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Information technology — Telecommunications and information exchange between systems — High Rate Ultra Wideband PHY and MAC Standard

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

International Standard ISO/IEC 26907 was prepared by Ecma International (as ECMA-368) and was adopted, under a special "fast-track procedure", by Joint Technical Committee ISO/IEC JTC 1, *Information technology,* SC 6, *Telecommunications and information exchange between systems,* in parallel with its approval by national bodies of ISO and IEC.

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Introduction

This International Standard specifies the Ultra Wideband (UWB) physical layer (PHY) and medium access control (MAC) sublayer for a high-speed, short-range wireless network, utilizing all or part of the spectrum between 3 100 MHz and 10 600 MHz supporting data rates of up to 480 Mb/s.

This International Standard divides the spectrum into 14 bands, each with a bandwidth of 528 MHz. The first 12 bands are then grouped into 4 band groups consisting of 3 bands, and the last two bands are grouped into a fifth band group. A MultiBand Orthogonal Frequency Division Modulation (MB-OFDM) scheme is used to transmit information. A total of 110 subcarriers (100 data carriers and 10 guard carriers) are used per band. In addition, 12 pilot subcarriers allow for coherent detection. Frequency-domain spreading, time-domain spreading, and forward error correction (FEC) coding are provided for optimum performance under a variety of channel conditions.

The MAC sublayer is designed to enable mobility, such that a group of devices may continue communicating while merging or splitting from other groups of devices. To maximize flexibility, the functionality of this MAC is distributed among devices. These functions include distributed coordination to avoid interference between different groups of devices by appropriate use of channels and distributed medium reservations to ensure Quality of Service. The MAC sublayer provides prioritized schemes for isochronous and asynchronous data transfer. To do this, a combination of Carrier Sense Multiple Access (CSMA) and Time Division Multiple Access (TDMA) are used. A Distributed Reservation Protocol (DRP) is used to reserve the medium for TDMA access for isochronous and other traffic. For network scalability, Prioritized Contention Access (PCA) is provided using a CSMA scheme. The MAC has policies that ensure equitable sharing of the bandwidth.

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Taken together, the PHY and MAC specified in this International Standard are well-suited to high rate, zero infrastructure communications between a mixed population of portable and fixed electronic devices.

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Information technology — Telecommunications and information exchange between systems — High Rate Ultra Wideband PHY and MAC Standard

1 Scope

This International Standard specifies a distributed medium access control (MAC) sublayer and a physical layer (PHY) for wireless networks.

2 Conformance

Conforming devices implement the MAC sublayer and the PHY layer as specified herein and support:

1. Data rates of 53,3 Mb/s, 106,7 Mb/s and 200 Mb/s for transmitting and receiving;
2. The first band group (lowest three frequency bands);
3. Time-frequency codes using both TFI and FFI.

In addition, conforming devices may implement the MAC/PHY Interface as specified in ISO/IEC 26908.

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3 Normative references

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The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC TR 8802-1:2001, *Information technology — Telecommunications and information exchange between systems — Local and metropolitan area networks — Specific requirements — Part 1: Overview of Local Area Network Standards*

ISO/IEC 10646:2003, *Information technology — Universal Multiple-Octet Coded Character Set (UCS)*

ISO/IEC 18033-3:2005, *Information technology — Security techniques — Encryption algorithms — Part 3: Block ciphers*

ISO/IEC 26908:2007, *Information technology — Telecommunications and information exchange between systems — MAC-PHY Interface for ISO/IEC 26907*

IEEE 100, *The Authoritative Dictionary of IEEE Standard Terms, Seventh Edition*

NIST Special Publication 800-38C, *Recommendation for Block Cipher Modes of Operation: The CCM Mode for Authentification and Confidentiality*

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4 Terms and definitions

For the purposes of this International Standard, the following terms and definitions apply. For terms not defined in this Clause, please consult IEEE 100.

4.1
access category (AC)
label for the common set of prioritized contention access (PCA) parameters that are used by a device to contend for the medium in order to transmit MAC protocol data units (MPDUs) with certain priorities

4.2
beacon group (BG)
set of devices from which a device receives beacons that identify the same beacon period start time (BPST) as the device

4.3
beacon period (BP)
period of time declared by a device during which it sends or listens for beacons

4.4
beacon period start time (BPST)
start of the beacon period

4.5
channel
medium over which cooperating entities exchange information

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4.6
data integrity
assurance that the data has not been modified from its original form

4.7
device
entity containing an implementation of this International Standard

4.8
distributed reservation protocol (DRP)
protocol implemented in each device to support negotiation and maintenance of channel time reservations binding on all neighbours of the reservation participants

4.9
extended beacon group
union of a device's beacon group and the beacon groups of all devices in the device's beacon group

4.10
frame
unit of data transmitted by a device

4.11
frame protection
security service provided for a frame, including (but not limited to) payload encryption, message authentication and replay attack protection

4.12
MAC client
entity above the MAC sublayer that generates MAC service data units for delivery to corresponding entities in other devices, and receives MAC service data units from such entities

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4.13
MAC command data unit (MCDU)
unit of data exchanged between peer medium access control sublayers in order to manage medium access control functions

4.14
MAC protocol data unit (MPDU)
unit of data exchanged between two peer medium access control sublayers using the physical layer

4.15
MAC service data unit (MSDU)
information that is delivered as a unit between medium access control service access points (SAPs)

4.16
message integrity code (MIC)
cryptographic checksum generated using a symmetric key that is typically appended to data in order to provide data integrity and source authentication similar to a digital signature

4.17
neighbour
device in a device's beacon group

4.18
network allocation vector (NAV)
indicator, maintained by each device capable of using PCA, of time periods when PCA-based transmission onto the wireless medium will not be initiated by the device, whether or not the device's clear-channel assessment function senses that the wireless medium is busy

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4.19
prioritized contention access (PCA)
prioritized CSMA/CA access mechanism used by devices for medium access

4.20
pseudo-random number generation
process of generating a deterministic sequence of bits from a given seed that has the statistical properties of a random sequence of bits when the seed is not known

4.21
random number generator
method or design that provides a sequence of bits that is unpredictable

NOTE A cryptographic random number generator is one specific type.

4.22
reservation
named set of one or more medium access slots (MASs) within a superframe during which a device has preferential access to the medium

4.23
reservation block
one or more temporally contiguous medium access slots (MASs) within a reservation not adjacent to other MASs in the reservation

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