IEC 62827-3

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Wireless power transfer – Management – Part 3: Multiple source control management

Transfert de puissance sans fil – Gestion – Partie 3: Gestion du contrôle de sources multiples

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WIRELESS POWER TRANSFER – MANAGEMENT –

Part 3: Multiple source control management

FOREWORD

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International Standard IEC 62827-3 has been prepared by technical area 15: Wireless power transfer, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

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

CDV	Report on voting
100/2604/CDV	100/2724/RVC

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.

A list of all parts in the IEC 62827 series, published under the general title *Wireless power transfer – Management*, 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 website 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- withdrawn,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

Wireless power transfer technology transmits electric power from the power source to the power-consuming device without the use of wire. The most widely used technology is electromagnetic induction technology and magnetic resonance technology. The wireless power transfer system eliminates the need for the user to connect a power cable to the electrical outlet. Through electromagnetic induction technology, users place the power-receiving device within a short distance from the power source in order to charge a battery without removing it from its device.

In parallel to this, magnetic resonance technology for wireless power transfer systems is also being developed. Magnetic resonance technology gives a spatial effect to power transfer. A spatial effect on wireless power transfer enables multiple power sources to deliver electric power to multiple receiving devices at a distance in the same vicinity.

In order to efficiently manage and support the wireless power transfer in spatial space, multiple power sources need to communicate and coordinate with each other.

WIRELESS POWER TRANSFER – MANAGEMENT –

Part 3: Multiple source control management

1 Scope

This document specifies methods and procedures to form groups for a spatial wireless power-transfer system. The group of spatial wireless power-transfer systems that include multiple power sources provides power transfer to receiving devices based on magnetic resonance technology.

In order to achieve efficient power transfer to multiple receiving devices, this document also specifies methods and procedures to set, share, and control the conditions of power transfer between multiple power sources and receiving devices.

NOTE Expected power-receiving devices are audio, video and multimedia equipment.

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 62827-1, *Wireless power transfer – Management – Part 1: Common components*

3 Terms, definitions and abbreviated terms

For the purposes of this document, the terms, definitions and abbreviated terms given in IEC 62827-1, and the following 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 Terms and definitions

3.1.1
magnetic resonance
subset of electromagnetic induction methods utilizing non-radiative, near-field or mid-field resonance coupling between two electromagnetic resonators where the coupling coefficient between the primary or source coil and the secondary or receiving coil is low (k much less than 1)

3.1.2
spatial wireless power transfer
concept of wireless power transfer between multiple sources and multiple receiving devices which are placed at a distance within a spatial space

Note 1 to entry: "Spatial" means that receiving devices will take various positions and postures, and will lead to variable transfer efficiency including almost zero per cent. This situation may occur when receiving devices are placed far apart from the power source and are freely rearranged.

3.1.3
spatial wireless power transfer system
group implementing spatial wireless power transfer in which the power source can deliver power and data to the power-receiving device

Note 1 to entry: In special cases, a spatial wireless power transfer system can consist of only a single power source and only a single power-receiving device.

Note 2 to entry: Spatial wireless power transfer system includes the case in which a power source has the ability to access a power-receiving device through a relay from other power sources when the power source attempts to deliver data to the receiving device. In this document, "data" means control and management data for wireless power transfer.

3.1.4
wireless power management system-source network
WPMS-SN
group of power sources which can communicate with each other via a network connection, such as wired LAN, wireless LAN, Bluetooth and so on

Note 1 to entry: As a special case, spatial wireless power transfer system-source network can consist of only a single source.

3.1.5
power transfer area
area in which a power source can deliver power to power-receiving devices wirelessly

3.1.6
communication area
area in which a power source can communicate with power-receiving devices via a network connection, such as wired LAN, wireless LAN, Bluetooth and so on

3.1.7
power transfer level
power strength of a power source transfer to the receiving device

3.1.8
wireless power transmitting condition
condition for transmitting power such as power strength and phase

3.1.9
wireless power receiving condition
condition for receiving power such as the received power, the relative value for required power and the voltage after receiving the required power which are calculated on the power-receiving device which receives or has received power from the power source

3.1.10
wireless power transfer mode
distinct methods of transferring power from sources to receiving devices

3.1.11
wireless power distribution
effective power delivery based on power required by the receiving devices

3.2 Abbreviated terms

WPMS*n*	the *n*-th WPMS if *n* is specified
WDCZ*n*	the *n*-th WDCZ if *n* is specified
WPTZ*n*	the *n*-th WPTZ if *n* is specified
WPMS-S*n*	the *n*-th WPMS-S if *n* is specified
WPMS-SN	wireless power management system-source network
WPMS-SN*n*	the *n*-th WPMS-SN if *n* is specified
WPMS-D*n*	the *n*-th WPMS-D if *n* is specified

4 Basic overview of WPMS

Wirelss power management system (WPMS) is a system to deliver power to WPMS-Ds within a spatial space on the basis of wireless power transfer technology, such as magnetic resonance. In this document, WPMS is regarded as spatial wireless power transfer system. A WPMS consists of multiple WPMS-Ss and multiple WPMS-Ds as shown in Figure 1, Figure 2 and Figure 3. In special cases, WPMS is allowed to consist of only one WPMS-S as shown in Figure 1.

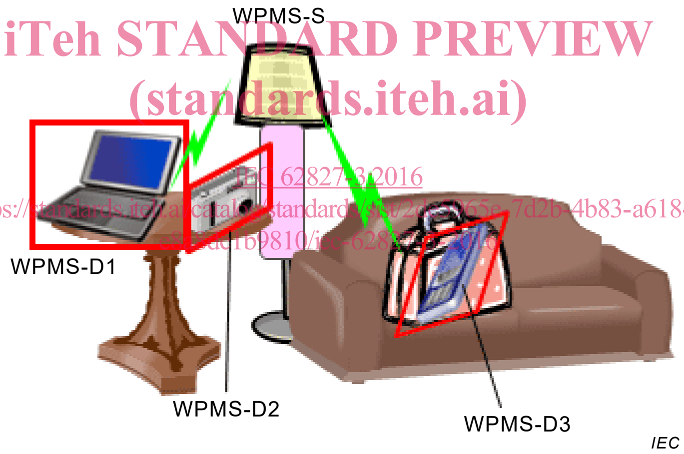

Figure 1 – Conceptual image of WPMS: Example 1

Figure 2 and Figure 3 illustrate that multiple WPMS-Ss transfer power to multiple WPMS-Ds at a distance. With magnetic resonance technology, a spatial wireless power transfer can have a wide range and cover more space, as shown in Figure 3.

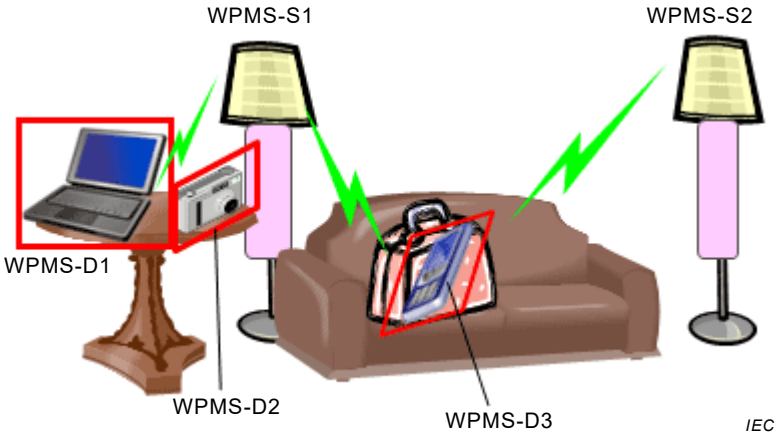

Figure 2 – Conceptual image of WPMS: Example 2

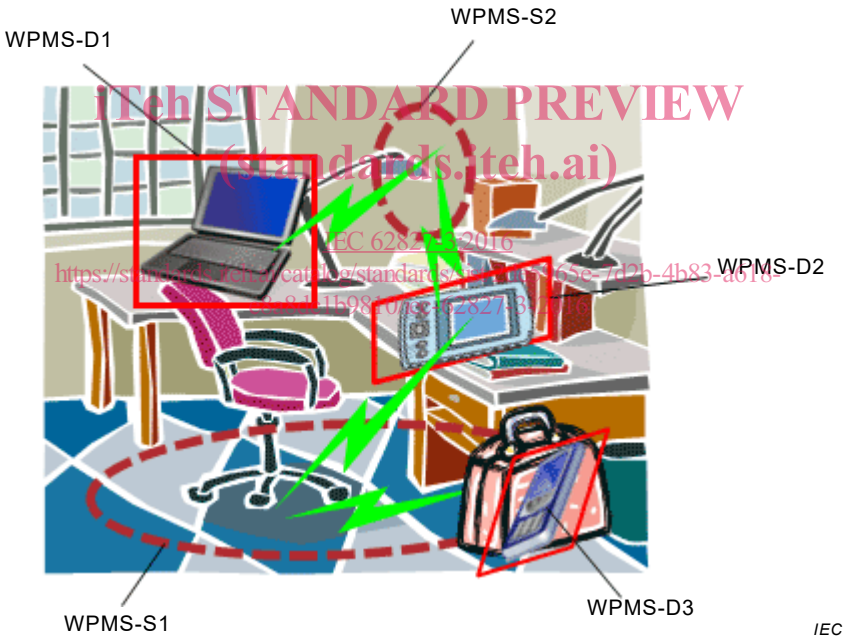

Figure 3 – Conceptual image of WPMS: Example 3

WPMS-Ss collect authentication information and wireless power receiving conditions from WPMS-Ds, and communicate this information with other WPMS-Ss. After that, each WPMS-S decides which power transfer mode to use and sets up power transmitting conditions. According to the power transfer mode, the power transmitting conditions and the wireless power receiving conditions which are decided by the WPMS-Ss, power is transferred to WPMS-Ds. When "simultaneous power-transfer mode" or "mixed simultaneous and time-division mode" is selected, effective wireless power distribution is carried out to control the receiving power based on the required power. See 6.3 for power transfer modes.

Therefore, if WPMS-Ds enter a WPMS, the WPMS-Ss within the WPMS can provide those WPMS-Ds of various positions and posture with efficient power transfer according to the control management based on information collected on the transmitting and wireless power receiving conditions by network communications and sensors.

In a spatial power transfer area, the power transfer level is flexible and dependent on the type of WPMS-Ds and their wireless power receiving conditions.

5 Requirements in WPMSs

5.1 General model for WPMSs

In Figure 4, two WPMSs in the same special vicinity shows the basic structure of multiple WPMSs, i.e. WPMS1 and WPMS2. Each WPMS-S in a WPMS forms its WPMS-S-centred star topology network with WPMS-Ds in the communication area of the WPMS-S. In addition, the WPMS-Ss form mesh or star topology network in the WPMS. Multiple WPMS-Ss set up the union of spatial power transfer areas which is WDTZ and the union of communication areas which is WPTZ. The communication area includes the power transfer area.

In one WPMS, one WPMS-S is selected as master WPMS-Ss and the remaining WPMS-Ss become slave WPMS-S. The master WPMS-S sends instructions about communication and power transfer conditions to slave WPMS-Ss. The master WPMS-S can communicate with all WPMS-Ds via the slave WPMS-Ss and control the entire behaviour, such as communication and power transfer situations, within the WPMS.

NOTE A single WPMS-S cannot belong to multiple WPMSs at the same time. In that case, WPMS1 and WPMS2 will be merged into one WPMS. Similarly, a WPMS-D cannot belong to both WPMS1 and SPWS2 at the same time. In that case, WPMS1 and WPMS2 will be merged into one WPMS.

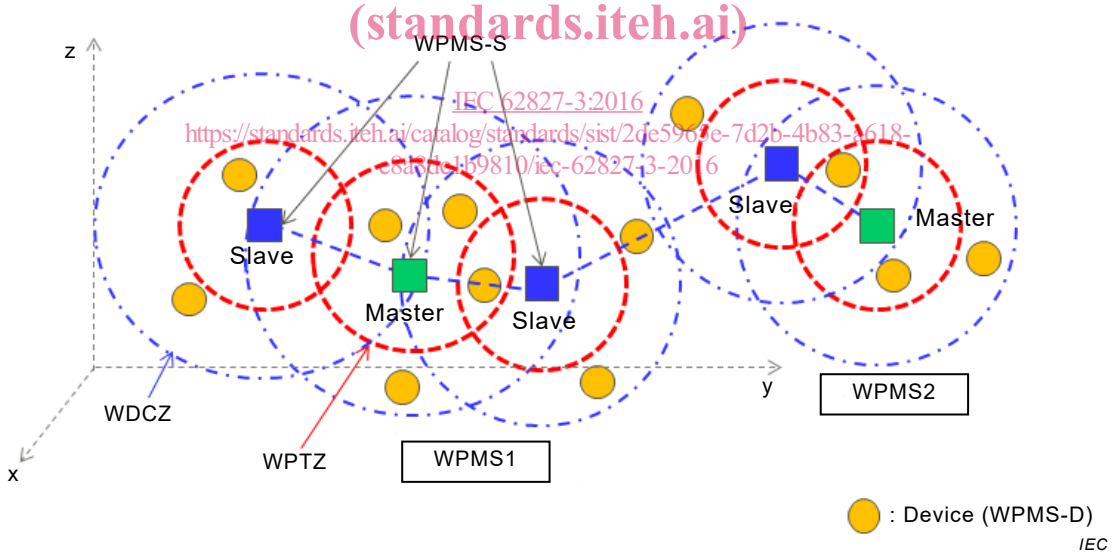

Figure 4 – Structure of a WPMS

5.2 Required functionalities

5.2.1 General

WPMS-Ss in a WPMS communicate and coordinate with each other to efficiently deliver power within a spatial power transfer area. 5.2 describes the required procedure for coordination among WPMS-Ss.

As shown in Figure 5, the following functionalities are required to set up and control a WPMS.

a) Configure a group by communication among WPMS-Ss.

b) Identify and authenticate WPMS-Ds by WPMS-Ss.