SLOVENSKI STANDARD
oSIST prEN IEC 62980:2021

01-marec-2021

Lažni komunikacijski protokol za brezžični radiofrekvenčni prenos električne energije (TA 15)

Parasitic communication protocol for radio-frequency wireless power transmission (TA 15)

Protocole de communication parasite pour le transfert d'énergie sans fil par rayonnement radiofréquence (TA 15)

Ta slovenski standard je istoveten z: prEN IEC 62980:2021

ICS:

33.160.01	Avdio, video in avdiovizualni sistemi na splošno	Audio, video and audiovisual systems in general

oSIST prEN IEC 62980:2021 **en,fr,de**

100/3533/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER:	
IEC 62980 ED1	
DATE OF CIRCULATION:	CLOSING DATE FOR VOTING:
2021-01-08	**2021-04-02**
SUPERSEDES DOCUMENTS:	
100/3379/CD, 100/3458A/CC	

IEC TA 15 : WIRELESS POWER TRANSFER

SECRETARIAT:	SECRETARY:
Korea, Republic of	Mr Ock-Woo Nam
OF INTEREST TO THE FOLLOWING COMMITTEES:	PROPOSED HORIZONTAL STANDARD: ☐ Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.

FUNCTIONS CONCERNED:

☐ EMC ☐ ENVIRONMENT ☐ QUALITY ASSURANCE ☐ SAFETY

☒ SUBMITTED FOR CENELEC PARALLEL VOTING ☐ NOT SUBMITTED FOR CENELEC PARALLEL VOTING

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TITLE:

Parasitic communication protocol for radio-frequency wireless power transmission (TA 15)

PROPOSED STABILITY DATE: 2025

NOTE FROM TC/SC OFFICERS:

Rev	Date	Description
01	2017.10.11	Circulation to experts for review
02	2018.01.18	Modified draft version of working document after getting comments or proposed change of NP voting
03	2018.09.04	Modified draft version of working document after getting editorial comments or proposed change from experts
04	2019.04.05	1st CD circulation document
05	2020.01.02	modified after 1st CD circulation document
06	2020.05.21	2nd CD circulation document

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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PARASITIC COMMUNICATION PROTOCOL FOR RADIO-FREQUENCY WIRELESS POWER TRANSMISSION

FOREWORD

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

FDIS	Report on voting
XX/XX/FDIS	XX/XX/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 publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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.

The National Committees are requested to note that for this publication the stability date is ....

THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE DELETED AT THE PUBLICATION STAGE.

INTRODUCTION

The [IEC 62980 (Parasitic communication protocol for radio-frequency wireless power transmission)] standard provides a parasitic backscatter communication protocol for battery-less internet-of-things (IoT) devices and sensors for radio-frequency (RF) wireless power transmission (WPT) without additional infrastructure.

Parasitic communication protocol for radio-frequency wireless power transmission

1. Scope

This standard defines procedures for transferring power to non-powered IoT devices using the existing ISM band communication infrastructure and RF WPT and a protocol for a two-way, long-distance wireless network in which IoT devices and APs communicate using backscatter modulation of ISM-band signals. Three components are required for two-way, long-distance wireless communication using backscatter modulation of ISM-band signals: an STA that transmits wireless power and data packets to SSNs by forming ISM-band signal channels between HIE-APs, a batteryless SSN that changes the sensitivity of the channel signals received from the STA using backscatter modulation, and an HIE-AP that practically decodes the channel signals whose sensitivity was changed by the SSN. In this standard, the procedures for CW-type RF WPT using communication among these three components are specified based on application of the CSI or RSSI detection method of ISM-band communication.

This standard proposes a convergence communication protocol than can deploy sensors, which can operate at low power (dozens of microwatts or less) without batteries, collect energy, and perform communication, to transmit power to SSNs using RF WPT based on parasitic communication. This method can be applied to application service areas such as domestic IoT, the micro-sensor industry, and industries related to environmental monitoring in the future

2. Normative references

Not applicable.

3. Definitions and terminology

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

3.1. Definitions

3.1.1.
BCU (Backscatter Communication Unit)
A BCU is a device that responds to a command from an STA with backscatter through load modulation and enables communication without power.

3.1.2.
BU (Battery Unit)
BUs are batteries and circuits capable of receiving wireless power to support the operations of devices and sensors.

3.1.3.
HIE-AP (Hybrid Information and Energy Access Point)
An HIE-AP practically decodes the channel signals whose sensitivity was changed by the SSN into digital signals of 0 or 1. It forms an STA and ISM-band channels for communication, detects the CSI or RSSI level of the response using backscatter from the SSN, and transmits the response data from the SSN to the STA. It also transmits CW-type power to the SSN for RF WPT.

3.1.4.
Impedance modulation
A method of changing the sensitivity of the received signal from the channel between the STA and HIE-AP using backscatter modulation in the SSN according to the data.

3.1.5.
SSN (Smart Sensor Node)
An SSN is a device that changes the sensitivity of the received channel signals using backscatter modulation. SSNs include IoT devices, wearable devices, and micro-sensors. An SSN consists of a backscatter communication unit (BCU) that supports communication without power, smart sensor unit (SSU) that identifies various sensors, and battery unit (BU) that receives WPT.

3.1.6.
SSU (Smart Sensor Unit)
SSUs are various sensors that can be attached to SSNs. Each sensor requires a different amount of power.

3.1.7.
STA (Station)
An STA is a device that can perform communication by occupying an ISM-band channel. It transmits wireless power and data packets to SSNs by forming a channel and using the pulse interval encoding (PIE) method.

3.2. Abbreviations

For the purposes of this document, the following abbreviations apply:

3.2.1.
ASK
Amplitude shift keying

3.2.2.
BCU
Backscatter Communication Unit

3.2.3.
BU
Battery Unit

3.2.4.
CRC
Cyclic Redundancy Check

3.2.5.
CSI
Channel State Information

3.2.6.
CW
Continuous Wave

3.2.7.
FCS
Frame Check Sequence

3.2.8.
HIE-AP
Hybrid Information and Energy Access Point

3.2.9.
ISM
Industrial scientific and medical equipment

3.2.10.
PIE
Pulse interval encoding

3.2.11.
RFID
Radio-Frequency Identification

3.2.12.
RFU
Reserved for Future Use

3.2.13.
RSSI
Received signal strength indicator

3.2.14.
RWP
Response Waiting Packet

3.2.15.
SSN
Smart Sensor Node

3.2.16.
SSU
Smart Sensor Unit

3.2.17.
STA
Station

4. Overview

RF WPT includes WPT using energy harvesting, magnetic induction, or magnetic resonant methods and involves the wireless transmission of power to sensors and facilities for practical use by employing RF waves. This standard proposes a method of performing RF WPT to batteryless sensors or facilities. The overall structure of parasitic communication for RF WPT proposed in this standard is depicted in figure 1. Parasitic communication (or Ambient backscatter) uses existing radio frequency signals, such as radio, television and mobile telephony, to transmit data without a battery or power grid connection. Each such device uses an antenna to pick up an existing signal and convert it into tens to hundreds of microwatts of electricity. This standard defines procedures for bi-directional, long-distance wireless communication protocol for communication using backscatter modulation of industrial, scientific, and medical (ISM)-band frequency signals between stations (STA) and smart sensor nodes (SSNs), such as IoT devices, sensors, tags, and wearable devices, and for RF WPT from a hybrid information and energy access point (HIE-AP) to nearby SSNs.

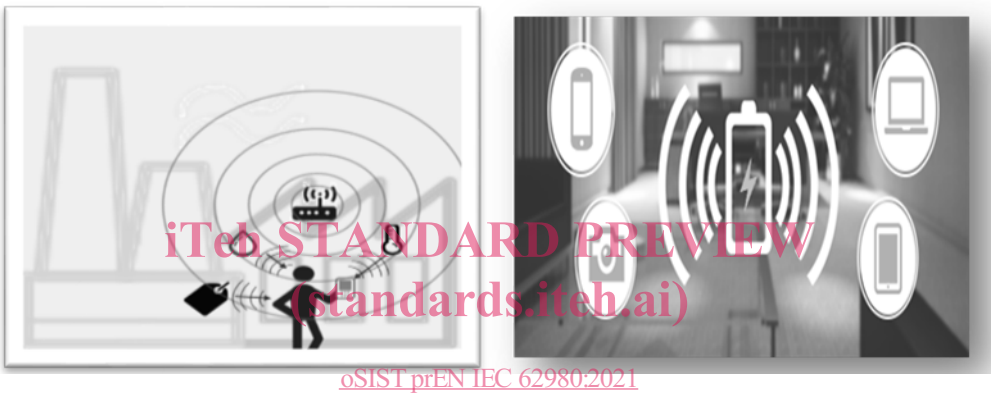

Figure 1 — Example/Application Usage of RF-WPT

Three components are required for the bi-directional, long-distance wireless communication protocol using backscatter modulation of ISM-band signals as shown in figure 2:

- STA: performing communication by occupying a communication channel and transmits wireless power and data packets for communication to the SSN in the PIE method.
- HIE-AP: decoding the channel signals whose sensitivity was changed by the SSN into digital signals of 0 or 1. It forms a channel with the STA for communication, detects the CSI level of the response from the SSN that used backscatter, and transmits the response data from the SSN to the STA. It also transmits CW-type power to the SSN for RF WPT.
- SSN: changing the sensitivity of the channel signals received from the STA using backscatter modulation and consists of a BCU, an SSU, and a BU.
  - BCU: responding to a command from an STA with backscatter through load modulation and can respond with backscatter using the wireless power transmitted by the STA.
  - SSU: various sensors that can be attached to the SSN, each of which requires a different amount of power.
  - BU: a battery or a circuit capable of receiving wireless power to support the operation of nodes and sensors.