
**Information Technology — Real
Time Locating System (RTLS) Device
Conformance Test Methods —**

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

*Technologies de l'information — Méthodes d'essai de conformité du
dispositif des systèmes de localisation en temps réel (RTLS) —*

*Partie 61: Interface d'air ultra large à bas taux de bande de fréquence
de répétition d'impulsion (UWB)*

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Contents

Page

Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms, definitions and abbreviated terms	1
3.1 Terms and definitions	1
3.2 Abbreviated terms	2
4 Conformance tests for ISO/IEC 24730-61	2
4.1 General	2
4.2 Default conditions applicable to the test methods	2
4.2.1 Test environment	2
4.2.2 Default tolerance	2
4.2.3 Noise floor at test location	2
4.2.4 Total measurement uncertainty	3
4.3 Tag UWB RF transmission tests	3
4.3.1 General	3
4.3.2 Test Objective	3
4.3.3 Test procedure	3
4.3.4 Test measurements and requirements	4
4.3.5 Test report	4
4.4 Receiver UWB RF tests	4
4.4.1 General	4
4.4.2 Test objective	5
4.4.3 Test procedure	5
4.4.4 Test measurements and requirements	5
4.4.5 Test report	5
Annex A (normative) RF test measurement site	6

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: [Foreword — Supplementary information](#).

The committee responsible for this document is ISO/IEC JTC 1, *Information technology*, Subcommittee SC 31, *Automatic identification and data capture techniques*.

ISO/IEC 24769 consists of the following parts, under the general title *Information technology — Real-time locating systems (RTLS) device conformance test methods*:

- Part 2: Test methods for air interface communication at 2,4 GHz
- Part 5: Test methods for chirp spread spectrum (CSS) at 2,4 GHz air interface
- 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

ISO/IEC 24730-61 defines the air interfaces and an application programming interface for Real Time Locating Systems (RTLS) devices used in asset management applications.

This International Standard contains all measurements required to be made on a product in order to establish whether it conforms to ISO/IEC 24730-61.

Test methods for measuring performance of equipment compliant with ISO/IEC 24730-61 are given in ISO/IEC 24770-61

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Information Technology — Real Time Locating System (RTLS) Device Conformance Test Methods —

Part 61:

Low rate pulse repetition frequency Ultra Wide Band (UWB) air interface

1 Scope

This International Standard defines the test methods for determining the conformance of Ultra Wide Band real-time locating system (RTLS) tags with the specifications given in the corresponding parts of ISO/IEC 24730-61, but does not apply to the testing of conformity with regulatory or similar requirements.

The test methods require only that the mandatory functions, and any optional functions which are implemented, be verified. This may in appropriate circumstances, be supplemented by further, application specific functionality criteria that are not available to the general case.

Unless otherwise specified, the tests in this International Standard apply exclusively to RTLS tags defined in ISO/IEC 24730-61.

2 Normative references

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

ISO/IEC 19762-1, *Information technology — Automatic identification and data capture (AIDC) techniques — Harmonized vocabulary — Part 1: General terms relating to AIDC*

ISO/IEC 19762-3, *Information technology — Automatic identification and data capture (AIDC) techniques — Harmonized vocabulary — Part 3: Radio frequency identification (RFID)*

ISO/IEC 24730-61:2013, *Information technology — Real time locating systems (RTLS) — Part 61: Low rate pulse repetition frequency Ultra Wide Band (UWB) air interface*

3 Terms, definitions and abbreviated terms

For the purposes of this document, the terms and definitions given in ISO/IEC 19762-1, ISO/IEC 19762-3 and the following apply.

3.1 Terms and definitions

3.1.1

error vector magnitude

EVM

difference between the measured signal and a reference

Note 1 to entry: A reference is a perfectly modulated signal.

3.2 Abbreviated terms

DUT	device under test
EVM	error vector magnitude
LEIP	location enhancing information postamble
PHY	physical layer
RBW	resolution bandwidth
RF	radio frequency
RFID	radio frequency identification
RTLS	real time locating system
TML	tag management layer
TOA	time-of-arrival
UWB	ultra wide band
VBW	video bandwidth

4 Conformance tests for ISO/IEC 24730-61

4.1 General

This International Standard specifies a series of tests to determine the conformance of RTLS tags to the ISO/IEC 24730-61 air interfaces. The results of these tests shall be compared with the values of the parameters specified in ISO/IEC 24730-61 to determine whether the tag under test conforms.

This International Standard also specifies a series of tests to determine the conformance of RTLS RF receivers to the ISO/IEC 24730-61 air interfaces. The results of these tests shall be compared with the values of the parameters specified in ISO/IEC 24730-61 to determine whether the RF receiver under test conforms.

4.2 Default conditions applicable to the test methods

4.2.1 Test environment

Unless otherwise specified, testing shall take place in an environment of temperature $23\text{ °C} \pm 3\text{ °C}$ ($73\text{ °F} \pm 5\text{ °F}$) and of relative humidity 25 % to 75 %.

4.2.2 Default tolerance

Unless otherwise specified, a default tolerance of $\pm 5\%$ shall be applied to the quantity values given to specify the characteristics of the test equipment and the test method procedures.

4.2.3 Noise floor at test location

Noise floor at test location shall be measured with the spectrum analyser in the same conditions as the measurement of the DUT, with a span of 10 MHz: RBW, VBW and antenna.

The spectrum analyser shall be configured in acquisition mode for at least 1 min.

The maximum of the measured amplitude shall be at least 60 dB below the expected value of the amplitude of the measured tag DSSS transmission at 0 dBm power with the tag placed at 1 m from the measurement antenna.

Special attention has to be given to spurious emissions, e.g. insufficiently shielded computer monitors. The electromagnetic test conditions of the measurements shall be checked by performing the measurements with and without a tag in the field.

4.2.4 Total measurement uncertainty

The test equipment will introduce a level of measurement uncertainty. For example, the frequency accuracy of the local oscillator used in RF down-converter will add uncertainty to the calculated frequency accuracy of the measured RF. The specifications of the test equipment used shall be included in the report.

4.3 Tag UWB RF transmission tests

4.3.1 General

The DUT shall be an RTLS tag. The measurement equipment shall consist of an anechoic chamber as described in [Annex A](#), a calibrated measuring antenna, a spectrum analyser such as an Agilent E4407B¹⁾, and a suitable receiver consisting of an RF amplifier, demodulator capable of 1 ns resolution, and digital circuitry. [Figure 1](#) shows the required test equipment setup.

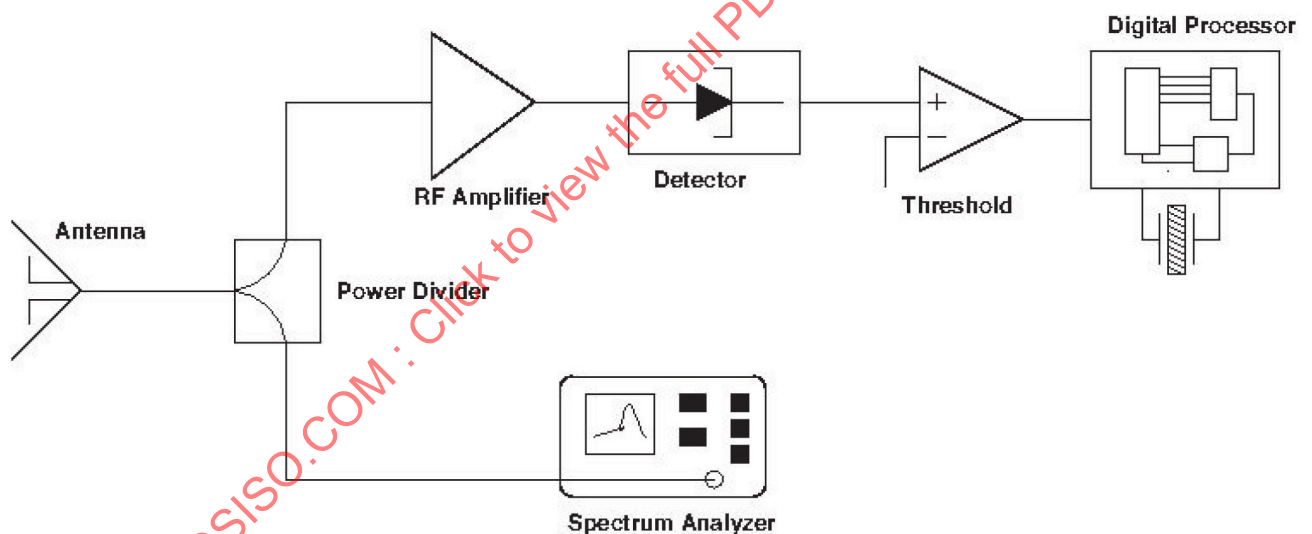


Figure 1 — Setup of equipment for UWB RF test

4.3.2 Test Objective

The objective of this test is to verify that the RTLS tag provides the appropriate UWB modulation waveform required for proper system performance.

4.3.3 Test procedure

The tag shall be configured to transmit the maximum length UWB blink that it is intended to be sent when deployed. The post processing software shall produce metrics for the following parameters to verify compliance of the tag.

1) The Agilent E4407B is an example of a suitable product available commercially. This information is given for the convenience of users of this Technical Report and does not constitute an endorsement by ISO of this product.

4.3.4 Test measurements and requirements

4.3.4.1 Spectral mask

The spectral mask shall be in accordance with ISO/IEC 24730-61:2013, 5.4.8.3, for the channel or channels in which the tag operates. The channels are 0, 1, or 2 as described in ISO/IEC 24730-61:2013, 5.3.

4.3.4.2 Transmit power

The transmitted power shall be calculated based on the power received at the measurement antenna. The calculated power shall be within ± 2.0 dB of the DUT specified transmit power. Transmit power and spectral density mask shall conform to regulatory constraints for the intended operating region, as discussed in ISO/IEC 24730-61:2013, 5.2.

4.3.4.3 Chip rate

The chip rate of the tag shall be in accordance with the mode of tag operation. There are 3 modes, Basic Extended and Long range. Those modes are described in ISO/IEC 24730-61:2013, 5.2. Accuracy of the chip rate shall be compliant with the requirement that less than 11 ns of drift shall occur over a 128 symbol period as specified in ISO/IEC 24730-61:2013, 5.4.8.2.

4.3.4.4 Message content and structure

The post processing software shall verify the selected message format including PHY, payload, and postamble containing location enhancing information if applicable are in compliance with the format specified in ISO/IEC 24730-61. The PHY format as well as the optional LEIP are specified in ISO/IEC 24730-61:2013, Clause 5, and it is dependent on the mode selected. The Payload format is specified in ISO/IEC 24730-61:2013, Clause 6, and is independent of the mode selected.

4.3.5 Test report

The test report shall contain the tag distance to the measurement antenna and all of the measured data. A brief narrative of the post processing software used to evaluate the captured signal shall also be included as an annex to the data. As mentioned before (in [4.2.4](#)), the report shall also contain the uncertainties of the measurement equipment.

4.4 Receiver UWB RF tests

4.4.1 General

The DUT shall be an RTLS RF receiver operating in one or more of the Channels defined in ISO/IEC 24730-61:2013, 5.3. Example measurement equipment could consist of a tag generator capable of producing the UWB signal in one or more channels frequencies, and capable of generating the PHY, payload and LEIP signals in all 3 modes of operation as shown in [Figure 2](#).

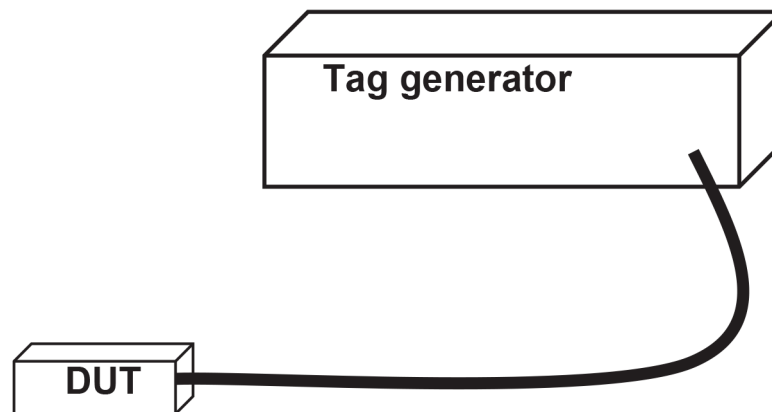


Figure 2 — Setup of equipment for test of RTLS RF receiver

4.4.2 Test objective

The objective of this test is to verify that the RTLS RF receiver (DUT) provides the appropriate UWB signal detection required for proper system performance.

4.4.3 Test procedure

The tag generator shall be configured to transmit in 3 modes of transmission: Basic, Extended, and Long range. Each mode type shall be configured with short and long preamble as defined in ISO/IEC 24730-61:2013, 5.4.4.1. Each mode shall be capable of generating payload and LEIP in all 3 modes. Payload operation shall include 3 message types and two ID encoding options (IEEE and ISO) as defined in ISO/IEC 24730-61:2013, 6.1.

The tag generator should be capable of sending those messages continually and automatically increment the message sequence number described in ISO/IEC 24730-61:2013, 6.3. It is desirable to have those messages at various rates to allow verification of receiver and overall system performance.

4.4.4 Test measurements and requirements

4.4.4.1 Carrier frequency tests

The centre carrier frequency test shall be in accordance with ISO/IEC 24730-61:2013, 5.3, and will be dependent on the selected channel of operation. The transmit spectral density mask shall be in accordance with ISO/IEC 24730-61:2013, 5.4.8.3.

4.4.4.2 Receiver input RF power levels

The receiver should be able to decode all tag generator transmissions.

4.4.5 Test report

The test report shall contain a summation detection percentage value for each of the tests and all of the measured data. A brief narrative of the post processing software used to evaluate the detection percentage shall also be included as an annex to the data.