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# IEEE Standard for Local and metropolitan area networks—

# Part 15.4: Low-Rate Wireless Personal Area Networks (LR-WPANs)

## Amendment 7: Physical Layer for Rail Communications and Control (RCC)

IEEE Computer Society

Sponsored by the
LAN/MAN Standards Committee

IEEE
3 Park Avenue
New York, NY 10016-5997
USA

**IEEE Std 802.15.4p™-2014**
(Amendment to
IEEE Std 802.15.4™-2011
as amended by IEEE Std 802.15.4e™-2012,
IEEE Std 802.15.4f™-2012,
IEEE Std 802.15.4g™-2012,
IEEE Std 802.15.4j™-2013,
IEEE Std 802.14.3k™-2013, and
IEEE Std 802.15.4m™-2014)

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**IEEE Computer Society**

Approved 27 March 2014

**IEEE-SA Standards Board**

**Abstract:** This amendment to IEEE Std 802.15.4™-2011 specifies a PHY for use in equipment intended to address rail transportation industry needs and to meet US positive train control (PTC) regulatory requirements and similar regulatory requirements in other parts of the world. In addition, the amendment describes only those MAC changes needed to support this PHY.

**Keywords:** CBTC, communications-based train control, IEEE 802.15.4p™, low data rate, low power, LR-WPAN, PAN, personal area network, positive train control, PTC, radio frequency, rail communications and control, RCC, RF, wireless personal area network, WPAN

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# Introduction

This introduction is not part of IEEE Std 802.15.4p™-2013, IEEE Standard for Local and metropolitan area networks—Part 15.4: Low-Rate Wireless Personal Area Networks (LR-WPANs)—Amendment 7: Physical Layer for Rail Communications and Control (RCC).

This amendment specifies alternate PHYs, in addition to those of IEEE Std 802.15.4™-2011, and any MAC modifications needed to support their implementation.

The new PHYs are to be used in equipment intended to address rail transportation industry needs and to meet US positive train control (PTC) regulatory requirements and similar regulatory requirements in other parts of the world. The new RCC PHYs are:

— PHYs operating at multiple over-the-air data rates in support of land mobile radio (LMR) for use in RCC applications. The following five modulation schemes are available for use: Gaussian minimum shift keying (GMSK), continuous four-level frequency modulation (C4FM), quadrature phase-shift keying (QPSK), Pi/4 differential quadrature phase-shift keying (DQPSK), and direct sequence spread spectrum (DSSS) employing differential phase-shift keying (DPSK).

DSSS binary phase-shift keying (BPSK) PHY operating at multiple over-the-air data rates for use in RCC applications.

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