

---

---

**Information technology — Real-time locating system (RTLS) device performance test methods —**

**Part 5:  
Test methods for chirp spread spectrum (CSS) air interface**

iTeh STANDARD PREVIEW  
(standards.iteh.ai)

[ISO/IEC 24770-5:2019](https://standards.iteh.ai/catalog/standards/sist/f2525d9d-842e-447f-a280-66f71f215197/iso-iec-24770-5-2019)

<https://standards.iteh.ai/catalog/standards/sist/f2525d9d-842e-447f-a280-66f71f215197/iso-iec-24770-5-2019>



**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[ISO/IEC 24770-5:2019](https://standards.iteh.ai/catalog/standards/sist/f2525d9d-842e-447f-a280-66f71f215197/iso-iec-24770-5-2019)  
<https://standards.iteh.ai/catalog/standards/sist/f2525d9d-842e-447f-a280-66f71f215197/iso-iec-24770-5-2019>



**COPYRIGHT PROTECTED DOCUMENT**

© ISO/IEC 2019

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
CP 401 • Ch. de Blandonnet 8  
CH-1214 Vernier, Geneva  
Phone: +41 22 749 01 11  
Fax: +41 22 749 09 47  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

Published in Switzerland

# Contents

Page

<b>Foreword</b> .....	<b>iv</b>
<b>Introduction</b> .....	<b>v</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms, definitions, and abbreviated terms</b> .....	<b>1</b>
3.1 Terms and definitions.....	1
3.2 Abbreviated terms.....	1
<b>4 General</b> .....	<b>2</b>
4.1 Performance requirements.....	2
4.1.1 Overview.....	2
4.1.2 Location accuracy.....	2
4.1.3 Tag capacity.....	2
4.1.4 Location latency.....	2
4.1.5 Tag orientation.....	2
4.1.6 System range and packet error rates.....	2
4.2 Default conditions applicable to the test methods.....	2
4.2.1 Overview.....	2
4.2.2 Test environment.....	3
4.2.3 Default tolerance.....	3
4.2.4 System logging.....	3
<b>5 Performance tests for ISO/IEC 24730-5</b> .....	<b>3</b>
5.1 System locate performance.....	3
5.1.1 Test overview.....	3
5.1.2 Test objective.....	3
5.1.3 Test setup.....	3
5.1.4 Test procedure.....	4
5.1.5 Test measurements and requirements.....	4
5.1.6 Test report.....	6
5.2 Tests for CSS tag to reader air interface using default blink mode.....	6
5.2.1 Test objective.....	6
5.2.2 Test setup.....	6
5.2.3 Test procedure.....	6
5.2.4 Test measurements and requirements.....	7
5.2.5 Test report.....	7
5.3 Tests for CSS tag to reader air interface using two-way-ranging.....	7
5.3.1 Overview.....	7
5.3.2 Test objective.....	7
5.3.3 Test setup.....	8
5.3.4 Test procedure.....	8
5.3.5 Test measurements and requirements.....	8
<b>Bibliography</b> .....	<b>9</b>

## 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.

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](http://www.iso.org/directives)).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)) or the IEC list of patent declarations received (see <http://patents.iec.ch>).

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

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

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

A list of all parts in the ISO/IEC 24770 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

## Introduction

ISO/IEC 24730-5 defines an air interface for real time locating systems (RTLS) devices used in asset management applications.

This document provides test methods for measuring the performance of equipment compliant with ISO/IEC 24730-5.

ISO/IEC 24769-5 contains all measurements required to be made on a product in order to establish whether it conforms to ISO/IEC 24730-5.

## iTeh STANDARD PREVIEW (standards.iteh.ai)

[ISO/IEC 24770-5:2019](https://standards.iteh.ai/catalog/standards/sist/f2525d9d-842e-447f-a280-66f71f215197/iso-iec-24770-5-2019)

<https://standards.iteh.ai/catalog/standards/sist/f2525d9d-842e-447f-a280-66f71f215197/iso-iec-24770-5-2019>

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

ISO/IEC 24770-5:2019

<https://standards.iteh.ai/catalog/standards/sist/f2525d9d-842e-447f-a280-66f71f215197/iso-iec-24770-5-2019>

# Information technology — Real-time locating system (RTLS) device performance test methods —

## Part 5: Test methods for chirp spread spectrum (CSS) air interface

### 1 Scope

This document defines the test methods for determining the performance characteristics of chirp spread spectrum (CSS) real time locating system (RTLS) equipment including tags and readers which are applicable to the selection of equipment that conforms to ISO/IEC 24730-5 for specific applications. This document does not apply to the testing in relation to regulatory or similar requirements.

The RTLS equipment performance parameters included in this document only include the chirp spread spectrum (CSS) radio frequencies link between tags and readers. Unlike ISO/IEC 18305, the tests in this document apply exclusively to RTLS equipment defined in ISO/IEC 24730-5 unless specified otherwise.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 19762, *Information technology — Automatic identification and data capture (AIDC) techniques — Harmonized vocabulary*

ISO/IEC 24730-5, *Information technology — Real-time locating systems (RTLS) — Part 5: Chirp spread spectrum (CSS) at 2,4 GHz air interface*

### 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 19762 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

#### 3.2 Abbreviated terms

CSS	chirp spread spectrum
RF	radio frequency
RTLS	real time locating system

TDOA	time difference of arrival
TOA	time of arrival
TOF	time of flight

## 4 General

### 4.1 Performance requirements

#### 4.1.1 Overview

This document specifies a series of tests to determine the performance characteristics of RTLS equipment relative to the ISO/IEC 24730-5 air interfaces. The results of these tests can be used to determine the suitability of RTLS equipment for applications.

#### 4.1.2 Location accuracy

The primary function of RTLS equipment is to locate tags within the area determined by the readers. Location accuracy determines the primary performance criteria of an RTLS. Location accuracy can be characterized by comparing the system's calculated location for a given set of tags to the actual location of the tags. The system shall be able to locate tags to within the applications allowable error. In many, but not necessarily in all applications, the Euclidean distance between the calculated location of a tag and the actual location of a tag can be used as an error criterion. The location tests specified in this document are confined to line-of-sight situations. Although this is not be applicable to all applications, the complexity of all the variations of blockage and partial blockage are beyond the scope of this test.

#### 4.1.3 Tag capacity

<https://standards.iteh.ai/catalog/standards/sist/f2525d9d-842e-447f-a280-6671215197/iso-iec-24770-5:2019>

An RTLS shall typically locate a large number of tags. The number of tag blinks per second that can be processed and located through the readers can be used to determine a system's tag capacity. The system shall be able to provide location information for an applications peak tag blink density.

#### 4.1.4 Location latency

The latency between when the tag blink is transmitted and, when the RTLS equipment can provide accurate location information, determines the suitability of the equipment for the application.

#### 4.1.5 Tag orientation

The ability of an RTLS to provide real time location information should be independent of the orientation of the tag. The location reported by the RTLS should stay within the applications allowable error as the tag is rotated in any orientation relative to the readers.

#### 4.1.6 System range and packet error rates

The length of the tag-reader link (system range) determines the reader density requirements and also affects system capacity. The packet error rate determines how often the equipment can successfully provide accurate location information for the tag. The maximum range at which a certain packet error rate is observed determines the usability of the system in meeting the applications requirements.

### 4.2 Default conditions applicable to the test methods

#### 4.2.1 Overview

These conditions apply to all tests.



#### 4.2.2 Test environment

Testing shall take place in an environment typical to that of the desired application. Testing should be performed indoors or outdoors with temperature and humidity profiles similar to that expected in the desired application. The RF noise floor at the test location should also represent typical conditions expected within the desired application.

#### 4.2.3 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.

#### 4.2.4 System logging

The RTLS should provide sufficient data logging to allow determination of the number of packets received and sent.

### 5 Performance tests for ISO/IEC 24730-5

#### 5.1 System locate performance

##### 5.1.1 Test overview

The following subclauses outline tests for the quantities introduced in 4.1.

##### 5.1.2 Test objective

The objective of this test is to evaluate the system locate performance characteristics of the ISO/IEC 24730-5 equipment.

##### 5.1.3 Test setup

The readers shall be connected to antennas with adequate width of field to cover the test area with 4 readers. It is preferred that the RTLS locate performance characteristics be evaluated with the system installed as it would for the desired application. If that is not possible, then the equipment shall be configured as shown in [Figure 1](#), with four readers at the corners of a square. The size of this square as defined by diagonal (D) is dependent on the expected operating mode of the devices.

In a TDOA system, the separation of the fixed (anchor) reader nodes is dependent on the ability of their receivers to receive the tags transmissions. This is not a direct feature of the air interface protocol but is rather the result of the implementation in the receiver of the physical layer protocol. The size of diagonal then should be chosen to be the range of successful tag-to-anchor communications. For ISO/IEC 24730-5 compliant tags, this depends on data rate and bandwidth, and on implementation choices in the receiver. In testing the performance of a particular system, the equipment manufacturer should be able to advise the maximum expected operating range for the system operating mode being tested. In addition to standalone tags, several tags mounted on the application's locatable assets (or items of comparable size and composition) shall be used to evaluate locate performance.