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AMENDMENT 5
2006-08-15

IEEE Std 802.11h-2003
(Amendment to
IEEE Std 802.11-1999)

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

Part 11:
Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications

AMENDMENT 5: Spectrum and Transmit Power Management Extensions in the 5 GHz band in Europe

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

Partie 11: Spécifications pour le contrôle d'accès au support et la couche physique

AMENDEMENT 5: Extensions de gestion de spectre et de puissance à l'émission dans la bande de 5 GHz en Europe

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(Amendment to IEEE Std 802.11™, 1999 Edition (Reaff 2003),
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IEEE Stds 802.11a™-1999, 802.11b™-1999,
802.11b™-1999/Cor 1-2001, 802.11d™-2001,
and 802.11g™-2003)

IEEE Standards

802.11h™

IEEE Standard for Information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements

Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications

Amendment 5: Spectrum and Transmit Power Management Extensions in the 5 GHz band in Europe

IEEE Computer Society

Sponsored by the
LAN/MAN Standards Committee

This amendment is an approved IEEE Standard. It will be incorporated into the base standard in a future edition.

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IEEE Standard for Information technology— Telecommunications and information exchange between systems— Local and metropolitan area networks— Specific requirements

Part 11: Wireless Medium Access Control (MAC) and Physical Layer (PHY) specifications:

Amendment 5: Spectrum and transmit power management extensions in the 5 GHz band in Europe

Sponsor
LAN/MAN Committee
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Approved 29 December 2003
American National Standard Institute

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Abstract: This amendment specifies the extensions to IEEE 802.11™ for wireless local area networks (WLANs) providing mechanisms for dynamic frequency selection (DFS) and transmit power control (TPC) that may be used to satisfy regulatory requirements for operation in the 5 GHz band in Europe.
Keywords: dynamic frequency selection (DFS), local area network (LAN), transmit power control (TPC)

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(This introduction is not part of IEEE 802.11h-2003, IEEE Standard for Information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements—Part 11: Wireless Medium Access Control (MAC) and Physical Layer (PHY) specifications: Amendment # 5: Spectrum and Transmit Power Management Extensions in the 5 GHz band in Europe.)

IEEE Std 802.11h-2003

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IEEE Standard for Information technology—

Telecommunications and information exchange between systems—

Local and metropolitan area networks—

Specific requirements

Part 11: Wireless Medium Access Control (MAC) and Physical Layer (PHY) specifications:

Amendment 5: Spectrum and Transmit Power Management Extensions in the 5 GHz band in Europe

[This amendment is based on IEEE Std 802.11™, 1999 Edition (Reaff 2003), as amended by IEEE Std 802.11a™-1999, IEEE Std 802.11b™-1999, IEEE Std 802.11b-1999/Cor 1-2001, IEEE Std 802.11d™-2001, and IEEE Std 802.11g™-2003.]

NOTE—The editing instructions contained in this amendment define how to merge the material contained herein into the existing base standard and its amendments to form the comprehensive standard.

The editing instructions are shown in ***bold italic***. Three editing instructions are used: change, delete, and insert. ***Change*** is used to make small corrections in existing text or tables. The editing instruction specifies the location of the change and describes what is being changed either by using ~~strikethrough~~ (to remove old material) or underscore (to add new material). ***Delete*** removes existing material. ***Insert*** adds new material without disturbing the existing material. Insertions may require renumbering. If so, renumbering instructions are given in the editing instructions. Editorial notes will not be carried over into future editions.

1. Overview

1.2 Purpose

Insert the following item at the end of the list at the end of 1.2:

— Defines mechanisms for dynamic frequency selection (DFS) and transmit power control (TPC) that may be used to satisfy regulatory requirements for operation in the 5 GHz band in Europe. The regulations and conformance tests are listed in Clause 2.

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2. Normative references

Insert the following citations at the appropriate locations in Clause 2:

ERC/DEC/(99)23, ERC Decision of 29 November 1999 on the harmonized frequency bands to be designated for the introduction of High Performance Radio Local Area Networks (HIPERLANs).[1]

ETSI EN 301 893, Broadband Radio Access Networks (BRAN); 5 GHz high performance RLAN; Part 2: Harmonized EN covering essential requirements of article 3.2 of the R&TTE Directive.[2]

3. Definitions

Insert the following definitions in alphabetical order into Clause 3, renumbering as necessary:

3.53 dynamic frequency selection (DFS): Facilities mandated to satisfy requirements in some regulatory domains for radar detection and uniform channel spreading in the 5 GHz band. These facilities may also be used for other purposes, such as automatic frequency planning.

3.54 dynamic frequency selection (DFS) owner: A station (STA) in an independent basic service set (IBSS) that takes responsibility for selecting the next channel after radar is detected operating in a channel. Due to the nature of IBSSs, it cannot be guaranteed that there will be a single DFS owner at any particular time and the protocol is robust to this situation.

3.55 effective isotropic radiated power (EIRP): The equivalent power of a transmitted signal in terms of an isotropic (omnidirectional) radiator. Normally the EIRP equals the product of the transmitter power and the antenna gain (reduced by any coupling losses between the transmitter and antenna).

3.56 5 GHz band in Europe: Refers to the nineteen 20 MHz channels between 5 GHz and 6 GHz in which wireless local area network (WLAN) operation is allowed in the CEPT regulatory domain.

3.57 link margin: Ratio of the received signal power to the minimum desired by the station (STA). The STA may incorporate rate information and channel conditions, including interference, into its computation of link margin. The specific algorithm for computing the link margin is implementation dependent.

3.58 receive power: Mean power measured at the antenna connector.

3.59 received power indicator (RPI): A quantized measure of the received power level as seen at the antenna connector.

3.60 transmit power: The effective isotropic radiated power (EIRP) when referring to the operation of a 5 GHz 802.11™ orthogonal frequency division multiplexing (OFDM) physical layer (PHY) in a country where so regulated.

3.61 transmit power control (TPC): Facilities mandated to satisfy requirements in some regulatory domains for maximum transmit power and transmit power mitigation in the 5 GHz band. These facilities may also be used for other purposes, e.g., reduction of interference, range control reduction of power consumption.

[1]ERC documents are available from European Radiocommunications Office, Midtermolen 1, DK-2100, Copenhagen, Denmark (http://www.ero.dk).

[2]ETSI documents are available from ETSI, 650 Route des Lucioles, F-06921 Sopia Antipolis Cedex, France (http://www.etsi.org).

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3.62 uniform spreading: A regulatory requirement per ERC/DEC/(99)23 for a channel selection mechanism that provides uniform loading across a minimum set of channels in the regulatory domain.[3]

4. Abbreviations and acronyms

Insert the following abbreviations in alphabetical order into Clause 4:

DFS	dynamic frequency selection
RLAN	radio local area network
RPI	receive power indicator
TPC	transmit power control

5. General description

5.3 Logical service interfaces

Insert the following items at the end of the list of architectural services in 5.3 as follows:

j) DFS

k) TPC

5.3.1 Station service (SS)

Insert the following items at the end of the list of SSs in 5.3.1 as follows:

e) DFS

f) TPC

5.4 Overview of the services

Change the first paragraph in 5.4 as follows:

There are ~~nine~~ several services specified by IEEE 802.11. Six of the services are used to support medium access control (MAC) service data unit (MSDU) delivery between stations (STAs). Three of the services are used to control IEEE 802.11 LAN access and confidentiality. Two of the services are used to provide spectrum management.

Insert the following text for 5.4.4 through 5.4.4.2 after 5.4.3.3 as follows:

5.4.4 Spectrum management services

Two services are required to satisfy requirements in some regulatory domains for operation in the 5 GHz band. These services are called transmit power control (TPC) and dynamic frequency selection (DFS).

[3]For information on references, see Clause 2.

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5.4.4.1 TPC

ERC/DEC/(99)23 requires radio local area networks (RLANs) operating in the 5 GHz band to use transmitter power control, involving specification of a regulatory maximum transmit power and a mitigation requirement for each allowed channel, to reduce interference with satellite services. The TPC service is used to satisfy this regulatory requirement.

The TPC service provides for the following:

— Association of STAs with an access point (AP) in a basic service set (BSS) based on the STAs power capability.

— Specification of regulatory and local maximum transmit power levels for the current channel.

— Selection of a transmit power for each transmission in a channel within constraints imposed by regulatory requirements.

— Adaptation of transmit power based on a range of information, including path loss and link margin estimates.

5.4.4.2 DFS

ERC/DEC/(99)23 requires RLANs operating in the 5 GHz band to implement a mechanism to avoid co-channel operation with radar systems and to ensure uniform utilization of available channels. The DFS service is used to satisfy these regulatory requirements.

The DFS service provides for the following:

— Association of STAs with an AP in a BSS based on the STAs' supported channels.

— Quieting the current channel so it can be tested for the presence of radar with less interference from other STAs.

— Testing channels for radar before using a channel and while operating in a channel.

— Discontinuing operations after detecting radar in the current channel to avoid interference with radar.

— Detecting radar in the current and other channels based on regulatory requirements.

— Requesting and reporting of measurements in the current and other channels.

— Selecting and advertising a new channel to assist the migration of a BSS or independent BSS (IBSS) after radar is detected.

5.5 Relationships between services

Change the following list in 5.5 as follows:

a) Class 1 frames (permitted from within States 1, 2, and 3):

  2) Management frames

    i) Probe request/response

    ii) Beacon

    iii) Authentication: Successful authentication enables a STA to exchange Class 2 frames. Unsuccessful authentication leaves the STA in State 1.

    iv) Deauthentication: Deauthentication notification when in State 2 or State 3 changes the STA's state to State 1. The STA shall become authenticated again prior to sending Class 2 frames.

    v) Announcement traffic indication message (ATIM)

    <u>vi)</u> <u>Action</u>

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5.7 Message information contents that support the services

5.7.2 Association

Change the following list in 5.7.2 as follows:

Association request

- Message type: Management
- Message subtype: Association request
- Information items:
  - IEEE address of the STA initiating the association
  - IEEE address of the AP with which the initiating STA will associate
  - ESS ID
  - Power capability
  - Supported channels
- Direction of message: From STA to AP

5.7.3 Reassociation

Change the following list in 5.7.3 as follows:

Reassociation request

- Message type: Management
- Message subtype: Reassociation request
- Information items:
  - IEEE address of the STA initiating the reassociation
  - IEEE address of the AP with which the initiating STA will reassociate
  - IEEE address of the AP with which the initiating STA is currently associated
  - ESS ID
  - Power capability
  - Supported channels
- Direction of message:
  - From STA to AP (The AP with which the STA is requesting reassociation)

Insert the following text for 5.7.8 after 5.7.7 as follows:

5.7.8 Spectrum management

The spectrum management services are supported by the following action message:

Spectrum Management Action

- Message type: Management
- Message subtype: Spectrum Management Action
- Information items:
  - Action identification
  - Dialog token
  - Action dependent information
  - Direction of message: From STA to STA

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7. Frame formats

7.1 MAC frame formats

7.1.3 Frame fields

7.1.3.1 Frame Control field

7.1.3.1.2 Type and Subtype fields

Insert the Management/Action row before the Management/Reserved row and change the Management/Reserved row in Table 1 as follows:

Table 1—Valid type and subtype combinations

Type value b3 b2	Type description	Subtype value b7 b6 b5 b4	Subtype description
00	Management	1101	Action
00	Management	~~1101~~1110–1111	Reserved

7.2 Format of individual frame types

7.2.3 Management frames

7.2.3.1 Beacon frame format

Change the order 11 information field and insert the order 14–18 information fields in Table 5 as follows:

Table 5—Beacon frame body

Order	Information	Notes
11	Country	The Country information element shall be present when dot11MultiDomainCapabilityEnabled is true or dot11SpectrumManagementRequired is true.
14	Power Constraint	Power Constraint element shall be present if dot11SpectrumManagementRequired is true.
15	Channel Switch Announcement	Channel Switch Announcement element may be present if dot11SpectrumManagementRequired is true.
16	Quiet	Quiet element may be present if dot11SpectrumManagementRequired is true.
17	IBSS DFS	IBSS DFS element shall be present if dot11SpectrumManagementRequired is true in an IBSS.
18	TPC Report	TPC Report element shall be present if dot11SpectrumManagementRequired is true.

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