

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Industrial networks – Coexistence of wireless systems –
Part 2: Coexistence management**

**Réseaux industriels – Coexistence des systèmes sans fil –
Partie 2: Gestion de coexistence**

<https://standards.iteh.ai/catalog/standards/sist/2d34915c-c7d4-4ce2-a921-a7e36c7ff35d/iec-62657-2-2022>



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CONTENTS

FOREWORD.....	7
INTRODUCTION.....	9
1 Scope.....	11
2 Normative references	11
3 Terms, definitions, abbreviated terms and conventions.....	12
3.1 Terms and definitions.....	12
3.2 Abbreviated terms.....	27
3.3 Conventions.....	28
4 Coexistence concept in industrial automation	28
4.1 Overview.....	28
4.2 Objective	30
4.3 Necessity to implement a coexistence management.....	32
4.4 Interference potential.....	33
4.5 Ancillary conditions.....	35
4.6 Requirements to wireless devices for support of coexistence management.....	36
4.7 Concepts	36
4.7.1 Manual coexistence management.....	36
4.7.2 Automated non-collaborative coexistence management.....	37
4.7.3 Automated collaborative coexistence management.....	37
4.8 Best practices to achieve coexistence.....	38
4.9 Coexistence conceptual model.....	40
4.10 Coexistence management and selection of a wireless solution.....	42
4.11 Coexistence management system.....	44
5 Coexistence management parameters.....	44
5.1 General.....	44
5.1.1 Definition and usage of parameters	44
5.1.2 Physical link	44
5.2 Adjacent channel selectivity.....	45
5.3 Antenna gain	45
5.4 Antenna radiation pattern.....	45
5.5 Antenna type	45
5.6 Communication availability.....	46
5.7 Communication reliability	46
5.8 Bit rate of physical link.....	46
5.9 Blocked frequency list.....	46
5.10 Centre frequency	46
5.11 Area of operation	47
5.12 Communication load	47
5.13 Cut-off frequency	49
5.14 Data throughput.....	50
5.15 Distance between wireless devices.....	50
5.16 Duty cycle.....	51
5.17 Dwell time.....	53
5.18 Equivalent isotropic radiated power.....	54
5.19 Equivalent radiated power.....	54
5.20 Frequency band.....	54

5.21	Frequency bandwidth	54
5.22	Frequency channel	55
5.23	Frequency hopping sequence	55
5.24	Future expansion plan	56
5.25	Geographical dimension of the plant	56
5.26	Infrastructure device	56
5.27	Initiation of data transmission	56
5.28	Interference type	56
5.29	Intervisibility	57
5.30	ISM application	57
5.31	Length of user data per transfer interval	57
5.32	Limitation from neighbours of the plant	57
5.33	Maximum number of retransmissions	57
5.34	Mechanism for adaptivity	58
5.35	Medium access control mechanism	58
5.36	Medium utilization factor	58
5.37	Message	59
5.38	Modulation	59
5.39	Natural environmental condition	59
5.40	Network topology	59
5.41	Number of consecutive lost messages	60
5.42	Object movement	60
5.43	Operating time between failures	60
5.44	Message loss ratio	60
5.45	Position of wireless devices	61
5.46	Power spectral density	61
5.47	Purpose of the automation application	62
5.48	Receiver blocking	62
5.49	Receiver maximum input level	62
5.50	Receiver sensitivity	62
5.51	Regional radio regulations	62
5.52	Relative movement	63
5.53	Response time	63
5.54	Security level	63
5.55	Spatial coverage of the wireless communication system	64
5.56	Spatial extent of the application	64
5.57	Spurious response	64
5.58	Survival time	64
5.59	Total radiated power	64
5.60	Transfer interval	64
5.61	Transmission gap	65
5.62	Transmission time	66
5.63	Transmitter output power	69
5.64	Transmitter sequence	69
5.65	Transmitter spectral mask	71
5.66	Update time	71
5.67	Wireless device density	72
5.68	Wireless device type information	72
5.69	Wireless communication solution density	73

5.70	Wireless technology or standard	73
6	Coexistence management information structures	73
6.1	General.....	73
6.2	General plant characteristic	75
6.2.1	General	75
6.2.2	General plant characteristic	75
6.2.3	Passive environmental influences	76
6.2.4	Active environmental influences.....	76
6.3	Application communication requirements	77
6.3.1	Overview	77
6.3.2	Requirements influencing the characteristic of wireless solutions	78
6.3.3	Performance requirements.....	79
6.4	Wireless system type and wireless device type	79
6.4.1	Overview	79
6.4.2	Wireless system type	80
6.4.3	Wireless device type	80
6.5	Wireless solution	83
6.5.1	Overview	83
6.5.2	Wireless system solution	83
6.5.3	Wireless device solution	84
6.6	Application related characteristic parameters	85
7	Coexistence management process	87
7.1	General.....	87
7.1.1	Overview	87
7.1.2	Documentation	87
7.1.3	Suitable documentation method	89
7.1.4	Application of tools	89
7.2	Establishment of a coexistence management system	89
7.2.1	Nomination of a coexistence manager	89
7.2.2	Responsibility of a coexistence manager	90
7.2.3	Support by wireless experts	90
7.2.4	Training	91
7.3	Maintaining coexistence management system	91
7.4	Phases of a coexistence management process	91
7.4.1	Investigation phase.....	91
7.4.2	Planning phase.....	94
7.4.3	Implementation phase.....	96
7.4.4	Operation phase	97
8	Coexistence parameter templates.....	99
	Bibliography.....	106
	Figure 1 – Issues of consideration	31
	Figure 2 – Applications using frequency spectrum	31
	Figure 3 – Progression of expense to achieve coexistence corresponding to the application classes	36
	Figure 4 – Separation of wireless systems according to frequency and time	39
	Figure 5 – Coexistence conceptual model.....	41
	Figure 6 – Flow chart of the coexistence conceptual model.....	42

Figure 7 – Selection of a wireless system in the coexistence management process	43
Figure 8 – Communication load in case of two wireless devices	48
Figure 9 – Communication load in the case of several wireless devices	49
Figure 10 – Cut-off frequencies derived from maximum power level	50
Figure 11 – Distance of the wireless devices	51
Figure 12 – Duty cycle	52
Figure 13 – Maximum dwell time	53
Figure 14 – Power spectral density of an IEEE 802.15.4 system	61
Figure 15 – Communication cycle, application event interval and machine cycle	65
Figure 16 – Transmission gap	66
Figure 17 – Example of the density functions of transmission time	67
Figure 18 – Example of the distribution functions of transmission time	68
Figure 19 – Transmitter sequence	70
Figure 20 – Transmitter spectral mask of an IEEE 802.15.4 system	71
Figure 21 – Example of distribution functions of the update time	72
Figure 22 – Principle for use of coexistence parameters	75
Figure 23 – Parameters to describe the general plant characteristic	75
Figure 24 – Parameters to describe application communication requirements	78
Figure 25 – Parameters to describe wireless system type and device type	79
Figure 26 – Example of power spectral density and transmitter spectral mask	81
Figure 27 – Example of medium utilization in time and frequency	82
Figure 28 – Parameters to describe a wireless communication solution	83
Figure 29 – Planning of a wireless system in the coexistence management process	95
Figure 30 – Implementation and operation of a wireless system in the coexistence management process	98
Table 1 – Example of a classification of application communication requirements	30
Table 2 – Application profile dependent observation time values	52
Table 3 – Parameter options for frequency channel	55
Table 4 – Hierarchy of the characteristics	74
Table 5 – List of parameters used to describe the general plant characteristic	76
Table 6 – List of parameters used to describe the passive environmental influences	76
Table 7 – List of parameters used to describe the active environmental influences	76
Table 8 – List of parameters used to describe the interference type	77
Table 9 – List of parameters used to describe the requirements influencing the characteristic of wireless solutions	78
Table 10 – List of characteristic parameters	79
Table 11 – List of parameters used to describe the wireless system type	80
Table 12 – List of parameters used to describe the transmitter of a wireless device type	82
Table 13 – List of parameters used to describe the receiver of a wireless device type	83
Table 14 – List of parameters used to describe a wireless solution	84
Table 15 – List of general parameters used to describe the wireless device solution	84
Table 16 – List of parameters used to describe the transmitter of a wireless device solution	85

Table 17 – List of parameters used to describe the receiver of a wireless device solution	85
Table 18 – List of relevant characteristic parameters of wireless solutions	86
Table 19 – List of relevant statistical values of characteristic parameters	86
Table 20 – Template used to describe the general plant characteristic	100
Table 21 – Template used to describe the application communication requirements	101
Table 22 – Template used to describe the wireless system type	102
Table 23 – Template used to describe a wireless device type	102
Table 24 – Template used to describe the wireless system solution	103
Table 25 – Template used to describe a wireless device solution	104
Table 26 – Template used to describe the relevant characteristic parameters of wireless solutions	104
Table 27 – Template used to describe the relevant statistical values of characteristic parameters	105
Table 28 – Template used to describe an interference type	105

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**INDUSTRIAL NETWORKS –
COEXISTENCE OF WIRELESS SYSTEMS –****Part 2: Coexistence management****FOREWORD**

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IEC 62657-2 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation. It is an International Standard.

This third edition cancels and replaces the second edition published in 2017 and Amendment 1: 2019. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) change the main part of the title from:
Industrial communication networks – Wireless communication networks
to
Industrial networks – Coexistence of wireless systems
- b) alignment of some definitions and specifications of coexistence parameters in order to facilitate their future inclusion in the IEC Common Data Dictionary (IEC CDD) maintained by the IEC;

- c) alignment of some definitions and specifications to be consistent to the new Part 3 and Part 4.

The text of this International Standard is based on the following documents:

Draft	Report on voting
65C/XX/FDIS	65C/XX/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

A list of all the parts of the IEC 62657 series, under the general title *Industrial networks – Coexistence of wireless systems*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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- withdrawn,
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- amended.

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INTRODUCTION

The overall market for wireless communication solutions spans a range of diverse applications, with differing performance and functional requirements. Within this overall market, the industrial automation domain could include:

- process automation, covering for example the following industry branches:
 - oil and gas, refining,
 - chemical,
 - pharmaceutical,
 - mining,
 - pulp & paper,
 - water & wastewater,
 - steel,
- electric power such as:
 - power generation (for example wind turbine),
 - power transmission and distribution (grid),
- factory automation, covering for example the following industry branches:
 - food and beverage,
 - automotive,
 - machinery,
 - semiconductor.

Industrial automation requirements for wireless communication systems are different from those of, for example, the telecommunications, commercial and consumer markets. These industrial automation requirements are identified and provided in IEC 62657-1.

Industrial premises can contain a variety of wireless communication technologies and other sources of radio emissions.

This document is intended for designers and persons responsible for production and process plants, system integrators and mechanical engineers having to integrate and start up wireless systems in machines and plants, and producers of industrial wireless solutions. In particular, it is intended to motivate exchange of information between automation and radio engineers.

Many wireless industrial automation applications are also located in physical environments over which the operator/owner can exert control. That is, within a physical facility where the presence and operation of all radio emitting devices are under the control of a single entity. This allows wireless management strategies to be employed which are not feasible for equipment installed in public or other unmanaged areas.

In industrial automation, many different wireless communication systems can operate in the same premises. Examples of these communication systems are IEC 62591 (WirelessHART^{®1}), IEC 62601 (WIA-PA) and IEC 62734 (ISA100.11a). All these communication systems use IEEE 802.15.4 [28]² for the process automation applications. Other examples of wireless communication systems are specified in IEC 61784-1 and IEC 61784-2 CPs that use IEEE 802.11 [25] and IEEE 802.15.1 [26] for factory automation applications. Different to wired fieldbuses, the wireless communication devices can interfere with others on the same premises or environment, disturbing each other. Other sources of radio energy in these bands, often at high energy levels, include radiated process heating, plastic welding, plasma lamps, and microwave irradiation devices.

Clearly, without a means to manage the coexistence of these varied emitters, it would be problematic to ensure that wireless systems meet the time-criticality and other performance requirements of industrial automation.

This document describes the management of independent radio sources that use the same transmission medium. The management within a wireless communication system is not the subject of this document. It is assumed that the standard of a wireless system regulates it, for example by a medium access control mechanism.

The IEC 62657 series has four parts:

- Part 1: Wireless communication requirements and spectrum considerations
- Part 2: Coexistence management
- Part 3: Formal description of the automated coexistence management and application guidance
- Part 4: Coexistence management with central coordination of wireless applications

IEC 62657-1 provides general requirements for industrial automation and spectrum considerations that are the basis for industrial communication solutions. This document specifies the coexistence management of wireless devices to ensure predictable performance. It is intended to facilitate harmonization of future adjustments to international, national, and local regulations.

This document provides the coexistence management concept and process. Based on the coexistence management process, a predictable assuredness of coexistence can be achieved for a given spectrum with certain application requirements. This document describes principles to manage the potential mutual interference that might occur due to the operation of multiple wireless devices in a plant.

This document provides guidance to the users of wireless systems on selection and proper use of wireless systems. To provide suitable wireless devices to the market, it also serves vendors in describing the behaviors of wireless devices to build wireless systems matching the application requirements.

This document is based on analyses of a number of International Standards, which focus on specific technologies. The intention of this document is not to invent new parameters but to use already defined ones and to be technology independent.

¹ WirelessHART is the registered trade name of the FieldComm Group, see www.fieldcommgroup.org. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the product named. Equivalent products may be used if they can be shown to lead to the same results.

² Numbers in square brackets refer to the bibliography.

INDUSTRIAL NETWORKS – COEXISTENCE OF WIRELESS SYSTEMS –

Part 2: Coexistence management

1 Scope

This part of IEC 62657:

- specifies the fundamental assumptions, concepts, parameters, and procedures for wireless communication coexistence;
- specifies coexistence parameters and how they are used in an application requiring wireless coexistence;
- provides guidelines, requirements, and best practices for wireless communication's availability and performance in an industrial automation plant; it covers the life-cycle of wireless communication coexistence;
- helps the work of all persons involved with the relevant responsibilities to cope with the critical aspects at each phase of life-cycle of the wireless communication coexistence management in an industrial automation plant. Life-cycle aspects include: planning, design, installation, implementation, operation, maintenance, administration and training;
- provides a common point of reference for wireless communication coexistence for industrial automation sites as a homogeneous guideline to help the users assess and gauge their plant efforts;
- deals with the operational aspects of wireless communication coexistence regarding both the static human/tool-organization and the dynamic network self-organization.

This document provides a major contribution to national and regional regulations. It does not exempt devices from conforming to all requirements of national and regional regulations.

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.

IEC 62657-1:2017, *Industrial communication networks – Wireless communication networks – Wireless communication requirements and spectrum considerations*

IEC 62657-4, *Industrial networks – Coexistence of wireless systems – Part 4: Coexistence management with central coordination of wireless applications*

IEC 62443 (all parts), *Industrial communication networks – Network and system security*

3 Terms, definitions, abbreviated terms and conventions

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

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

3.1.1

active environmental influence

influence on the signal propagation through interfering of the wireless communication application or wireless application

3.1.2

adjacent channel interference

interference that occurs from wireless devices using adjacent frequency channels

3.1.3

adjacent channel selectivity

ability of a radio receiver to respond to the desired signal and to reject signals in adjacent frequency channels

3.1.4

antenna gain

ratio of the power required at the input of a reference antenna to the power supplied to the input of the given antenna to produce, in a given direction, the same field strength at the same distance

[SOURCE: Federal Standard 1037C:1996, modified – Deletion of "loss-free" before "reference antenna", deletion of the two notes and synonyms] [29]

3.1.5

antenna radiation pattern

variation of the field intensity of an antenna as an angular function with respect to the axis

3.1.6

antenna type

kind of part of a radio transmitting or receiving system which is designed to provide the required coupling between a transmitter or a receiver and the medium in which the radio wave propagates

Note 1 to entry: In practice, the terminals of the antenna or the points to be considered as the interface between the antenna and the transmitter or receiver should be specified.

Note 2 to entry: If a transmitter or receiver is connected to its antenna by a feed line, the antenna may be considered to be a transducer between the guided waves of the feed line and the radiated waves in space.

[SOURCE: IEC 60050-712:1992, 712-01-01, modified – Addition of "kind of" at front]

3.1.7

application communication requirements

quantitative requirements specifying the required conditions and the required characteristics of wireless communication solutions at the communication interface that is met in order to achieve the purpose of the automation application

3.1.8**area of operation**

distinguishing properties of the area where the wireless communication system is operated

3.1.9**automated collaborative coexistence management**

tool supported collaborative coexistence management with defined interfaces between the tool and the wireless communication system

Note 1 to entry: The tool can be according to IEC 62657-4³.

3.1.10**automation application**

industrial automation application

application of measurement and automatic control in the industrial automation domain

3.1.11**automation application data length**

user data length

number of octets that are exchanged at the reference interface

3.1.12**bit rate of the physical link**

measure of the number of binary digits transferred per second

3.1.13**blocking frequency**

ability of a device to avoid part of the available spectrum

[SOURCE: ETSI TR 102 889-2: 2011, modified – Changed "blacklisting frequencies" to "blocking frequency"] [22]

3.1.14**blocked frequency list**

list of the blocked frequencies to avoid part of the available spectrum

[SOURCE: ETSI TR 102 889-2: 2011, modified – Exchanged "blacklisting frequencies" by "blocked frequency list" and added "to avoid part of the available spectrum"] [22]

3.1.15**cellular topology**

cellular network topology

network topology where the geographical area is divided in cells

Note 1 to entry: A device can move from one cell to another cell. Devices that are in a cell communicate through a central hub. Hubs in different cells are interconnected.

3.1.16**centre frequency**

geometric mean of lower cut-off frequency and upper cut-off frequency of a frequency channel

3.1.17**channel number**

unsigned integer number identifying a wireless communication channel in accordance with an authoritative document or rule

³ Under preparation. Stage at the time of publication: IEC FDIS 62657-4:2022.