

Distribution automation using distribution line carrier systems —

Part 5-3: Lower-layer profiles — Spread spectrum adaptive wideband (SS-AW) profile

ICS 33.200

National foreword

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Comments arising from the use of this Draft for Development are requested so that UK experience can be reported to the international organization responsible for its conversion into a international standard. A review of this publication will be initiated 2 years after its publication by the international organization so that a decision can be taken on its status at the end of its three-year life. The commencement of the review period will be notified by an announcement in *Update Standards*.

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A list of organizations represented on this committee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled “International Standards Correspondence Index”, or by using the “Find” facility of the BSI Standards Electronic Catalogue.

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**Automatisation de la distribution à l'aide de
systèmes de communication à courants porteurs –**

**Partie 5-3:
Profils des couches basses – Profil SS-AW
(Spread Spectrum Adaptive Wideband)**

**Distribution automation using distribution line
carrier systems –**

**Part 5-3:
Lower-layer profiles – Spread spectrum adaptive
wideband (SS-AW) profile**



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

DISTRIBUTION AUTOMATION USING DISTRIBUTION LINE CARRIER SYSTEMS –

Part 5-3: Lower-layer profiles – Spread spectrum adaptive wideband (SS-AW) profile

FOREWORD

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- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

IEC 61334-5-3, which is a technical specification, has been prepared by IEC technical committee 57: Power system control and associated communications.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
57/423/CDV	57/475/RVC

Full information on the voting for the approval of this technical specification can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

The committee has decided that the contents of this publication will remain unchanged until 2004. At this date, the publication will be

- transformed into an International Standard;
- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

DISTRIBUTION AUTOMATION USING DISTRIBUTION LINE CARRIER SYSTEMS –

Part 5-3: Lower-layer profiles – Spread spectrum adaptive wideband (SS-AW) profile

1 General

1.1 Scope and object

This specification describes the requirements of the spread spectrum adaptive wideband (SS-AW) approach which incorporates the services provided by the physical layer entity and the MAC sublayer. The transmission medium is assumed to be the distribution network on both the MV or LV level. The MAC sublayer described in this specification interfaces with the logical link control (LLC) layer described in IEC 61334-4-32.

The noise and signal attenuation characteristics of the MV and LV networks require a hierarchical approach, where methods for modulation/demodulation, synchronization, equalization, error control coding, and media access control are designed specifically for this hostile communications environment. This approach includes a low-level link protocol within the MAC sublayer that incorporates some functions generally associated with a data link control procedure. This specification describes such a hierarchical approach based on a spread spectrum physical layer with fast synchronization enabling short-duration transmissions and adaptive equalization. This coupled with a low-level link protocol, the effective utilization of error correction and detection, and robust medium access management provides a robust, reliable platform for the LLC sublayer.

The adaptive component of this approach refers to the equalization method used to compensate for the time-varying nature of the communication channel impairments. The receiver must select appropriate equalization values to adapt to the changing channel characteristics, which can be node-specific, on a frame basis to achieve optimal performance. The equalization parameters are adjusted based on various quality metrics available from the received frame, for example, the Hamming distance of the synchronization preamble, the error-free status of the frame header and data block, if present, or the failure to receive an expected response. The equalization methods are well-known and the precise method is determined by the particular implementation of this specification. This allows cost/performance trade-offs and future improvements to occur without losing compatibility.

1.2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61334. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 61334 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 61334-4-32:1996, *Distribution automation using distribution line carrier systems – Part 4: Data communication protocols – Section 32: Data link layer – Logical link control (LLC)*

2 Physical layer

2.1 Purpose

This clause details the services required of the physical layer at the logical interface with the MAC sublayer. Also defined is the transmission method used to provide the information flow through the low-voltage distribution network.

2.2 Overview

The physical layer provides the interface to the MAC sublayer for the transmission of data units onto the physical medium.

2.3 Modulation method

The transmitter shall generate a wideband signal to conform to the signal defined in 2.3.1 and 2.3.2 with a centre frequency of f_0 and a null-to-null signal bandwidth of $f_0/2$ to $3/2 \times f_0$, where for example f_0 can be 47,5 kHz.

2.3.1 Spreading method

An anti-symmetric waveform is digitally synthesized using 16 bits (chips) of a $16 \times f_0$ clock. Two periods of the anti-symmetric waveform (corresponding to 32 chips of the clock) define one raw data bit interval; for example, one raw data bit interval can consist of two cycles of a sine wave.

2.3.2 Raw data bit modulation

Each raw data bit interval is binary phase shift keyed (BPSK) using a non-return-to-zero level (NRZ-L) format, resulting in a raw data bit rate of $f_0/2$.

2.4 Transmission method

2.4.1 Purpose

In order to ensure optimum performance, all MAC data-units received for transmission are encapsulated with a preceding preamble and encoded with a forward error correcting code (FEC). A PHY_frame consists of

- a P_sdu (from 6 bytes to 26 bytes) the same as the M_pdu (from 3 bytes to 13 bytes) transmitted by the MAC sublayer and encoded with the FEC (see 2.4.4);
- a preceding preamble (5 bytes) and a succeeding interframe gap (1 byte).

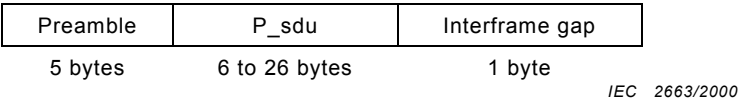


Figure 1 – Physical frame structure

2.4.2 Bit and byte ordering

The bytes are sent from most significant byte (MSB) to least significant byte (LSB). By convention, the most significant byte corresponds to the leftmost byte. Bit fields are packed with the same convention as byte fields. That is, the first bit in an octet is the most significant (leftmost) bit.