



**Electromagnetic compatibility
and Radio spectrum Matters (ERM);
Short Range Devices;
Smart Metering Wireless Access Protocol;
Part 2: Data Link Layer (MAC Sub-layer)**

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Electromagnetic Compatibility and Radio Spectrum matters (ERM)

The present document is part 2 of a multi-part deliverable covering Short Range Devices; Smart Metering Wireless Protocol.

Part 1: "PHY Layer";

Part 2: "Data Link Layer (MAC sub-layer)".

Introduction

The present document, together with its associated PHY Technical Specification [1], provide radio communications connectivity for continuously powered or battery operated Smart Metering devices which, when coupled with suitable transport protocols, support advanced metering and other energy related applications. The MAC/PHY combination is also suitable for a wide range of sensor and Machine-to-Machine applications characterised by low device duty cycle and operation in shared spectrum.

This wide range of applications requires efficient connectivity protocol support for intermittent bi-directional data exchanges between devices in both low density (e.g. rural) and high density (e.g. urban) environments covering operations as simple as discovery and connection between one pair of devices (e.g. for walk-by meter reading) up to networks of many devices sharing a Network Point of Attachment to an external wide area network.

Spectrum sharing imposes additional requirements on the lower layer communications protocols governed by regulations limiting power and duty cycle among other characteristics. Such regulations taken into account by the present document include those governing the operation of Short Range Devices. Simple and low density deployments may be supported by distributed or cluster-based control algorithms, e.g. as found in [3] and [4], operating on a single channel. Frequency agility to select or change operating channel to minimise interference is advantageous for these applications but not essential for their operation.

Dense deployments and more complex applications may be constrained by spectrum sharing rules designed to limit the interference to other devices or services from the data traffic generated. In these cases the optimum control algorithms spread the population of devices uniformly over the available spectrum (channels) to minimise the number of devices on any given channel thereby minimising interference from their generated traffic. Device behaviour defined in [2] automatically distributes devices over the available channels by using device-centric pseudo-random channel hopping but also supports single channel operation via a degenerate hopping algorithm always returning the same channel number.

Both approaches to systems design may be deployed using the same PHY protocol and in the same frequency range and it is therefore necessary to include facilities to discriminate between information belonging to each MAC approach. Nothing prevents an implementation choosing to use only one of the alternate approaches or supporting both and the present document provides the necessary data structure encoding to identify each unit of information in its correct context.

1 Scope

The present document is the second part of the Smart Metering Wireless Access Protocol describing the data structures and functional operation of Smart Metering and other applications intending to use spectrum resources covered by TS 102 887-1 [1] Physical Layer.

TS 102 887-1 [1] is derived from IEEE 802.15.4g-2012™ [5] and the present document is derived from IEEE 802.15.4-2011™ [3], IEEE 802.15.4e-2012™ [4] and ANSI/TIA-4957-200 [2] together with specific enhancements or adaptations for the European context.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://docbox.etsi.org/Reference>.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are necessary for the application of the present document.

- [1] ETSI TS 102 887-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices; Smart Metering Wireless Access Protocol; Part 1: PHY layer".
- [2] ANSI/TIA-4957.200: "Layer 2 Standard Specification for the Smart Utility Network".
- [3] IEEE 802.15.4-2011™: "IEEE Standard for Local and metropolitan area networks-- Part 15.4: Low-Rate Wireless Personal Area Networks (LR-WPANs)".
- [4] IEEE 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".
- [5] IEEE 802.15.4g-2012™: "IEEE Standard for Local and metropolitan area networks-- Part 15.4: Low-Rate Wireless Personal Area Networks (LR-WPANs) Amendment 3: Physical Layer (PHY) Specifications for Low-Data-Rate, Wireless, Smart Metering Utility Networks".
- [6] FIPS 197 (November 26, 2001): "Advanced Encryption Standard (AES)".
- [7] NIST Special Publication 800-108 (October 2009): "Recommendation for Key Derivation Using Pseudorandom Functions", US National Institute of Standards and Technology, Computer Security Division, Information Technology Laboratory.

2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] IEEE Standards Association Registration Authority.

NOTE: Available at: <http://standards.ieee.org/develop/regauth/>

- [i.2] IEEE-Standards Association Guidelines for 64-bit Global Identifier (EUI-64™).

NOTE: Available at: <http://standards.ieee.org/develop/regauth/tut/eui64.pdf>