
**Information technology —
Telecommunications and information
exchange between systems —
Magnetic field area network (MFAN) —
Part 2:
In-band Control Protocol for Wireless
Power Transfer**

*Technologies de l'information — Téléinformatique — Réseau de zone
de champ magnétique (MFAN) —*

*Partie 2: Protocole de contrôle dans la bande pour le transfert de
puissance sans fil*

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Contents

Page

Foreword	v
Introduction	vi
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Symbols and abbreviated terms	2
5 Overview	4
6 Network elements	5
6.1 General	5
6.2 Time element	5
6.2.1 General	5
6.2.2 Time element for MPAN	6
6.3 Physical element	7
6.3.1 Coordinator	7
6.3.2 Node	7
6.4 Address element	8
6.4.1 MFAN ID	8
6.4.2 UID	8
6.4.3 Group ID	8
6.4.4 Node ID	8
6.4.5 WPT ID	8
7 Network status	9
7.1 General	9
7.2 Network status for MPAN	9
7.2.1 Stabilization	9
7.2.2 Invigoration	9
7.2.3 Revitalization	9
7.3 MPAN state	9
7.3.1 Coordinator state	10
7.3.2 Node state	11
8 Physical layer frame format	13
8.1 General	13
8.2 Preamble	14
8.3 Header	14
8.4 Payload	14
8.5 Frame check sequence	14
9 MAC layer frame format	14
9.1 General	14
9.2 Frame format for MPAN	14
9.2.1 Frame header	15
9.2.2 Frame body	15
9.2.3 Frame type	15
9.2.4 Payload format	16
9.3 Frame format for power status feedback	25
9.3.1 Frame header	25
9.3.2 Frame body	26
9.3.3 Frame type	26
9.3.4 Payload format	27
10 MAC layer function	28
10.1 General	28

10.2	Stabilization.....	28
10.3	Invigoration.....	29
10.4	Revitalization.....	30
11	Air interface.....	31
11.1	Frequency.....	31
11.2	Signal waveform for WPT.....	31

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: [Foreword — Supplementary information](#).

The committee responsible for this document is ISO/IEC JTC 1, *Information technology*, Subcommittee SC 6, *Telecommunications and information exchange between systems*.

ISO/IEC 15149 consists of the following parts, under the general title *Information technology — Telecommunications and information exchange between systems — Magnetic field area network (MFAN)*:

- *Part 1: Air interface*
- *Part 2: In-band control protocol for wireless power transfer*
- *Part 3: Relay protocol for extended range*
- *Part 4: Security protocol for authorization*

Introduction

This International Standard provides protocols for magnetic field area network (MFAN). MFAN can support the service based on wireless communication and wireless power transfer in harsh environment. MFAN is composed of four protocols; air interface, in-band control protocol, relay protocol, and security protocol.

ISO/IEC 15149-1 specifies the physical layer and media access control layer protocols of wireless network over a magnetic field.

ISO/IEC 15149-2 specifies the control protocol for wireless power transfer based on magnetic field area network.

ISO/IEC 15149-3 specifies the relay protocol to extend effective network coverage of magnetic field area network.

ISO/IEC 15149-4 specifies the security protocol to authorize nodes to communicate in magnetic field area network.

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Information technology — Telecommunications and information exchange between systems — Magnetic field area network (MFAN) —

Part 2: In-band Control Protocol for Wireless Power Transfer

1 Scope

This International Standard establishes a system for an in-band network, from which both wireless power transfer and data transmission are carried out simultaneously at the same frequency band. It provides technical solution for a remote and consistent power supply, along with a stable network.

For the purpose of this International Standard, the system is designed based on the principles described in ISO/IEC 15149 (Magnetic Field Area Network). In this way, it is expected to achieve superiority in control of devices, while managing wireless power transfer to multiple devices in request. The focus is on the physical and media access control layer protocol; it will not discuss matters on the upper layer protocols. As together, the PHY and MAC layers have to be able to carry out the following tasks: data transmission, signal control, wireless power transfer.

This International Standard is applicable in various situations and environments, but is expected to perform excellently in the following certain use cases:

- mobile phones: provide ubiquitous charging environments for portable devices;
- home appliances: allow unrestrained placement of appliances with the elimination of wire cables and plugs for power supply.

The media access control layer protocol is designed for the following scope:

- variable superframe structure for wireless power transfer to multiple devices;
- simple and effective network topology for efficient wireless power transfer;
- dynamic address assignment for efficient timesharing among multiple devices.

The physical layer protocol is designed for the following scope:

- one frequency band for both wireless power transfer and magnetic field communication;
- simple and robust modulation for low-cost implementation and minimized margin of error;
- variable coding and bandwidth for dynamic charging environment.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 15149-1:2014, *Information technology — Telecommunications and information exchange between systems — Magnetic field area network (MFAN) — Part 1: Air interface*

3 Terms and definitions

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

3.1 wireless power transfer

WPT

method of consistent and simultaneous power supply to multiple devices within a range without physical contact

3.2 magnetic field area network

MFAN

wireless network that provides reliable communication in harsh environments using magnetic field

3.3 magnetic power network

MPAN

in-band wireless power transfer network that incorporates magnetic field area network (MFAN) in its communication and wireless power transfer within a single frequency band

3.4 magnetic power area network-coordinator

MPAN-C

device that carries out integral operations for magnetic power area network; wireless power transfer, connection and release of devices, and time scheduling of power transfer and data

3.5 magnetic power area network-node

MPAN-N

devices that comprises magnetic power area network and that is not a coordinator

4 Symbols and abbreviated terms

The following acronyms are used in this document:

ARq	Association Request
ARs	Association Response
ARA	Association Response Acknowledgement
ASC	Association Status Check
ASK	Amplitude Shift Keying
ASRq	Association Status Request
ASRs	Association Status Response
ASRA	Association Status Response Acknowledgement
BPSK	Binary Phase Shift Keying
CRC	Cyclic Redundancy Check
DA	Data Acknowledgement
DaRq	Disassociation Request

DaRs	Disassociation Response
DaRA	Disassociation Response Acknowledgement
DRq	Data Request
DRs	Data Response
DRA	Data Response Acknowledgement
FCS	Frame Check Sequence
GSRq	Group ID Set-up Request
GSRs	Group ID Set-up Response
GSRA	Group ID Set-up Response Acknowledgement
LSB	Least Significant Bit
MAC	Media Access Control
NRZ-L	Non-Return-to-Zero Level
PHY	Physical Layer Protocol
PLRC	Power Level Request Command
PLRCA	Power Level Request Command Acknowledgement
PS	Power Status
PSF	Power Status Feedback
PSFI	Power Status Feedback Interval
PT	Power Transfer
PTBRq	Power Transfer Beacon Request
PTEC	Power Transfer Execution Command
PTECA	Power Transfer Execution Command Acknowledgement
PTPC	Power Transfer Permission Command
PTRC	Power Transfer Request Command
PTRq	Power Transfer Request
PTRs	Power Transfer Response
RA	Response Acknowledgement
RR	Response Request
SIFS	Short Inter Frame Space
TDMA	Time Division Multiple Access
UID	Unique Identifier