

CENELEC/TC or SC TC219	Secretariat GB	Date March 2022
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**TC or SC title:** Mains Communicating Systems

## **A Background**

**Scope:** To prepare harmonized standards for communication systems using electricity supply lines or the wiring of buildings as a transmission medium and using frequencies above 3 kHz. This includes the allocation of frequency bands for signal transmissions on the mains

### **Structure**

WG 09: Revision of EN 50065-1

To maintain standard EN 50065-1, which describes general requirements, frequency bands and electromagnetic disturbances related to the use of mains communicating systems (MCS) in low voltage electrical installations.

WG:10: High frequency power lines

To define standards for high-frequency mains communicating systems (MCS) complying with existing regulations in normal (typical) conditions and being consistent with EN 50065-1. This may include conducted emissions, radiated emissions, immunity, both internal and external to premises, as well as methods of measurement of disturbances. This should also include co-existence between mains communicating equipment of a same system or belonging to different systems.

WG 11: Immunity

1. to write and/or maintain harmonized immunity standards compatible with the EMCD for mains communicating systems (MCS) in respect to the electromagnetic environment and its changing development over time;
2. to deal with immunity issues within the scope of TC 219, in particular related to the harmonized standard EN 50065 and its harmonized Part-2-series and with its appropriate maintenance;
3. to further deal with electromagnetic interference (EMI) issues in the frequency range of interest for MCS, especially up to 150 kHz, and to provide information and advice about related problems to the CLC/TC219 Plenary as well as to other interested technical committees. This includes monitoring or contributing as appropriate to any related work of interest to TC 219 undertaken in TC210 working groups or task forces.

WG 12: Filters

To maintain EN 50065-4-x (part 1 to 7) standards related to decoupling filters installed in low voltage networks and designed to protect mains communicating systems (MCS) from unwanted interference and/or from other networks characteristics (attenuation/impedance).

The work also takes into consideration the recent developments in EMC standardisation of disturbances encountered in low voltage distribution networks in the frequency range 2 kHz to 150 kHz.

The committee was formed originally as TC105 about 1990 to define standards for communicating in the low voltage electricity distribution network (LVDN) from the distribution transformer to customer premises, including internal customer premises wiring. The work was initiated jointly by European electrical utilities, to provide communication for the remote reading of meters, and by manufacturers interested in within premises communication for home and building automation.

In 1996, CLC/TC205 was formed to work on higher layer protocols and CLC/TC105 was reconstituted as CLC/SC205A, but the original intent to create CLC/SC205B and CLC/SC205C etc., to cover other communications media was never followed up.

In 2020, CLC/SC205A became CLC/TC205A. This decision was made for different reasons:

- Over time, SC205A and TC205 evolved towards quite different and unrelated activities (no subject of common interest, different communities of experts and officers participating to the two committees).
- From a practical point of view, SC205A and TC205 were already acting as separate TCs for a long time.

In 2021, CLC/TC205A was renumbered into CLC/TC219 to avoid any confusion that may arise.

### **Activity summary below 150 kHz:**

The most important standard created by TC219 is EN 50065-1 (Signalling on low-voltage electrical installations in the frequency range 3 kHz to 148,5 kHz — Part 1: General requirements, frequency bands and electromagnetic disturbances), which was first published in 1991 and revised in 2001 and 2011 and is the harmonised standard for mains signalling below 150 kHz.

This standard covers the physical layer for narrowband and wideband systems, but deliberately excludes modulation methods so as not to limit technical innovation. Some aspects of the MAC sub-layer are also included to allow coexistence of systems on the same network segment.

In 2008 CLC/SC205A first became aware of increasing electromagnetic interference (EMI) below 150 kHz and identified this as a technology trend arising from increased use of applications using switched-mode technology to improve energy efficiency. As a result, study reports CLC/SC205A/Sec0260/R (2011), CLC/SC205A/Sec0339/R (2013) and CLC/SC205A/Sec0400/R (2015) were produced. This work also resulted in CLC/TR 50627:2015 and CLC/TR 50669:2017. Further work on electromagnetic interference is envisaged, including results on EMI up to 500 kHz. Additional reference to the importance of these studies is made under § B.3 "trends in technology" below.

### **Activity summary above 150 kHz:**

In 1997 CLC/SC205A began work on standards up to 30 MHz and the scope was updated appropriately. Later on the 30 MHz upper limit was removed. Recently the restriction to the LVDN was also deleted because the standard was already also widely used on the medium voltage network. During this time CISPR/I had a related activity on EMC, but because the CLC/SC205A activity started first a standstill was not imposed on CLC/SC205A.

Although work on immunity progressed and a standard was published, the work on an emission standard proved to be controversial and a consensus could not be achieved. While SC205A was cooperating closely with ETSI TC PLT the different rules between CENELEC and ETSI caused a conflict, so in 2000 the CENELEC/ETSI JWG on EMC of conducted transmission networks was formed and as a consequence a standstill was applied to SC205A. In 2001 Mandate M/313 was taken up by the JWG which modified its scope to a network standard for all media. In 2006 this work had not achieved consensus on the powerline issues and the standstill on SC205A was lifted. The JWG decided that the part of the network standard that covered for powerline communication would be now dependent on an accepted EMC product standard and this would come from CISPR. SC205A respected the fact that national committees supported this work taking place in CISPR, however this work also failed in 2010. With the support of the European Commission it was decided that a European solution was now necessary and so a project was started in CENELEC TC/210/WG11 which resulted in the EN 50561 series of standards on which work is still ongoing. From this time work on emission standards in CLC/SC205A above 1.65 MHz was dropped, but CLC/TC219 still has responsibility for the immunity standard EN 50412-2-1. More recently ETSI PLT has closed (2017), as has the CLC/ETSI JWG, and Mandate M/313 has been withdrawn.

In 2021, work has been started on the use of frequency bands above 150 kHz for signalling. The main motivation for this new activity lies in the deployment of a growing number of smart meters implementing mains communicating systems (MCS) operating in the 150-500 kHz frequency band in Europe. In addition, MCS above 150 kHz also gains popularity for smart grid use cases, such as monitoring and controlling outdoor PV sites using communication over AC mains and/or DC bus. The work is led by TC219/WG9 in close cooperation with CLC/TC210/WG11.

## **B Business Environment**

### **B.1 General**

Under the EMC Directive (2014/30/EU) Mains signalling, or PLC must not cause interference with other electronic systems and in particular radio. In Europe (ITU Region 1) radio broadcasting takes place above 148.5 kHz, whereas in other ITU regions broadcasting begins above 525 kHz. Consequently, PLC systems in these regions can operate up to 525 kHz at levels exceeding those considered as acceptable in Europe. This is one reason why it is necessary to have a separate European committee for mains signalling.

Some aspects of PLC have always been controversial and therefore it has often been SMEs that have been first to take the risk in exploiting the technology and to exploit new standards, whereas the larger companies have held back until the situation is clearer.

The initial thrust during the 1980s and 1990s to install remote meter reading systems based on PLC slowed across Europe for a decade due to electricity deregulation and privatisation, but the advent of the Energy Services Directive (2006/32/EC) and then its replacement by the Energy Efficiency Directive (2012/27/EU) and the drive for energy efficiency has rekindled interest in this technology as mandates M/441 and M/490 have recognised.

The Internal Market Directive (2009/72/EC) states that where roll-out of smart meters is assessed positively, at least 80% of consumers shall be equipped with intelligent metering systems by 2020. Currently, Italy, France, Spain, Portugal and Austria have significant roll-outs of this technology.

## **B.2 Market demand**

The market demand for products using CLC/TC219's harmonized standards for CE-marking and in particular EN 50065-1 already runs into tens of millions, so it is an important, widely-used standard..

CLC/TC219 has had particular concern about "standards" emerging from the IEEE, because semiconductor manufacturers usually implement these in silicon and thereby create de facto standards. Such standards for PLC products might not align with European regulations and harmonised EMC standards. Similar standards have emerged from ITU-T, but these have more readily highlighted regional differences.

## **B.3 Trends in technology**

From the beginning CLC/SC205A took in consideration both traditional and innovative modulation techniques for PLC. EN 50065-1 recognizes both single carrier systems and multicarrier systems with appropriate tests for the different levels of transmitter output voltage. It should be noted that the original tests described in the standard are still valid and take into account the "crest-factor" effect which occurs when sub-carriers overlap in time.

As mentioned under A above, CLC/TC219 has extensively studied the rise in electromagnetic interference below 150 kHz arising from switched-mode power supplies, LED lighting, inverters used in PV systems or washing machines etc. This is now acknowledged by IEC SC77A and has contributed to two amendments to IEC 61000-2-2 Ed 2, which were published in 2017 (Amd1) and 2018 (Amd2)."

## **B.4 Market trends**

Environmental concerns are the driver which is likely to increase demand for PLC communications for energy control and monitoring mainly in relation to smart metering and smart grids and CLC/TC219 standards define EMC and coexistence requirements for this technology. It is to be noted that there is growing interest to deploy PLC above 150 kHz for smart metering and smart grid use cases in both public grid and private installations. In addition, the use of PLC in DC networks, in particular, for controlling outdoor PV sites, is a new trend to be addressed by CLC/TC219 standards.

## **B.5 Ecological environment**

CLC/TC219 harmonized standard EN 50065-1 is already widely used for conformance of PLC communications for smart metering. This is within the scope of M/441 and M/490.

## **B.6 Involvement of societal stakeholders**

The rather restricted scope of CLC/TC219 which covers mainly EMC and coexistence requirements of MCS means that interfaces with other bodies will always be largely of a technical nature.

## **B.7 Involvement of SMEs**

New PLC systems have often been created by SMEs, but more recently there has been less involvement from new members. This is perhaps because it is assumed that much of the work has already been done.

### **C System approach aspects**

CLC/TC219 co-operates with CLC/TC210. In addition, CLC/TC219 also informally liaises with IEC TC13, IEC SC77A, CISPR and CLC/TC8X through common membership.”

### **D Objectives and strategies (3 to 5 years)**

CLC/TC219 will concentrate on updating its substantial back-catalogue of standards, prioritised according to needs and available resource, which is the main limitation.

Monitoring the status of electromagnetic interference below 150 kHz will continue in WG11 and any new developments will be raised at plenary meetings so that action can be taken if sufficiently urgent and if resource is available.

At the same time CLC/TC219 investigates how to extend the PLC frequency band in Europe above 150 kHz to accommodate latest market trends in an acceptable way with respect to the EMC Directive (2014/30/EU).

### **E Action plan**

#### **EN 50065-2-3**

There is currently a revision underway in WG11 however there remains an open issue due to lack of compliance received at Enquiry and Formal Vote. The initiation of formal vote ballot remains on hold pending communications open with the HAS consultants to address the negative assessments and resolve all issues in an effort to maintain the harmonisation.

#### **EN 50065-2-1 and EN 50065-2-2**

These will be considered for revision when the problems with EN 50065-2-3 have been resolved.

#### **EN 50065-4 Part 1 to 7**

Work underway and publication of all parts expected before end of 2022.

#### **EN 50412-2-1**

At its recent plenary CLC/TC219 agreed to confirm EN 50412-2-1:2005 'Power line communication apparatus and systems used in low-voltage installations in the frequency range 1,6 MHz to 30 MHz - Part 2-1: Residential, commercial and industrial environment - Immunity requirements' and WG10 will undertake preliminary discussions to revise it when additional expertise becomes available.

#### **EN 50065-1**

This needs some references to be updated and a new Annex ZZ. This is currently under a PWI in WG9 and the WG is working towards a revision. A formal NWI is expected to be submitted in 2023.

### **F Useful links to CENELEC web site**

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