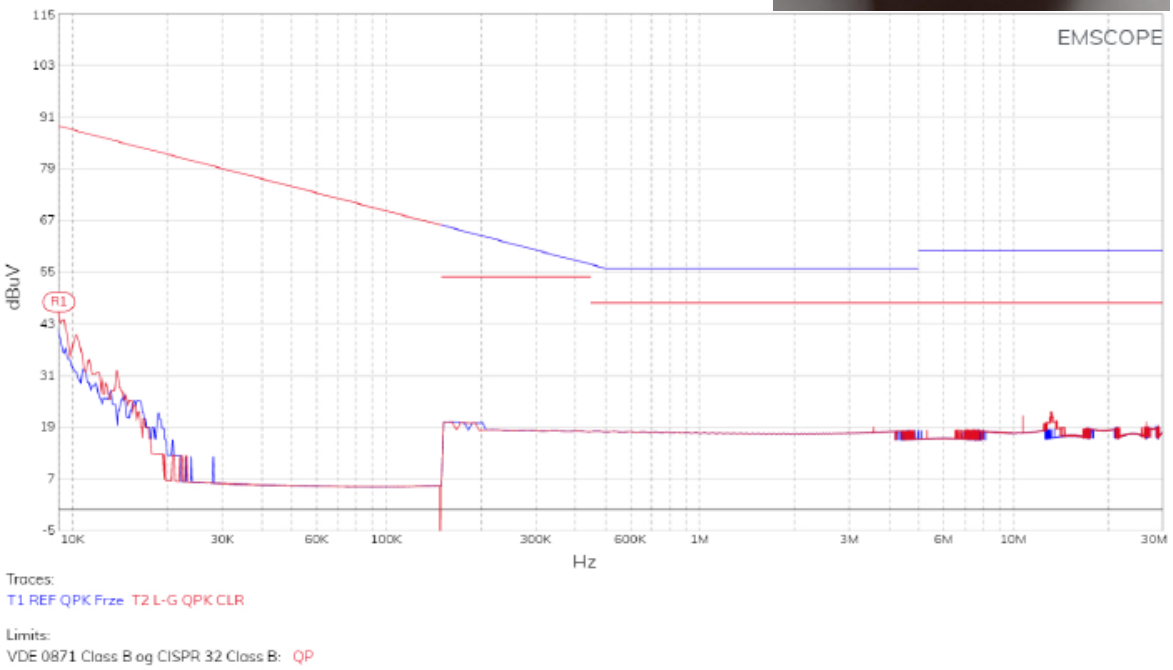
REPORT - VDE 0871 Class B og CISPR 32 Class B

Test Conditions
EUT: 1 ph digital
Op Cond: Conductive emission
Operator:EMF Consult
Test Spec: VDE0871B + CISPR32B
Date (YYYY/MM/DD): 2021/09/15
Extra compliance: Fewer than 6 emissions are within the defined margin.
686-162-QR-40



Scan Settings
Instrument: EMSCOPE
Software version: 2.43
EMSCOPE SN: 0341100012414166
Freq start: 9 kHz
Freq stop: 30 MHz
RBW: 200Hz - 9kHz
Losses: Internal LISN
Dwell time: 2 sec

Measurement Plot



There is virtually zero conducted voltage noise from the digital electricity meter. The red graph shows the voltage level from the electricity meter, and this is identical to the blue reference level.

Smart meter 3-ph Aidon 5550 (2. gen - 2006)

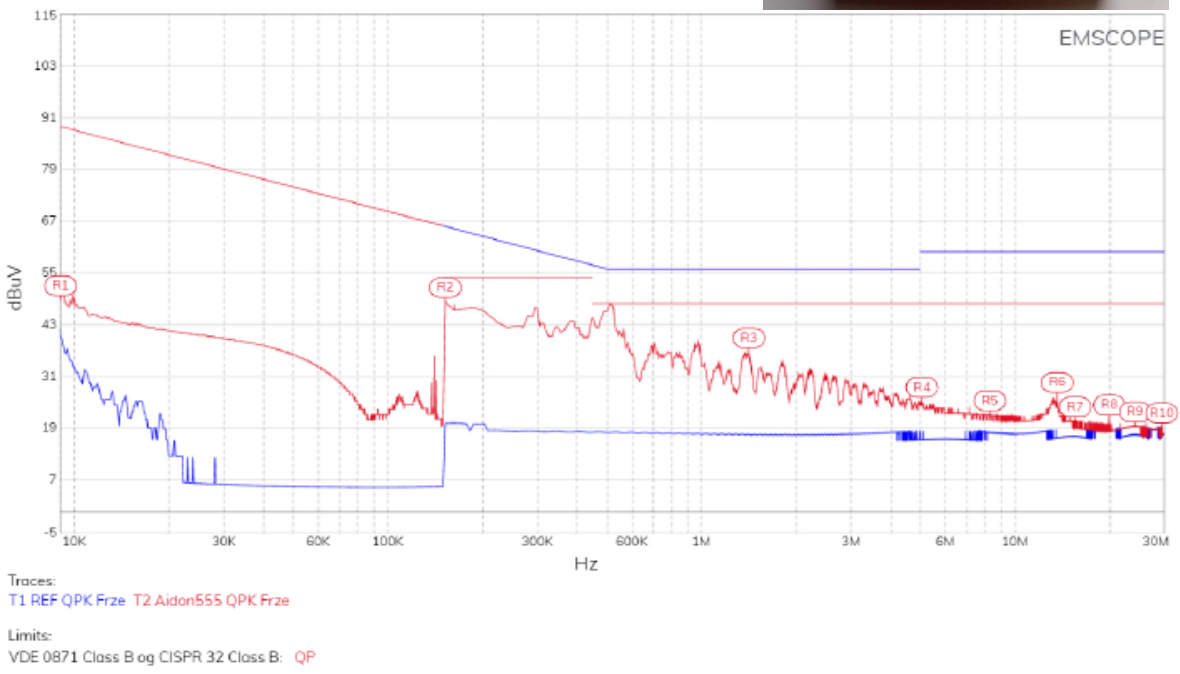
REPORT - VDE 0871 Class B og CISPR 32 Class B

Test Conditions
EUT: 3ph Aidon 5550 AMS
Op Cond: Conductive emission
Operator:EMF Consult
Test Spec: VDE0871B + CISPR32B
Date (YYYY/MM/DD): 2021/09/15



Scan Settings
Instrument: EMSCOPE
Software version: 2.43
EMSCOPE SN: 0341100012414166
Freq start: 9 kHz
Freq stop: 30 MHz
RBW: 200Hz - 9kHz
Losses: Internal LISN
Dwell time: 2 sec

Measurement Plot



There is significantly more conducted voltage noise from the new smart electricity meter. The red graph shows voltage noise from the electricity meter, which is above the blue reference level in the entire frequency range of 10kHz to 30MHz.

Smart meter 3-ph Kamstrup Omnipower 684-11-31B-N24-3101-040 (4. gen - 2019)

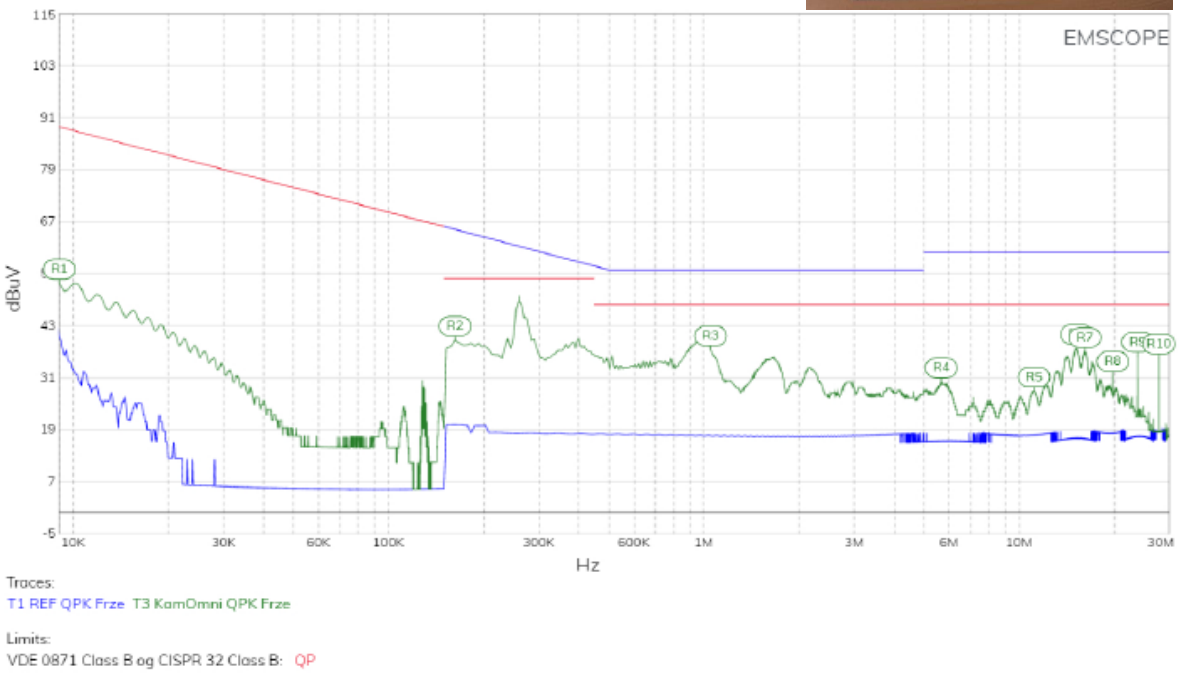
REPORT - VDE 0871 Class B og CISPR 32 Class B

Test Conditions
EUT: 3ph Omnipower AMS
Op Cond: Conductive emission
Operator:EMF Consult
Test Spec: VDE0871B + CISPR32B
Date (YYYY/MM/DD): 2021/09/15

684-11-31B-N24-3101-040



Scan Settings
Instrument: EMSCOPE
Software version: 2.43
EMSCOPE SN: 0341100012414166
Freq start: 9 kHz
Freq stop: 30 MHz
RBW: 200Hz - 9kHz
Losses: Internal LISN
Dwell time: 2 sec
Measurement Plot



There is significantly more conducted voltage noise from the new smart electricity meter. The green graph shows voltage noise from the electricity meter, which is above the blue reference level in the entire frequency range of 10kHz to 30MHz.

Appendix

Appendix 1 – Measurement equipment

Equipment, frequency range and accuracy

Instrument
Producer, Type **Serial number**

LISN and Spectrum analyser
EMZER EMSCOPE 9kHz-110MHz 341100012414166



Isolation transformer

GW-Instek GIT5060 GER873298



Galvanic isolation transformer

Noratel LS16LI-230



Additional equipment
Media converter and PC

Calibration
EMZER EMSCOPE 9kHz-110MHz calibration date:

- EMSCOPE - Internal Dual Channel Receiver, 14. May 2021
- EMSCOPE - Internal LISN, 12. May 2021