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**Information technology —  
Telecommunications and information  
exchange between systems — Local  
and metropolitan area networks —  
Specific requirements —**

**Part 15-6:  
Wireless body area network**

*Technologies de l'information — Télécommunications et échange  
d'information entre systèmes — Réseaux locaux et métropolitains —  
Exigences spécifiques —*

*Partie 15-6: Réseau corporel sans fil (BAN)*



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**IEEE Standard for  
Local and metropolitan area networks—  
Part 15.6: Wireless Body Area Networks**

Sponsor

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IEEE Computer Society**

Approved 6 February 2012

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**Abstract:** Short-range, wireless communications in the vicinity of, or inside, a human body (but not limited to humans) are specified in this standard. It uses existing industrial scientific medical (ISM) bands as well as frequency bands approved by national medical and/or regulatory authorities. Support for quality of service (QoS), extremely low power, and data rates up to 10 Mbps is required while simultaneously complying with strict non-interference guidelines where needed. This standard considers effects on portable antennas due to the presence of a person (varying with male, female, skinny, heavy, etc.), radiation pattern shaping to minimize the specific absorption rate (SAR) into the body, and changes in characteristics as a result of the user motions.

**Keywords:** BAN, body area network, IEEE 802.15.6

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## Introduction

This introduction is not part of IEEE Std 802.15.6-2012, IEEE Standard for Local and metropolitan area networks—Part 15.6: Wireless Body Area Networks.

With the decreasing size and increasing capability of electronic devices, thanks to the Moore's Law, it was inevitable that small and portable devices would be developed for communications around human bodies. Some devices are wearable and some are implementable for medical purposes. These devices need to communicate with their remote controllers. IEEE Std 802.15.6-2012 is a standard for short-range, wireless communications in the vicinity of, or inside, a human body (but not limited to humans). It uses ISM and other bands as well as frequency bands in compliance with applicable medical and communication regulatory authorities. It allows devices to operate on very low transmit power for safety to minimize the specific absorption rate (SAR) into the body and increase the battery life. It supports quality of service (QoS), for example, to provide for emergency messaging. Since some communications can carry sensitive information, it also provides for strong security.

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## 1. Overview

### 1.1 Scope

This is a standard for short-range, wireless communication in the vicinity of, or inside, a human body (but not limited to humans). It uses existing industrial scientific medical (ISM) bands as well as frequency bands approved by national medical and/or regulatory authorities. Support for quality of service (QoS), extremely low power, and data rates up to 10 Mbps is required while simultaneously complying with strict non-interference guidelines where needed. This standard considers effects on portable antennas due to the presence of a person (varying with male, female, skinny, heavy, etc.), radiation pattern shaping to minimize specific absorption rate (SAR) into the body, and changes in characteristics as a result of the user motions.

### 1.2 Purpose

The purpose is to provide an international standard for a short-range (i.e., about human body range), low power, and highly reliable wireless communication for use in close proximity to, or inside, a human body. Data rates, typically up to 10Mbps, can be offered to satisfy an evolutionary set of entertainment and healthcare services. Current *personal area networks* (PANs) do not meet the medical (proximity to human tissue) and relevant communication regulations for some application environments. They also do not support the combination of reliability, QoS, low power, data rate, and noninterference required to broadly address the breadth of body area network (BAN) applications.

## 2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

ETSI EN 301 839-1, V1.3.1 (2009), Electromagnetic Compatibility and Radio Spectrum Matters (ERM); Short Range Devices (SRD); Ultra Low Power Active Medical Implants (ULP-AMI) and Peripherals (ULP-AMI-P) operating in the frequency range 402 MHz to 405 MHz; Part 1: Technical characteristics and test methods.<sup>1</sup>

FIPS Pub 186-3 (2009), Digital Signature Standard (DSS).<sup>2</sup>

FIPS Pub 197 (2001), Advanced Encryption Standard (AES).

IEEE Std 802<sup>®</sup>-2001, IEEE Standard for Local and Metropolitan Area Networks: Overview and Architecture.<sup>3, 4</sup>

IEEE Std 1363<sup>™</sup>-2000, IEEE Standard Specifications for Public-Key Cryptography.

ISO/IEC 10646:2003, Information Technology—Universal Multiple-Octet Coded Character Set (UCS). Amendment 1, November 2005; Amendment 2, July 2006; Amendment 3, February 2008.<sup>5</sup>

NIST Special Publication 800-38B (2005), Recommendation for Block Cipher Modes of Operation: The CMAC Mode for Authentication.<sup>6</sup>

NIST Special Publication 800-38C (2004), Recommendation for Block Cipher Modes of Operation: The CCM Mode for Authentication and Confidentiality.

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<sup>1</sup> ETSI publications are available from the European Telecommunications Standards Institute (<http://www.etsi.org>).

<sup>2</sup> FIPS publications are available from the National Technical Information Service (<http://www.ntis.gov/>).

<sup>3</sup> IEEE publications are available from The Institute of Electrical and Electronics Engineers (<http://standards.ieee.org>).

<sup>4</sup> The IEEE standards or products referred to in Clause 2 are trademarks owned by The Institute of Electrical and Electronics Engineers, Incorporated.

<sup>5</sup> ISO/IEC publications are available from the ISO Central Secretariat (<http://www.iso.org/>). ISO publications are also available in the United States from the American National Standards Institute (<http://www.ansi.org/>).

<sup>6</sup> NIST publications are available from the National Institute of Standards and Technology (<http://www.nist.gov/>).