Nederlandse norm

# NEN-ISO/IEC 24730-62

(en)

Information technology - Real time locating systems (RTLS) - Part 62: High rate pulse repetition frequency Ultra Wide Band (UWB) air interface (ISO/IEC 24730-62:2013,IDT)

ICS 35.040

september 2013

Als Nederlandse norm is aanvaard:

- ISO/IEC 24730-62:2013,IDT



Normcommissie 381029 "Coding of audio, picture, multimedia..."



NEN

©2013 Nederlands Normalisatie-instituut
Postbus 5059, 2600 GB Delft
Telefoon (015) 2 690 390, Fax (015) 2 690 190

INTERNATIONAL STANDARD

**ISO/IEC 24730-62**

First edition
2013-09-01



# Information technology — Real time locating systems (RTLS) —

## Part 62: High rate pulse repetition frequency Ultra Wide Band (UWB) air interface

*Technologie de l'information — Systèmes de localisation en temps réel (RTLS) —*

*Partie 62: Interface aérienne ultra large bande (UWB) à impulsions haute fréquence de répétition*

Reference number
ISO/IEC 24730-62:2013(E)

**COPYRIGHT PROTECTED DOCUMENT**



ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

 

## Contents

Page

# Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

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.

ISO/IEC 24730-62 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 31, *Automatic identification and data capture techniques*.

ISO/IEC 24730 consists of the following parts, under the general title *Information technology — Real time locating systems (RTLS)*:

— *Part 1: Application program interface (API)*

— *Part 2: Direct Sequence Spread Spectrum (DSSS) 2,4 GHz air interface protocol*

— *Part 5: Chirp spread spectrum (CSS) at 2,4 GHz air interface*

— *Part 21: Direct Sequence Spread Spectrum (DSSS) 2,4 GHz air interface protocol: Transmitters operating with a single spread code and employing a DBPSK data encoding and BPSK spreading scheme*

— *Part 22: Direct Sequence Spread Spectrum (DSSS) 2,4 GHz air interface protocol: Transmitters operating with multiple spread codes and employing a QPSK data encoding and Walsh offset QPSK (WOQPSK) spreading scheme*

— *Part 61: Low rate pulse repetition frequency Ultra Wide Band (UWB) air interface*

— *Part 62: High rate pulse repetition frequency Ultra Wide Band (UWB) air interface*

# Introduction

This series of standards defines one Air Interface Protocol for Real Time Locating Systems (RTLS) for use in asset management and is intended to allow for compatibility and to encourage interoperability of products for the growing RTLS market.

This document, the high rate pulse repetition frequency (HRP) UWB Air Interface Protocol, establishes a technical standard for Real Time Locating Systems that operate at an internationally available UWB frequency bands and that are intended to provide accurate location (e.g. within some tens of centimetres) with frequent updates (for example, every second).

Real Time Locating Systems are wireless systems with the ability to locate the position of an item anywhere in a defined space (local/campus, wide area/regional, global) at a point in time that is, or is close to, real time. Position is derived by measurements of the physical properties of the radio link.

Conceptually there are four classifications of RTLS:

- Locating an asset via satellite - requires line-of-sight - accuracy to 10 meters
- Locating an asset in a controlled area, e.g., warehouse, campus, airport - area of interest is instrumented - accuracy to 3 meters
- Locating an asset in a more confined area - area of interest is instrumented - accuracy to tens of centimetres
- Locating an asset over a terrestrial area using a terrestrial mounted receivers over a wide area, cell phone towers for example – accuracy 200 meters

With a further two methods of locating an object which are really RFID rather than RTLS:

- Locating an asset by virtue of the fact that the asset has passed point A at a certain time and has not passed point B
- Locating an asset by virtue of providing a homing signal whereby a person with a handheld can find an asset

Method of location is through identification and location, generally through multilateration

- Types
  - Time of Flight Ranging Systems
  - Amplitude Triangulation
  - Time Difference of Arrival (TDOA)
  - Cellular Triangulation
  - Satellite multilateration
  - Angle of Arrival

This standard defines the air interface protocol needed for the creation of an RTLS system using HRP UWB which is a physical layer UWB signalling mechanism (based on standard IEEE 802.15.4a UWB) and employing high rate pulse repetition frequencies (PRF) 16 MHz or 64 MHz, and a combination of burst position modulation (BPM) and binary phase-shift keying (BPSK.

**INTERNATIONAL STANDARD** **ISO/IEC 24730-62:2013(E)**

# Information technology — Real time locating systems (RTLS) —

# Part 62: High rate pulse repetition frequency Ultra Wide Band (UWB) air interface



## 1 Scope

This part of ISO/IEC 24730 defines the air-interface for real time locating systems (RTLS) using a physical layer Ultra Wide Band (UWB) signalling mechanism (based on IEEE 802.15.4a UWB). This modulation scheme employs high rate pulse repetition frequencies (PRF) 16 MHz or 64 MHz, and a combination of burst position modulation (BPM) and binary phase-shift keying (BPSK) giving an extremely high level of performance with a fully coherent receiver.

In addition to defining the air interface protocol (AIP) in terms of the physical layer modulation, this part of ISO/IEC 24730 also defines the AIP in terms of the messages sent over the air. This AIP supports simple one-way communication of a basic blink that may be used for a one-way Time Difference of Arrival (TDOA) based RTLS, where mobile tags periodically transmit the blink message which is received by an infrastructure consisting of a number of fixed reader nodes.

This AIP also optionally supports bidirectional communication and two-way ranging between the readers and tags of an RTLS. The support of two-way ranging depends on additionally including a UWB receiver in the tag and UWB transmitters in the reader infrastructure.

The mandatory default operational mode ensures interoperability between tags and infrastructure from various manufacturers, while the availability of several options offers flexibility to the developer of the infrastructure to adapt the behaviour of the overall system to the specific needs of his application.

## 2 Normative references

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/IEEE 8802-15-4, *Information technology — Telecommunications and information exchange between systems — Local and metropolitan area networks — Specific requirements Part 15-4: Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for Low-Rate Wireless Personal Area Networks (WPANs)*

ISO/IEC 15963, *Information technology — Radio frequency identification for item management — Unique identification for RF tags*

ISO/IEC 19762, *Information technology AIDC techniques — Harmonized vocabulary — (all parts)*

# 3 Terms, definitions, and abbreviated terms

## 3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC/IEEE 8802-15-4, ISO/IEC 19762 (all parts), and the following apply.

**3.1.1**
**burst**
group of ultra wide band (UWB) pulses occurring at consecutive chip periods

**3.1.2**
**complex channel**
combination of a channel [radio frequency (RF) center frequency] and a ternary code sequence

**3.1.3**
**frame**
format of aggregated bits that are transmitted together in time

**3.1.4**
**hybrid modulation**
modulation used in the ultra wide band (UWB) physical layer (PHY) that combines both binary phase-shift keying (BPSK) and burst position modulation (BPM) so that both coherent and non-coherent receivers can be used to demodulate the signal

**3.1.5**
**idle period**
duration of time where no transceiver activity is scheduled to take place

**3.1.6**
**local clock**
symbol clock internal to a device

**3.1.7**
**mean pulse repetition frequency (PRF)**
total number of pulses within a symbol divided by the symbol duration

**3.1.8**
**payload data**
contents of a data message that is being transmitted

**3.1.9**
**peak pulse repetition frequency (PRF)**
maximum rate at which an ultra wide band (UWB) physical layer (PHY) emits pulses

**3.1.10**
**ranging frame (RFRAME)**
ultra wide band (UWB) frame having the ranging bit set in the physical layer (PHY) header (PHR)

**3.1.11**
**ranging marker (RMARKER)**
first ultra wide band (UWB) pulse of the first bit of the physical layer (PHY) header (PHR) of a ranging frame (RFRAME)

**3.1.12**
**symbol**
period of time and a portion of the transmitted signal that is logically considered to be a unit signaling event conveying some defined number of data bits or repeated portion of the synchronization signal

## 3.2 Abbreviated terms

| | |
|---|---|
| AGC | automatic gain control |
| API | application program interface |
| BPM | burst position modulation |
| BPSK | binary phase-shift keying |
| CRC | cyclic redundancy check |
| DPS | dynamic preamble selection |
| DSN | data sequence number |
| FCS | frame check sequence |
| FEC | forward error correction |
| HRP | high rate PRF |
| LFSR | linear feedback shift register |
| LRP | low rate PRF |
| LSB | least significant bit |
| MAC | medium access control |
| MSB | most significant bit |
| PHR | PHY header |
| PHY | physical layer |
| PPDU | PHY protocol data unit |
| PRBS | pseudo-random binary sequence |
| PRF | pulse repetition frequency |
| PSD | power spectral density |
| PSDU | PHY service data unit |
| RF | radio frequency |
| RFID | Radio Frequency Identification |
| RFRAME | ranging frame |
| RMARKER | ranging marker |
| RTLS | Real Time Locating System |
| RX | receive or receiver |
| SFD | start-of-frame delimiter |
| SHR | synchronization header |
| SNR | signal-to-noise ratio |
| SYNC | synchronization |
| TDOA | time difference of arrival |
| TOF | time of flight |

TX transmit or transmitter

UWB ultra wide band

# 4 Overview

## 4.1 Components

The major components of a Real Time Locating System (RTLS) and the relationship of those components are shown in Figure 1. As shown in this figure the tags communicate with an infrastructure. The infrastructure provides an Application Program Interface (API) through which an application can control the RTLS and retrieve information about location and state of tags.

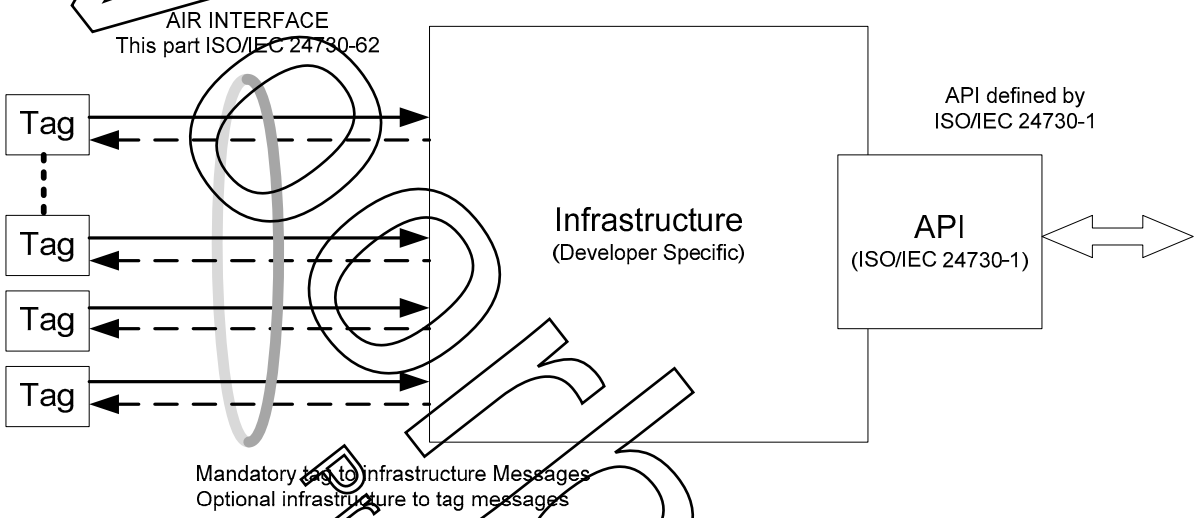


**Figure 1 — RTLS components**

As indicated in Figure 1 tags communicate with infrastructure over an air interface. Generally the air interface includes the definition of waveforms, formats of packets as well as commands and reports to be exchanged between tags and infrastructure. This can be depicted in a layered approach as shown in Figure 2. Similar interpretations can be found in other standards e.g. in ISO/IEC 18000-1[1].

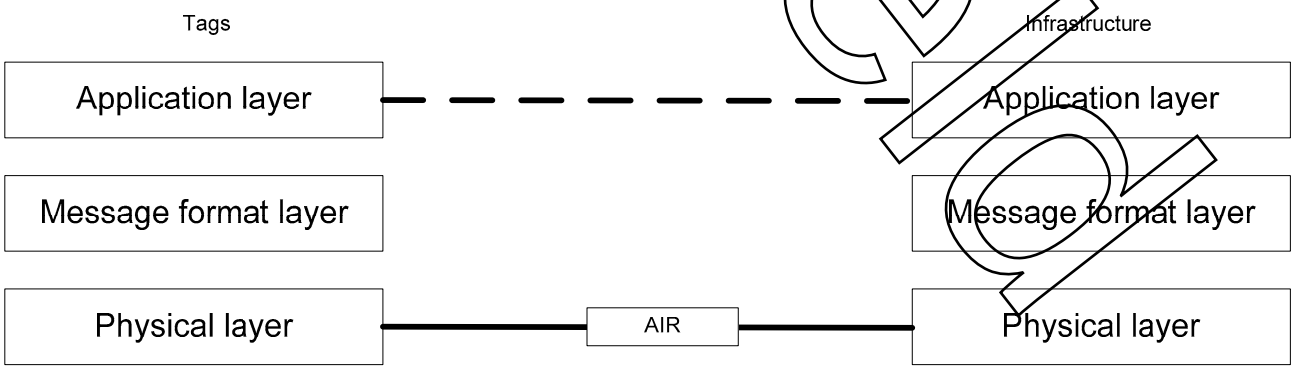


**Figure 2 — air interface layers**

# Bestelformulier

**Stuur naar:**

NEN Standards Products & Services
t.a.v. afdeling Klantenservice
Antwoordnummer 10214
2600 WB Delft

**NEN** Standards Products & Services

Postbus 5059
2600 GB Delft

Vlinderweg 6
2623 AX Delft

T (015) 2 690 390
F (015) 2 690 271

www.nen.nl/normshop

## Ja, ik bestel

__ ex. NEN-ISO/IEC 24730-62:2013 en Information technology - Real time locating systems (RTLS) - Part 62: High rate pulse repetition frequency Ultra Wide Band (UWB) air interface € 161.21

### Wilt u deze norm in PDF-formaat? Deze bestelt u eenvoudig via www.nen.nl/normshop

**Gratis e-mailnieuwsbrieven**

Wilt u op de hoogte blijven van de laatste ontwikkelingen op het gebied van normen, normalisatie en regelgeving? Neem dan een gratis abonnement op een van onze e-mailnieuwsbrieven. www.nen.nl/nieuwsbrieven

## Gegevens

Bedrijf / Instelling

T.a.v. O M O V

E-mail

Klantnummer NEN

Uw ordernummer BTW nummer

Postbus / Adres

Postcode Plaats

Telefoon Fax

**Factuuradres** (indien dit afwijkt van bovenstaand adres)

Postbus / Adres

Postcode Plaats

Datum Handtekening

**Retourneren**

Fax: (015) 2 690 271
E-mail: klantenservice@nen.nl
Post: NEN Standards Products & Services,
t.a.v. afdeling Klantenservice
Antwoordnummer 10214,
2600 WB Delft
(geen postzegel nodig).

**Voorwaarden**

- De prijzen zijn geldig tot 31 december 2016, tenzij anders aangegeven.
- Alle prijzen zijn excl. btw, verzend- en handelingskosten en onder voorbehoud bij o.m. ISO- en IEC-normen.
- Bestelt u via de normshop een pdf, dan betaalt u geen handeling en verzendkosten.
- Meer informatie: telefoon (015) 2 690 391, dagelijks van 8.30 tot 17.00 uur.
- Wijzigingen en typefouten in teksten en prijsinformatie voorbehouden.
- U kunt onze algemene voorwaarden terugvinden op: www.nen.nl/leveringsvoorwaarden.

**Normalisatie**: de wereld op één lijn.

preview - 2016