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## Information technology — Specification of low power wireless mesh network over channel-hopped TDMA links

*Technologies de l'information — Spécification des réseaux maillés  
sans fil à faible puissance par liens AMRT à saut de canaux*



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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.

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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, SC 6, Telecommunications and information exchange between systems*.

## Introduction

This working draft defines the protocol for the low-power wireless mesh network over channel-hopped TDMA links (LPWMN). The objective of LPWMN is to define a wireless mesh network specification, which is relatively lightweight compared to the legacy WPAN network specifications and can maximize usefulness of the channel-hopped TDMA link which is followed by the deterministic and synchronous multichannel extension (DSME) MAC specified in IEEE 802.15.4e-2012 amendment.

In recent years, there is market demand for applying the low-energy short range communication of the WSN to the networks for mission-critical services or real-time services including remote monitoring and alarming of health devices or medicine equipment, sensing and actuation control of process automation, and voice service over the low-energy short range networks. To provide more reliable link and deterministic delay for the mission-critical services, enhancements of the IEEE 802.15.4-2006 MAC specification was started in March 2008 and the draft of the amendment is approved in February 2012. In the IEEE 802.15.4e-2012 amendment, three types of TDMA and two types of channel diversity function are added as optional MAC features.

These new MAC features introduce two attributes to be managed in the network layer, which includes time slots and radio channels. To employ the new enhanced MAC for the reliable and real-time services in the low-cost, low-power, short-range communication network, the network protocol needs to be designed for managing the network resources including time slots and radio channels. The LPWMN is a network specification over the DSME of IEEE 802.15.4e-2012 amendment. The LPWMN is applicable to industrial applications that require a loss sensitive large wireless network guaranteeing deterministic end-to-end delay with low-power resource-constrained communication nodes.

The International Organization for Standardization (ISO) and International Electrotechnical Commission (IEC) draw attention to the fact that it is claimed that compliance with this document may involve the use of a patent concerning the functional procedure and message structure of LPWMN given in [Clauses 5, 6, 7, and 8](#), and a patent concerning the authentication and key establishment protocols given in [Annex B](#).

ISO and IEC take no position concerning the evidence, validity, and scope of this patent right.

The holder of this patent right has assured the ISO and IEC the willingness to negotiate licences either free of charge or under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with ISO and IEC. Information may be obtained from the following:

— Patent holder: Electronics and Telecommunications Research Institute (ETRI)

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# Information technology — Specification of low power wireless mesh network over channel-hopped TDMA links

## 1 Scope

This International Standard defines the network specification for devices, which are operated on IEEE Std. 802.15.4-2011 PHY, capable to support the channel-hopped TDMA links of the DSME MAC of IEEE Std. 802.15.4e-2012, to provide low-cost communication network that allows reliable, deterministic-latency, and scalable wireless mesh connectivity.

This International Standard provides the following:

- DSME MAC link control;
- unbalanced cluster-tree based network formation;
- directional multiple grades mesh connection;
- link-path routing and data forwarding;
- link and link-path maintenance.

## 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.

IEEE Std 802.15.4-2011, *IEEE Standard for Local and metropolitan area networks—Part 15.4: Low-Rate Wireless Personal Area Networks (LR-WPANs)*

IEEE Std 802.15.4e-2012, *IEEE Standard for Local and metropolitan area networks—Part 15.4: Low-Rate Wireless Personal Area Networks (LR-WPANs), Amendment 1: MAC sublayer*