IEC 63245-2

Edition 1.0 2022-12

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Spatial wireless power transfer based on multiple magnetic resonances – Part 2: Reference model

Transfert d'énergie sans fil dans l'espace reposant sur des résonances magnétiques multiples –
Partie 2: Modèle de référence



IEC 63245-2:2022-12(en-fr)



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2022 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, …). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch
Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 300 terminological entries in English and French, with equivalent terms in 19 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

A propos de l'IEC
La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC
Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC - webstore.iec.ch/advsearchform
La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, …). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished
Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Service Clients - webstore.iec.ch/csc
Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch
Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

Electropedia - www.electropedia.org
Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 300 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 19 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

IEC 63245-2

Edition 1.0 2022-12

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Spatial wireless power transfer based on multiple magnetic resonances – Part 2: Reference model

Transfert d'énergie sans fil dans l'espace reposant sur des résonances magnétiques multiples – Partie 2: Modèle de référence

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 29.240.99; 35.200

ISBN 978-2-8322-6305-1

Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.

® Registered trademark of the International Electrotechnical Commission
Marque déposée de la Commission Electrotechnique Internationale

CONTENTS

FOREWORD 3
INTRODUCTION 5
1 Scope 6
2 Normative references 6
3 Terms, definitions, and abbreviated terms 6
3.1 Terms and definitions 6
3.2 Abbreviated terms 7
4 Overview of spatial wireless power transfer based on multiple magnetic resonances 7
5 Reference model 8
5.1 Overview 8
5.2 Components of an SWPT-MMR system 9
5.2.1 Power source 9
5.2.2 Capacitor 9
5.2.3 Inverter 10
5.2.4 Transmitter coils 12
5.2.5 Communication module 14
Bibliography 15

Figure 1 – Conceptual image of SWPT-MMR [IEC 63245-1] 8
Figure 2 – The reference model of an SWPT-MMR system 8
Figure 3 – Example configuration of an SWPT-MMR system with power sources 9
Figure 4 – Configuration on an SWPT-MMR system with transmitter coils connected to capacitors 10
Figure 5 – Configuration of an SWPT-MMR system with an inverter controlling a phase of magnetic field formed on transmitter coils connected in parallel 11
Figure 6 – Configuration of an SWPT-MMR system with an inverter controlling a phase of magnetic field formed on transmitter coils connected in series 11
Figure 7 – An example of an SWPT-MMR system with two transmitter coils 12
Figure 8 – An example of an SWPT-MMR system with two pairs of transmitter coils 13

Table 1 – Power source-related requirements defined in IEC 63245-1 9
Table 2 – Capacitor-related requirements defined in IEC 63245-1 10
Table 3 – Inverter-related requirements defined in IEC 63245-1 12
Table 4 – Transmitter coil-related requirements defined in IEC 63245-1 13
Table 5 – Communication module-related requirements defined in IEC 63245-1 14

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

SPATIAL WIRELESS POWER TRANSFER BASED ON MULTIPLE MAGNETIC RESONANCES –

Part 2: Reference model

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.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 63245-2 has been prepared by technical area 15: Wireless Power Transfer, of IEC technical committee 100: Audio, video and multimedia systems and equipment. It is an International Standard.

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

Draft	Report on voting
100/3839/FDIS	100/3864/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.

A list of all parts in the IEC 63245 series, published under the general title *Spatial wireless power transfer based on multiple magnetic resonances*, can be found on the IEC website.

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.

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

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

IMPORTANT – The "colour inside" logo on the cover page of this document 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 IEC 63245 series (Spatial wireless power transfer based on multiple magnetic resonances, SWPT-MMR) provides requirements and a reference model for implementing spatial wireless power transfer systems. The IEC 63245 series consists of the following parts:

– Part 1: Requirements, and
– Part 2: Reference model

IEC 63245-1 describes requirements of SWPT-MMR.

IEC 63245-2 (this document) describes the reference model of SWPT-MMR.

SPATIAL WIRELESS POWER TRANSFER BASED ON MULTIPLE MAGNETIC RESONANCES –

Part 2: Reference model

1 Scope

This document specifies a reference model for spatial wireless power transfer based on multiple magnetic resonances (SWPT-MMR), which is a type of non-radiative wireless power transfer (WPT). The document contains an overview of SWPT-MMR and a reference model.

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 63245-1:2021, *Spatial wireless power transfer based on multiple magnetic resonances – Part 1: Requirements*

3 Terms, definitions, and abbreviated terms

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

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

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

3.1 Terms and definitions

3.1.1
null point
point or area in the charging zone where the magnetic field cancels out almost entirely or is below a certain specified minimum

[SOURCE: IEC 63245-1:2021, 3.1.1]

3.1.2
quiet zone
magnetic field having an equalized energy density corresponding to each of the magnetic fields formed on the transmitter coils

[SOURCE: IEC 63245-1:2021, 3.1.2]

3.1.3
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 percent. This situation can occur when receiving devices are placed far apart from power source and freely rearranged.

[SOURCE: IEC 62827-3:2016, 3.1.2, modified – "placed at a certain distance in various positions and postures within a space" has been replaced with " which are placed at a distance within a spatial space"]

3.1.4
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.

[SOURCE: IEC 62827-3:2016, 3.1.3]

3.1.5
transmitter coil
component of a wireless power transmitter that converts electric current to magnetic flux

[SOURCE: IEC 63006:2019, 3.48]

3.2 Abbreviated terms

SWPT	spatial wireless power transfer
SWPT-MMR	spatial wireless power transfer based on multiple magnetic resonances
WPT	wireless power transfer

4 Overview of spatial wireless power transfer based on multiple magnetic resonances

A spatial wireless power transfer (SWPT) system delivers the electronic power to one or more receivers within a specific space. As a specific implementation of SWPT, spatial wireless power transfer based on multiple magnetic resonances (SWPT-MMR) includes multiple magnetic resonances to generate the specific space, namely a charging zone. In the charging zone, electric power is transferred to one or more receivers regardless of the position and the direction of the receiver(s). Figure 1 shows a conceptual image of SWPT-MMR.