IEC 62657-2

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Industrial communication networks – Wireless communication networks – Part 2: Coexistence management

Réseaux de communication industriels – Réseaux de communication sans fil – Partie 2: Gestion de coexistence

IEC 62657-2:2013

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FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 62657-2 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation.

The text of this standard is based on the following documents:

FDIS	Report on voting
65C/736/FDIS	65C/740/RVD

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

This first edition cancels and replaces IEC/TS 62657-2, published in 2011.

The main changes with respect to the TS are:

a) updated the normative references, terms, definitions, symbols, abbreviations;
b) corrected spelling;
c) changed figures to make them consistent with the text and vice versa;
d) added and modified text to make the text more readable.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

The market is in need of network solutions, each with different performance characteristics and functional capabilities, matching diverse application requirements. Industrial automation applications cover different industrial application domains like:

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

Industrial automation applications require behaviors of wireless communication networks that are different from those that are used for example in telecommunications or for commercial like a remote control or toy. These industrial automation requirements are identified and provided in IEC/TS 62657-1.

In industrial automation, many different wireless communication networks may operate in the same premises. Examples of these networks are IEC 62591 [6] [1] (WirelessHART®[2]), IEC 62601 [7] (WIA-PA) and IEC/PAS 62734 [9] (ISA100.11a); all these networks use IEEE 802.15.4 [18] for the process automation applications. Other examples of wireless networks are specified in IEC 61784-1 [3] and IEC 61784-2 [4] CPs that use IEEE 802.11 [14] and IEEE 802.15.1 [16] for factory automation applications. Different to wired fieldbuses, the wireless communication interfaces can interfere with others on the same premises or environment, disturbing each other. Therefore, without a predictable assuredness of coexistence, it could be problematic to have multiple wireless communication networks in the same facility or environment, especially because the time-criticality, the safety and the security of the operation may not be ensured in such an environment.

This part of the IEC 62657 addresses the coexistence management for a predictable assuredness of coexistence.

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1 Figures in square brackets refer to the Bibliography.

2 WirelessHART is the registered trade name of the HART Communication Foundation. 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.

The IEC 62657 series has two parts:

- Part 1: Wireless communication requirements and spectrum considerations
- Part 2: Coexistence management

IEC/TS 62657-1 [8] provides general requirements of industrial automation and spectrum considerations that are the basis for industrial communication solutions. This second part of IEC 62657 specifies the coexistence management with a predictable assuredness of coexistence. It is intended to facilitate harmonization of future adjustments to international, national, and local regulations.

This Part 2 of IEC 62657 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 Part 2 of IEC 62657 provides guidance to the users of wireless communication networks on selection and proper use of wireless communication networks. To provide suitable wireless devices to the market, it also serves vendors in describing the behaviors of wireless devices to build wireless communication networks matching the application requirements.

This Part 2 of IEC 62657 is based on analyses of a number of International Standards, which focus on specific technologies. The intention of this standard is not to invent new parameters but to use already defined ones and to be technology independent.

INDUSTRIAL COMMUNICATION NETWORKS – WIRELESS COMMUNICATION NETWORKS –

Part 2: Coexistence management

1 Scope

This Part 2 of IEC 62657

- specifies the fundamental assumptions, concepts, parameters, and procedure 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 Part 2 of IEC 62657 will provide a major contribution to national and regional regulations. It does not exempt devices to conform to all requirements of national and regional regulations.

EXAMPLE 1 This Part 2 of IEC 62657 could be listed as a harmonized standard in the Official Journal of the European Union (OJEU) to address the requirements of the European R&TTE directive, Article 3.2 [20], in addition to other applicable harmonized standards.

EXAMPLE 2 This Part 2 of IEC 62657 could be listed in the Korean Enforcement Decree of the Radio Regulation Law, Article 18 [21].

2 Normative references

None

3 Terms, definitions, abbreviated terms and conventions

3.1 Terms and definitions

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

3.1.1
adjacent channel interference
interference that occurs when two or more wireless applications use adjacent frequency channels

3.1.2
adjacent channel selectivity
ability of a radio receiver to respond to the desired signal and to reject signals in adjacent frequency channels

3.1.3
antenna
structure or device used to collect or radiate electromagnetic waves

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] [19]

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
automation application
application of measurement and automatic control in the industrial automation domains

3.1.7
automation application data length
number of octets that are exchanged at the communication interface

3.1.8
bandwidth
difference between upper cut-off frequency and lower cut-off frequency

3.1.9
centre frequency
geometric mean of lower cut-off frequency and upper cut-off frequency of a radio channel

3.1.10
channel occupation
time in which the medium is busy

Note 1 to entry: Beyond the pure transfer of user data, this time includes all time slices necessary to process the transmission protocol, for example to transfer an acknowledgement.

3.1.11
co-channel
emissions or transmissions in the same frequency channel

[SOURCE: IEC 60050-713:1998, 713-06-23, modified] [1]

3.1.12
coexistence
wireless communication coexistence
state in which all wireless communication solutions of a plant using shared medium fulfill all their application communication requirements

Note 1 to entry: This is consistent with the definition of coexistence in IEEE 802.15.2-2003 [17].

3.1.13
coexistence assessment
undertaking of an investigation in order to arrive at a judgment, based on evidence of the suitability of a set of products and their installation to achieve coexistence

[SOURCE: derived from IEC 62278:2002, 3.2] [5]

3.1.14
coexistence management
process to establish and to maintain coexistence that includes technical and organizational measures

3.1.15
coexistence planning
process that describes the allocation of wireless communication resources (time, frequencies, coding, space) to each wireless communication system in order to achieve coexistence

3.1.16
communication interface
exposed interface between an automation application and the wireless component

Note 1 to entry: There is no consistently defined interface for measurement and automation. The interface of the device might be a serial or a parallel hardware interface, a fieldbus interface, a software interface, or serial, parallel, discrete, and analog interface.

3.1.17
communication load
requirement of the automation application to transfer a certain amount of user data within a certain period of time

3.1.18
duty cycle
ratio of the transmitter sequence referenced to a given observation time for the used radio channel

3.1.19
dwell time
period spent at a particular frequency during any single hop of a frequency hopping system

3.1.20
effective radiated power
ERP
power supplied to the antenna multiplied by antenna gain

3.1.21
frequency band
range in the frequency spectrum that is assigned by regulatory organizations for use for specific applications

3.1.22
frequency channel
part of a frequency band that is used under a specification (standard or device specification) by a wireless communication system

Note 1 to entry: The coordinated use of different frequency channels is one of the measures to achieve coexistence.

3.1.23
immunity
ability of an item to continue operating properly in the event of an interference, up to a certain level of interference, and to be resilient above this level

Note 1 to entry: Immunity of an item is achieved by adding to the robustness of the item the ability to be resilient to interference.

3.1.24
intermodulation sensitivity
levels of out-of-band interfering signals that, when mixed in the receiver front-end, produce an in-band third order non-linearity product

3.1.25
jitter
time variation of an expected occurrence

Note 1 to entry: Examples are variation of transmission time and update time.

3.1.26
lower cut-off frequency
frequency furthest below the frequency of maximum power where the power spectral density drops below a certain level

3.1.27
mechanisms for adaptivity
measures to modify one or more of the systems operational parameters in order to improve the systems robustness against interferences and to minimize the medium utilization

3.1.28
metrics
set of quantitative indicators corresponding to selected properties of a communication device, equipment, or wireless communication system

3.1.29
plant
the facility under consideration, including its physical area of operation, personnel, equipment and all other contents

3.1.30
power spectral density
signal power per defined bandwidth

3.1.31
radio channel
span of the frequency spectrum which is characterized by lower cut-off frequency and upper cut-off frequency or by centre frequency and bandwidth

3.1.32
(radio) resource
means used by multiple wireless communication solutions for the purpose of radio signal transmission

3.1.33
radio robustness
attribute of wireless communication to fulfill the designated function despite the presence of other active wireless communication applications interfering in the sphere of influence

Note 1 to entry: This term has the same meaning as the definition of the term coexistence in IEEE 802.15.2-2003, 3.1.2 [17].