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Cognitive Wireless RAN Medium Access Control (MCA) and Physical Layer (PHY) Specifications: Policies and Procedures for Operation in the TV Bands

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ISO/IEC/IEEE 8802 consists of the following parts, under the general title *Information technology — Telecommunications and information exchange between systems — Local and metropolitan area networks — Specific requirements*

— *Part 1: Overview of Local Area Network Standards*

— *Part 2: Logical link control*

— *Part 5: Token ring access method and physical layer specifications*

— *Part 11: Wireless LAN medium access control (MAC) and physical layer (PHY) specifications*

— *Part 1X: Port-based network access control*

— *Part 1AB: Station and media access control connectivity discovery*

— *Part 1AE: Media access control (MAC) security*

— *Part 1AR: Secure device identity*

— *Part 1AS: Timing and synchronization for time-sensitive applications in bridged local area networks*

— *Part 15-4: Wireless medium access control (MAC) and physical layer (PHY) specifications for low-rate wireless personal area networks (WPANs)*

Abstract: This standard specifies the air interface, including the cognitive medium access control layer (MAC) and physical layer (PHY), of point-to-multipoint wireless regional area networks comprised of a professional fixed base station with fixed and portable user terminals operating in the VHF/UHF TV broadcast bands between 54 MHz to 862 MHz.
Keywords: broadband wireless access network, cognitive radio, fixed user terminals, IEEE 802.22, portable user terminals, radio spectrum sensing, regional area network, WRAN standards

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Introduction

This introduction is not part of IEEE Std 802.22-2011, IEEE Standard for Information Technology—Telecommunications and information exchange between systems—Wireless Regional Area Networks (WRAN)—Specific requirements—Part 22: Cognitive Wireless RAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications: Policies and Procedures for Operation in the TV Bands.

This standard specifies the air interface of broadband wireless access (BWA) systems for fixed and portable user terminals supporting multimedia services. The medium access control layer (MAC) supports a point-to-multipoint architecture. The MAC is structured to support a physical layer (PHY) specification especially suited for operation in TV broadcast bands while avoiding interference to the incumbent broadcast services.

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IEEE Standard for Information Technology—Telecommunications and information exchange between systems
Wireless Regional Area Networks (WRAN)—Specific requirements

Part 22: Cognitive Wireless RAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications: Policies and Procedures for Operation in the TV Bands

1. Overview

1.1 Scope

This standard specifies the air interface, including the cognitive medium access control layer (MAC) and physical layer (PHY), of point-to-multipoint wireless regional area networks comprised of a professional fixed base station with fixed and portable user terminals operating in the VHF/UHF TV broadcast bands between 54 MHz to 862 MHz.

1.2 Purpose

This standard is intended to enable deployment of interoperable IEEE 802® multivendor wireless regional area network products, to facilitate competition in broadband access by providing alternatives to wireline broadband access and extending the deployability of such systems into diverse geographic areas, including sparsely populated rural areas, while preventing harmful interference to incumbent licensed services in the TV broadcast bands.

1.3 Reference application

The Wireless Regional Area Networks (WRANs) for which this standard has been developed are expected to operate primarily in low population density areas in order to provide broadband access to data networks. The WRAN systems will use vacant channels in the VHF and UHF bands allocated to the Television Broadcasting Service in the frequency range between 54 MHz and 862 MHz while avoiding interference to the broadcast incumbents in these bands. A typical application can be the coverage of the rural area around a village, as illustrated in Figure 1, within a radius of 10 km to 30 km from the base station depending on its EIRP and antenna height. The MAC can also accommodate user terminals located as far as 100 km with proper scheduling of the traffic in the frame when exceptional RF signal propagation conditions are present. With the PHY implemented in this standard, WRAN systems can cover up to a radius of 30 km without special scheduling.

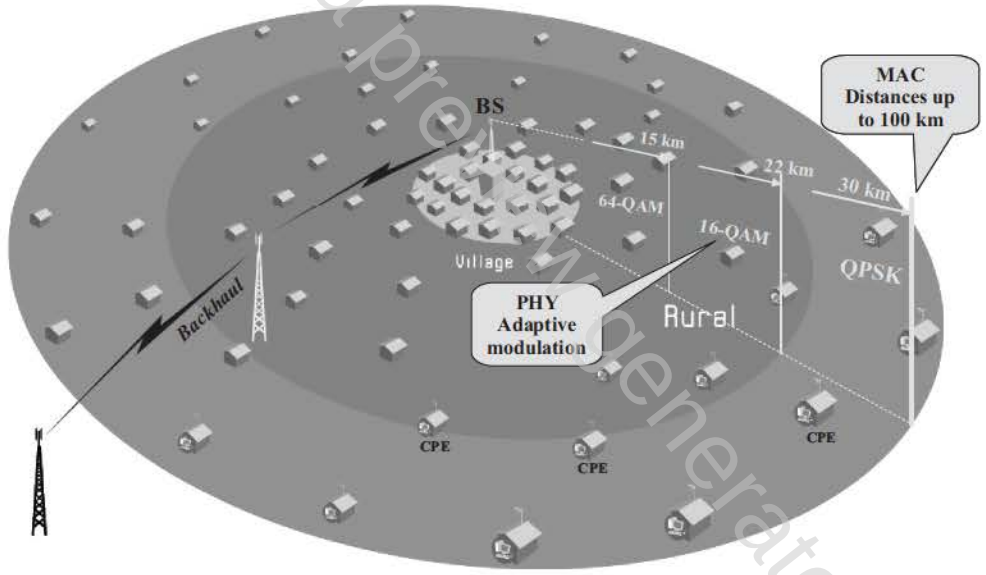

Figure 1 — An IEEE 802.22 WRAN cell with a base station and user terminals

A base station (BS) complying with this standard shall be able to provide high-speed Internet service for up to 512 fixed or portable customer premise equipment (CPE) devices or groups of devices within its coverage area assuming different quality of service (QoS) requirements for various CPEs, while meeting the regulatory requirements for protection of the incumbents.

The standard includes cognitive radio techniques to mitigate interference to incumbents, including geolocation capability, provision to access a database of incumbent services, and spectrum-sensing technology to detect the presence of incumbent services, other WRAN systems, and IEEE 802.22.1 wireless beacons.

2. Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. At the time of publication, the editions indicated were valid. All standards and specifications are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the references listed below.

ANSI X9.62-2005, Public Key Cryptography for the Financial Services Industry: The Elliptic Curve Digital Signature Algorithm (ECDSA), November 2005.[1]

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IETF RFC 5216, The EAP-TLS Authentical Protocol, March 2008.

IETF RFC 5246, The Transport Layer Security (TLS) Protocol Version 1.2, August 2008.

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