

ICS 33.100.10

English Version

Investigation Results on Electromagnetic Interference in the Frequency Range below 150 kHz

Résultats des études réalisées sur le brouillage
électromagnétique dans la plage des fréquences inférieures
à 150 kHz

Untersuchungsergebnisse zu elektromagnetischen
Interferenzen im Frequenzbereich unter 150 kHz

This Technical Report was approved by CENELEC on 2017-09-11.

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (CLC/TR 50669:2017) has been prepared by CLC/SC 205A "Mains communicating systems" of CLC/TC 205, "Home and Building Electronic Systems (HBES)".

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Introduction

In April 2010, SC 205A¹⁾ published its first Study Report on “Electromagnetic Interference between Electrical Equipment in the Frequency Range 2 to 150 kHz” [1], providing first results of investigations on electromagnetic interference (EMI) in this frequency range, due to Touch-dimmer lamps (TDLs) as an EMI victim, an inverter as an EMI source, and automated meter reading systems using powerline communication (AMR-PLC) figuring as EMI victims as well as sources.

With a second edition of this Study Report, in 2013 [2], the specific situation in the frequency range 2 kHz - 150 kHz and the broad relevance of recognised EMI for safeguarding electromagnetic compatibility (EMC) also in this frequency range was highlighted; that also with provision of results of measurements on the existing situation of emissions in the grid as well as with an overview of results of investigations on proven EMI cases. This 2nd edition of the Study Report has been published as CLC/TR 50627:2015 [3].

Based on a third edition of this Study Report [4], CLC/TR 50669 covers the same scope as CLC/TR 50627 but provides a comprehensive set of additional measurement results on electromagnetic interference in this frequency range.

It documents the existing disturbances on the electricity supply network, including customer premises. It covers both products acting as emission sources and those which are susceptible to such, including cumulative effects and the effect of ageing of components that are intended to suppress emissions. It also provides information on interference mechanisms and on the current situation with regard to standardisation. The TR is based on investigation results (measurement results, reported EMI cases) from twelve countries involving network operators, manufacturers, universities, accredited test houses and consultants.

¹⁾ CENELEC SC 205A "Mains communicating system"

1 Scope

Following to [1, 2, 3] having proceeded with the collection of related information, with this Technical Report, further extended information is provided including:

- the given EMC problems in the frequency range 2 kHz - 150 kHz, concerning EMC between electrical equipment in general as well as EMC between non-mains communicating equipment / systems (NCE) and mains communicating systems (MCS) as a particular issue
- the given situation of related emissions in the grid, with other measurement results
- EMI cases and related investigation results
- new findings on parameters to be considered when dealing with EMC in this frequency range, in particular related to
 - the impact of the network impedance and its variation over time on the more or less disturbing effect of emissions in this frequency range
 - the behaviour of emissions in this frequency range over time and the increasing need for performing also time domain measurements for comprehensively evaluating emissions and their disturbance potential
- the actual standardisation situation
- needs for the future, concerning
 - measurement of related emissions
 - investigation on the impedance of the grid / in installations over time
 - closing gaps in standardisation
 - installation guidelines and possibly regulatory measures related to the ageing effect.

In light of different positions on and in evaluating related EMC problems, with additional measurement results concerning emission levels in the supply network and results from investigations of additional proven EMI cases, the given problems are highlighted in more detail and recommendations for what to do in the future are provided.

2 General

As the results of investigations having been made for the Study Reports [1, 2, 3] show, utilisation of the frequency range 2 kHz – 150 kHz by electrical equipment shows several effects, which, compared with other frequency ranges, needs to be considered as a somehow specific situation; that resulting in the need for consideration of these effects when considering related EMC issues.

In the following, extended information about this specific situation and measurement and investigation results on related emissions and EMI cases are provided.

3 Specific situation in the frequency range 2 kHz – 150 kHz

Concerning the origin of disturbing interactions between electrical equipment using frequencies in the range 2 kHz – 150 kHz, there are to be considered