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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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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
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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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Introduction

(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

IEEE Std 802.11h-2003 provides 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.

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— http://standards.ieee.org/reading/ieee/interp/

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Contents

Figures

Tables

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.

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).

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.

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)

vi) Action

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

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.

7.2.3.4 Association Request frame format

Insert the order 6 and 7 information fields in Table 7 as follows:

Table 7—Association Request frame body

Order	Information	Notes
6	Power Capability	The Power Capability element shall be present if dot11SpectrumManagementRequired is true.
7	Supported Channels	The Supported Channels element shall be present if dot11SpectrumManagementRequired is true.

7.2.3.6 Reassociation Request frame format

Insert the order 7 and 8 information fields in Table 9 as follows:

Table 9—Reassociation Request frame body

Order	Information	Notes
7	Power Capability	The Power Capability element shall be present if dot11SpectrumManagementRequired is true.
8	Supported Channels	The Supported Channels element shall be present if dot11SpectrumManagementRequired is true.

7.2.3.9 Probe Response frame format

Change Table 12 from order 10 information field to the end of the table as follows:

Table 12—Probe Response frame body

Order	Information	Notes
10	Country	Included if dot11MultiDomainCapabilityEnabled or dot11SpectrumManagementRequired is true.
11	FH Parameters	FH Parameters, as specified in 7.3.2.10, may be included if dot11MultiDomainCapabilityEnabled is true.
12	FH Pattern Table	FH Pattern Table information, as specified in 7.3.2.11, may be included if dot11MultiDomainCapability-Enabled is true.
13	Power Constraint	Shall be included if dot11SpectrumManagementRequired is true.
14	Channel Switch Announcement	May be included if dot11SpectrumManagementRequired is true.
15	Quiet	May be included if dot11SpectrumManagementRequired is true.

Table 12—Probe Response frame body *(continued)*

Order	Information	Notes
16	IBSS DFS	Shall be included if dot11SpectrumManagementRequired is true in an IBSS.
17	TPC Report	Shall be included if dot11SpectrumManagementRequired is true.
18		Reserved
19	ERP Information	The ERP Information element is present within Beacon frames generated by STAs using ERP PHYs and is optionally present in other cases.
20	Extended Supported Rates	The Extended Supported Rates element is present whenever there are more than eight supported rates, and it is optional otherwise.
~~13~~21–*n*	Requested information elements	Elements requested by the Request information element of the Probe Request frame.

Insert 7.2.3.12 after 7.2.3.11 as follows:

7.2.3.12 Action frame format

The frame body of a management frame of subtype Action contains the information shown in Table 15a.

Table 15a—Action frame body

Order	Information
1	Action

7.3 Management frame body components

7.3.1 Fixed fields

7.3.1.4 Capability Information field

Change the second paragraph in 7.3.1.4 as follows:

The length of the Capability Information field is 2 octets. The Capability Information field consists of the following subfields: extended service set (ESS), IBSS, contention-free (CF)-Pollable, CF-Poll Request, Privacy, Short Preamble, Packet Binary Convolutional Code (PBCC), Channel Agility, Spectrum Management, Short Slot Time, and DSSS-OFDM. The format of the Capability Information field is as illustrated in Figure 27. No subfield is supplied for ERP as a STA supports ERP operation if it includes all of the Clause 19 mandatory rates in its supported rate set.

Change the contents of Figure 27 as shown:

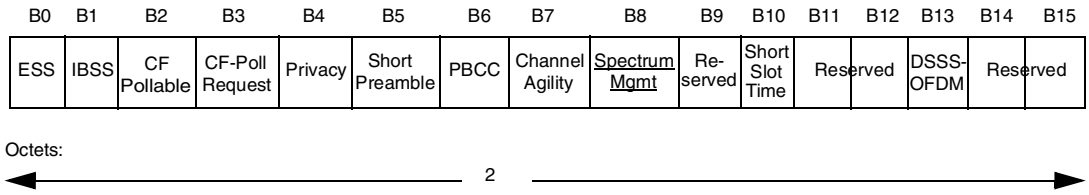

Figure 27—Capability Information fixed field

Insert the following text after the paragraph that starts "Bit 7 of the ..." in 7.3.1.4:

A STA shall set the Spectrum Management subfield in the Capability Information field to 1 if the STA's dot11SpectrumManagementRequired is true; otherwise, it shall be set to 0.

7.3.1.7 Reason Code field

Insert reason codes 10 and 11 and change the Reserved reason code row in Table 18 as follows:

Table 18—Reason codes

Reason code	Meaning
10	Disassociated because the information in the Power Capability element is unacceptable
11	Disassociated because the information in the Supported Channels element is unacceptable
~~10~~12–65 535	Reserved

7.3.1.9 Status Code field

Insert status codes 22-24 and change the Reserved status code row in Table 19 as follows:

Table 19—Status codes

Status code	Meaning
22	Association request rejected because Spectrum Management capability is required
23	Association request rejected because the information in the Power Capability element is unacceptable
24	Association request rejected because the information in the Supported Channels element is unacceptable
~~22~~25–65 535	Reserved

Insert 7.3.1.11 after 7.3.1.10 and renumber figures and tables as necessary:

7.3.1.11 Action field

The Action field provides a mechanism for specifying extended management actions. The format of the Action field is shown in Figure 33a.

	Category	Action Details
Octets:	1	variable

Figure 33a—Action field

The Category field shall be set to one of the nonreserved values shown in Table 19a. If a STA receives a unicast Action frame with an unrecognized Category field or some other syntactic error and the most significant bit (MSB) of the Category field set to 0, then the STA shall return the Action frame to the source without change except that the MSB of the Category field shall be set to 1.

The Action Details field contains the details of the action. The details of the actions allowed in each category are described in the appropriate subclause referenced in Tab1e 19a.

Table 19a—Category values

Name	Value	See subclause
Spectrum management	0	7.4.1
Reserved	1–127	—
Error	128–255	—

7.3.2 Information elements

Change Table 20 from element identifier (ID) 17 to the end of the table as follows:

Table 20—Element IDs

Information element	Element ID
Reserved	17–31
Power Constraint	32
Power Capability	33
TPC Request	34
TPC Report	35
Supported Channels	36
Channel Switch Announcement	37

Table 20—Element IDs *(continued)*

Information element	Element ID
Measurement Request	38
Measurement Report	39
Quiet	40
IBSS DFS	41
ERP Information	42
Reserved	43–49
Extended Supported Rates	50
Reserved	51–255

Insert 7.3.2.15 through 7.4.1.5 after 7.3.2.14 and renumber figures and tables as appropriate:

7.3.2.15 Power Constraint element

The Power Constraint element contains the information necessary to allow a STA to determine the local maximum transmit power in the current channel. The format of the Power Constraint element is shown in Figure 46a.

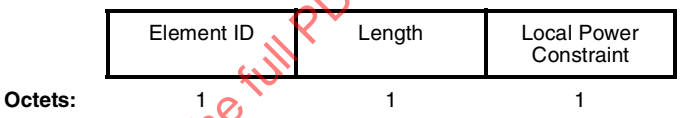

Figure 46a—Power Constraint element format

The Length field shall be set to 1.

The Local Power Constraint field shall be set to a value that allows the mitigation requirements to be satisfied in the current channel. The field is coded as an unsigned integer in units of decibels. The local maximum transmit power for a channel is thus defined as the maximum transmit power level specified for the channel in the Country element minus the local power constraint specified for the channel [from the management information base (MIB)] in the Power Constraint element.

The Power Constraint element is included in Beacon frames, as described in 7.2.3.1, and Probe Response frames, as described in 7.2.3.9. The use of Power Constraint elements is described in 11.5.2.

7.3.2.16 Power Capability element

The Power Capability element specifies the minimum and maximum transmit powers with which a STA is capable of transmitting in the current channel. The format of the Power Capability element is shown in Figure 46b.

The Length field shall be set to 2.

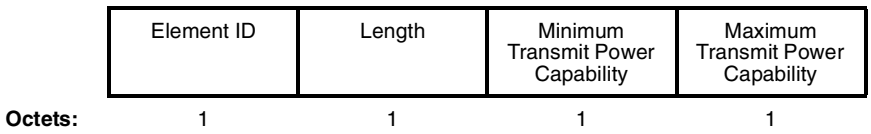

Figure 46b—Power Capability element format

The Minimum Transmit Power Capability field shall be set to the nominal minimum transmit power with which the STA is capable of transmitting in the current channel, with a tolerance ± 5 dB. The field is coded as a signed integer in units of decibels relative to 1 mW.

The Maximum Transmit Power Capability field shall be set to the nominal maximum transmit power with which the STA is capable of transmitting in the current channel, with a tolerance ± 5 dB. The field is coded as a signed integer in units of decibels relative to 1 mW.

The Power Capability element is included in Association Request frames, as described in 7.2.3.4, and Reassociation Request frames, as described in 7.2.3.6. The use of Power Capability elements is described in 11.5.1.

7.3.2.17 TPC Request element

The TPC Request element contains a request for a STA to report transmit power and link margin information using a TPC Report element. The format of the TPC Request element is shown in Figure 46c.

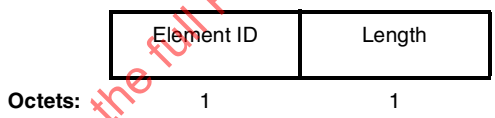

Figure 46c—TPC Request element format

The Length field shall be set to 0.

The TPC Request element is included in TPC Request frames, as described in 7.4.1.3. The use of TPC Request elements and frames is described in 11.5.4.

7.3.2.18 TPC Report element

The TPC Report element contains transmit power and link margin information sent in response to a TPC Request element. A TPC Report element is included in a Beacon frame or Probe Response frame without a corresponding request. The format of the TPC Report element is shown in Figure 46d.

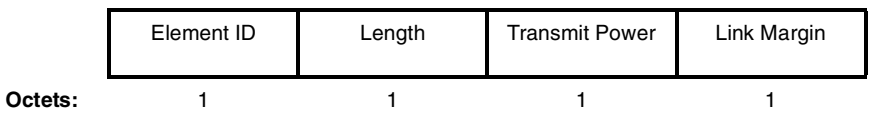

Figure 46d—TPC Report element format

The Length field shall be set to 2.

The Transmit Power field shall be set to the transmit power used to transmit the frame containing the TPC Report element. The field is coded as a signed integer in units of decibels relative to 1 mW. The maximum tolerance for the transmit power value reported in the TPC Response element shall be ± 5 dB. This tolerance is defined as the difference, in decibels, between the reported power value and the actual EIRP of the STA (measured when transmitting 1500 octet frames).

The Link Margin field contains the link margin at the time and for the rate at which the frame containing the TPC Request element was received. The field is coded as a signed integer in units of decibels. The Link Margin field shall be set to 0 and shall be ignored when a TPC Report element is included in a Beacon frame or Probe Response frame. The measurement method of Link Margin is beyond the scope of this amendment.

The TPC Report element is included in TPC Report frames, as described in 7.4.1.4; Beacon frames, as described in 7.2.3.1; and Probe Response frames, as described in 7.2.3.9. The use of TPC Report elements and frames is described in 11.5.4.

7.3.2.19 Supported Channels element

The Supported Channels element contains a list of channel subbands (from those channels defined in 17.3.8.3.3) in which a STA is capable of operating. The format of the Supported Channels element is shown in Figure 46e.

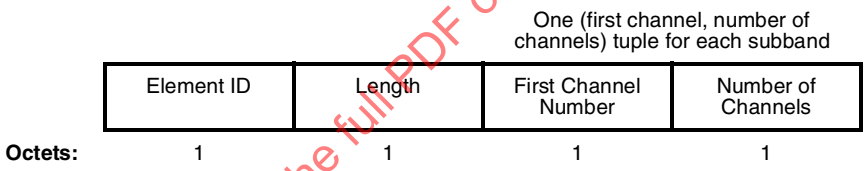

Figure 46e—Supported Channels element format

The Length field is variable and depends on the number of subbands, defined by a First Channel Number–Number of Channels pair, that are included in the element.

The First Channel Number field shall be set to the first channel (as defined in 17.3.8.3.3) in a subband of supported channels.

The Number of Channels field shall be set to the number of channels in a subband of supported channels.

The Supported Channels element is included in Association Request frames, as described in 7.2.3.4, and Reassociation Request frames, as described in 7.2.3.6. The use of the Supported Channels element is described in 11.6.1 and 11.6.7.

7.3.2.20 Channel Switch Announcement element

The Channel Switch Announcement element is used by an AP in a BSS or a STA in an IBSS to advertise when it is changing to a new channel and the channel number of the new channel. The format of the Channel Switch Announcement element is shown in Figure 46f.

The Length field shall be set to 3.

	Element ID	Length	Channel Switch Mode	New Channel Number	Channel Switch Count
Octets:	1	1	1	1	1

Figure 46f—Channel Switch Announcement element format

The Channel Switch Mode field indicates any restrictions on transmission until a channel switch. An AP in a BSS or a STA in an IBSS shall set the Channel Switch Mode field to either 0 or 1 on transmission. A Channel Switch Mode set to 1 means that the STA in a BSS to which the frame containing the element is addressed shall transmit no further frames within the BSS until the scheduled channel switch. A STA in an IBSS may treat a Channel Switch Mode field set to 1 as advisory. A Channel Switch Mode set to 0 does not impose any requirement on the receiving STA.

The New Channel Number field shall be set to the number of the channel to which the STA is moving (as defined in 17.3.8.3.3).

The Channel Switch Count field either shall be set to the number of target beacon transmission times (TBTTs) until the STA sending the Channel Switch Announcement element switches to the new channel or shall be set to 0. A value of 1 indicates that the switch will occur immediately before the next TBTT. A value of 0 indicates that the switch will occur at any time after the frame containing the element is transmitted.

The Channel Switch Announcement element is included in Channel Switch Announcement frames, as described in 7.4.1.5, and may be included in Beacon frames, as described in 7.2.3.1, and Probe Response frames, as described in 7.2.3.9. The use of Channel Switch Announcement elements and frames is described in 11.6.7.

7.3.2.21 Measurement Request element

The Measurement Request element contains a request that the receiving STA undertake the specified measurement action. The format of the Measurement Request element is shown in Figure 46g.

	Element ID	Length	Measurement Token	Measurement Request Mode (see Figure 46h)	Measurement Type	Measurement Request
Octets:	1	1	1	1	1	variable

Figure 46g—Measurement Request element format

	Reserved (0)	Enable	Request	Report	Reserved (0)
Bit:	0	1	2	3	4–7

Figure 46h—Measurement Request Mode field

The Length field is variable and depends on the length of the Measurement Request field. The minimum value of the Length field is 3 (based on a minimum length for the Measurement Request field of 0 octets).

The Measurement Token shall be set to a nonzero number that is unique among the Measurement Request elements in a particular Measurement Request frame.

The Measurement Request Mode field (shown in Figure 46h) is a bit field with the following bits defined:

— Enable bit (bit 1) indicates whether this element is used to request the destination STA to enable or disable the sending of measurement requests and autonomous measurement reports of a specified type to this STA. The Enable bit shall be set to 1 when the Request bit and Report bit are valid. The Enable bit shall be set to 0 when the Request bit and Report bit are invalid.

— Request bit (bit 2) indicates whether the STA receiving the request shall enable or disable measurement requests of the type specified in the Measurement Type field. The Request bit shall be set to 1 when enabling a measurement request. The Request bit shall be set to 0 when disabling a measurement request or when the Request bit is invalid (i.e., when the Enable bit is set to 0 or when the Measurement Type field contains a reserved measurement request type value).

— Report bit (bit 3) indicates whether the STA receiving the request shall enable or disable autonomous measurement reports of the type corresponding to the measurement report specified in the Measurement Type field. The Report bit shall be set to 1 when enabling an autonomous measurement report. The Report bit shall be set to 0 when disabling an autonomous measurement report or when the Report bit is invalid (i.e., when the Enable bit is set to 0 or when the Measurement Type field contains a reserved measurement report type value).

— All other bits are reserved and shall be set to 0.

The use of the Enable, Request, and Report bits is also summarized in Table 20a. See 11.6.6 for the description of how a STA shall handle requests to enable or disable measurement requests and autonomous reports.

Table 20a—Summary of use of Enable, Request, and Report bits

Bits			Meaning of bits
Enable	Request	Report	
0	0	0	When Enable bit is set to 0, Request and Report bits are invalid and shall be set to 0.
0	0	1	Not allowed.
0	1	0	Not allowed.
0	1	1	Not allowed.
1	0	0	The transmitting STA is requesting that it be sent neither measurement requests nor autonomous measurement reports of the types indicated in the Measurement Type field.
1	1	0	The transmitting STA is indicating it will accept measurement requests and requesting it not be sent autonomous measurement reports of the types indicated in the Measurement Type field.
1	0	1	The transmitting STA is requesting it not be sent measurement requests and indicating it will accept autonomous measurement reports of the types indicated in the Measurement Type field.
1	1	1	The transmitting STA is indicating it will accept measurement requests and autonomous measurement reports of the type indicated in the Measurement Type field.

The Measurement Type field shall be set to a number that identifies a measurement request or a measurement report. The Measurement Types that have been allocated for measurement requests are shown in Table 20b and measurement reports are shown in Table 20c (in 7.3.2.22).

Table 20b—Measurement Type definitions for measurement requests

Name	Measurement Type
Basic request	0
Clear channel assessment (CCA) request	1
Receive power indication (RPI) histogram request	2
Reserved	3–255

The Measurement Request field shall be null when the Enable bit is set to 1 and shall contain the specification of the measurement request, as described in 7.3.2.21.1 through 7.3.2.21.3, when the Enable bit is set to 0.

The Measurement Request element is included in a Measurement Request frame as described in 7.4.1.1. The use of Measurement Request elements and frames is described in 11.6.6.

7.3.2.21.1 Basic request

A Measurement Type in the Measurement Request element may indicate a basic request. The response to a basic request is a basic report. It is mandatory for a STA in a BSS to generate a basic report in response to a basic request if the request is received from the AP with which it is associated, except as specified in 11.6.6. The Measurement Request field corresponding to a basic request is shown in Figure 46i.

	Channel Number	Measurement Start Time	Measurement Duration
Octets:	1	8	2

Figure 46i—Measurement Request field format for a basic request

The Channel Number field shall be set to the channel number for which the measurement request applies (as defined in 17.3.8.3.3).

The Measurement Start Time field shall be set to the timing synchronization function (TSF) timer at the time (± 32μs) at which the requested basic request measurement shall start. A value of 0 shall indicate it shall start immediately.

The Measurement Duration field shall be set to the duration of the requested measurement, expressed in time units (TUs).

7.3.2.21.2 CCA request

A Measurement Type in the Measurement Request element may indicate a CCA request. A response to a CCA request is a CCA report. It is optional for a STA to generate a CCA report in response to a CCA Request. The Measurement Request field corresponding to a CCA request is shown in Figure 46j.

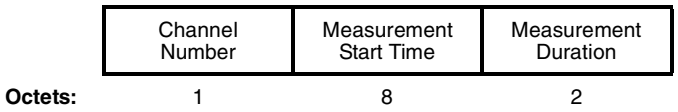

Figure 46j—Measurement Request field format for a CCA request

The Channel Number field shall be set to the channel number for which the measurement request applies (as defined in 17.3.8.3.3).

The Measurement Start Time field shall be set to the TSF at the time (± 32μs) at which the requested CCA request measurement shall start. A value of 0 shall indicate it shall start immediately.

The Measurement Duration field shall be set to the duration of the requested measurement, expressed in TUs.

7.3.2.21.3 RPI histogram request

A Measurement Type in the Measurement Request element may indicate an RPI histogram request. A response to an RPI histogram request is an RPI histogram report. It is optional for a STA to generate a RPI histogram report in response to a RPI histogram request. The Measurement Request field corresponding to an RPI histogram request is shown in Figure 46k.

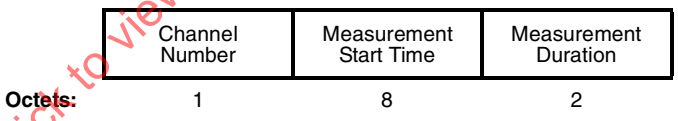

Figure 46k—Measurement Request field format for a RPI histogram request

The Channel Number field shall be set to the channel number for which the measurement request applies (as defined in 17.3.8.3.3).

The Measurement Start Time field shall be set to the TSF at the time (± 32μs) at which the requested RPI histogram request measurement shall start. A value of 0 shall indicate it shall start immediately.

The Measurement Duration field shall be set to the duration of the requested measurement, expressed in TUs.

7.3.2.22 Measurement Report element

The Measurement Report element contains a measurement report. The format of the Measurement Report element is shown in Figure 46l.

	Element ID	Length	Measurement Token	Measurement Report Mode (see Figure 46m)	Measurement Type	Measurement Report
Octets:	1	1	1	1	1	variable

Figure 46l—Measurement Report element format

	Late	Incapable	Refused	Reserved
Bit:	0	1	2	3–7

Figure 46m—Measurement Report Mode field

The Length field is variable and depends on the length of the Measurement Report field. The minimum value of the Length field is 3.

The Measurement Token field shall be set to the Measurement Token in the corresponding Measurement Request element. If the Measurement Report element is being sent autonomously, then the Measurement Token shall be set to 0.

The Measurement Report Mode field (shown in Figure 46m) is a bit field with the following bits defined:

— Late bit (bit 0) indicates whether this STA is unable to carry out a measurement request because it received the request after the requested measurement time. The Late bit shall be set to 1 to indicate the request was too late. The Late bit shall be set to 0 to indicate the request was received in time for the measurement to be executed.

— Incapable bit (bit 1) indicates whether this STA is incapable of generating a report of the type specified in the Measurement Type field that was previously requested by the destination STA of this Measurement Report element. The Incapable bit shall be set to 1 to indicate the STA is incapable. The Incapable bit shall be set to 0 to indicate the STA is capable or the report is autonomous.

— Refused bit (bit 2) indicates whether this STA is refusing to generate a report of the type specified in the Measurement Type field that was previously requested by the destination STA of this Measurement Report element. The Refused bit shall be set to 1 to indicate the STA is refusing. The Refused bit shall be set to 0 to indicate the STA is not refusing or the report is autonomous.

— All other bits are reserved and shall be set to 0.

The Measurement Type field shall be set to a number that identifies the measurement report. The Measurement Types that have been allocated are shown in Table 20c.

The Measurement Report field shall be null when the Late bit is set to 1, the Incapable bit is set to 1, or the Refused bit is set to 1. Otherwise, it shall contain the specification of the measurement report, as described in 7.3.2.22.1 through 7.3.2.22.3.

The Measurement Report element is included in a Measurement Report frame as described in 7.4.1.2. The use of Measurement Report elements and frames is described in 11.6.6.

Table 20c—Measurement Type definitions for measurement reports

Name	Measurement Type
Basic report	0
CCA report	1
RPI histogram report	2
Reserved	3–255

7.3.2.22.1 Basic report

A Measurement Type in the Measurement Report element may indicate a basic report. The format of the Measurement Report field corresponding to a basic report is shown in Figure 46n. It is mandatory for a STA to support the generation of this report.

	Channel Number	Measurement Start Time	Measurement Duration	Map (see Figure 46o)
Octets:	1	8	2	1

Figure 46n—Measurement Report field format for a basic report

	BSS	Orthogonal frequency division multiplexing (OFDM) Preamble	Unidentified Signal	Radar	Unmeasured	Reserved (0)
Bit:	0	1	2	3	4	5-7

Figure 46o—Map field format

The Channel Number field shall be set to the channel number to which the basic report applies (as defined in 17.3.8.3.3).

The Measurement Start Time field shall be set to the TSF at the time (± 32µs) at which the basic report measurement started.

The Measurement Duration field shall be set to the duration over which the basic report was measured, expressed in TUs.

The Map field is coded as a bit field, as shown in Figure 46o, and shall contain the following bits:

— BSS bit, which shall be set to 1 when at least one valid MAC protocol data unit (MPDU) was received in the channel during the measurement period from another BSS or IBSS. Otherwise, the BSS bit shall be set to 0.

— OFDM Preamble bit, which shall be set to 1 when at least one sequence of short training symbols, as defined in 17.3.3, was detected in the channel during the measurement period without a subsequent

valid Signal field (see 17.3.4). This may indicate the presence of an OFDM preamble, such as high-performance RLAN/2 (HIPERLAN/2). Otherwise, the OFDM Preamble bit shall be set to 0.

— Unidentified Signal bit, which may be set to 1 when significant power is detected in the channel during the measurement period that cannot be characterized as radar, an OFDM preamble, or a valid MPDU. Otherwise, the Unidentified Signal bit shall be set to 0. The definition of significant power is implementation dependent.

— Radar bit, which shall be set to 1 when radar was detected operating in the channel during the measurement period. The algorithm to detect radar shall satisfy regulatory requirements and is outside the scope of this amendment. Otherwise, the Radar bit shall be set to 0.

— Unmeasured bit, which shall be set to 1 when this channel has not been measured. Otherwise, the Unmeasured bit shall be set to 0. When the Unmeasured field is set to 1, all the other bit fields shall be set to 0.

7.3.2.22.2 CCA report

A Measurement Type in the Measurement Report element may indicate a CCA report. It is optional for a STA to support the generation of this report. The format of the Measurement Report field corresponding to a CCA report is shown in Figure 46p.

	Channel Number	Measurement Start Time	Measurement Duration	CCA Busy Fraction
Octets:	1	8	2	1

Figure 46p—Measurement Report field format for a CCA report

The Channel Number field shall contain the channel number to which the CCA report applies (as defined in 17.3.8.3.3).

The Measurement Start Time field shall be set to the TSF at the time (± 32μs) at which the CCA report measurement started.

The Measurement Duration field shall be set to the duration over which the CCA report was measured, expressed in TUs.

The CCA Busy Fraction field shall contain the fractional duration over which CCA indicated the channel was busy during the measurement duration. The resolution of the CCA busy measurement is in microseconds. The CCA Busy Fraction value is defined as Ceiling (255 * [Duration CCA indicated channel was busy (microseconds)] / (1024 * [Measurement duration (TUs)])).

7.3.2.22.3 RPI histogram report

A Measurement Type in the Measurement Report element may indicate an RPI histogram report. It is optional for a STA to support the generation of this report. The format of the Measurement Report field corresponding to an RPI histogram report is shown in Figure 46q.

The Channel Number field shall be set to the channel number to which the RPI histogram report applies (as defined in 17.3.8.3.3).

The Measurement Start Time field shall be set to the TSF at the time (± 32μs) at which the RPI histogram report measurement started.

	Channel Number	Measure-ment Start Time	Measure-ment Duration
Octets:	1	8	2

	RPI 0 density	RPI 1 density	RPI 2 density	RPI 3 density	RPI 4 density	RPI 5 density	RPI 6 density	RPI 7 density
Octets:	1	1	1	1	1	1	1	1

Figure 46q—Measurement Report field format for an RPI histogram report

The Measurement Duration field shall be set to the duration over which the RPI histogram report was measured, expressed in TUs.

The RPI histogram report shall contain the RPI densities observed in the channel for the eight RPI levels defined in Table 20d. To compute the RPI densities, the STA shall measure the received power level on the specified channel, as detected at the antenna connector, as a function of time over the measurement duration. The maximum tolerance of the received power measurements shall be ± 5 dB. Furthermore, the received signal power measurement should be a monotonic function of the actual power at the antenna. The time resolution of the received power measurements is in microseconds. The received power measurements are converted to a sequence of RPI values by quantizing the measurements according to Table 4. The RPI densities are then computed for each of the eight possible RPI values using Ceiling (255 * [Duration receiving at RPI value (microseconds) / (1024 * Measurement duration)]). The sum of the RPI densities will be approximately 255, but could be up to 262 because of rounding effects.

Table 20d—RPI definitions for an RPI histogram report

RPI	Power observed at the antenna (dBm)
0	Power ≤–87
1	–87 < Power ≤–82
2	–82 < Power ≤–77
3	–77 < Power ≤–72
4	–72 < Power ≤–67
5	–67 < Power ≤–62
6	–62 < Power ≤–57
7	–57 < Power

The RPI histogram report provides an additional mechanism for a STA to gather information on the state of a channel from other STAs. The STA may use this information to assist in the choice of new channel, to help avoid false radar detections, and to assess the general level of interference present on a channel.

7.3.2.23 Quiet element

The Quiet element defines an interval during which no transmission shall occur in the current channel. This interval may be used to assist in making channel measurements without interference from other STAs in the BSS or IBSS. The format of the Quiet element is shown in Figure 46r.

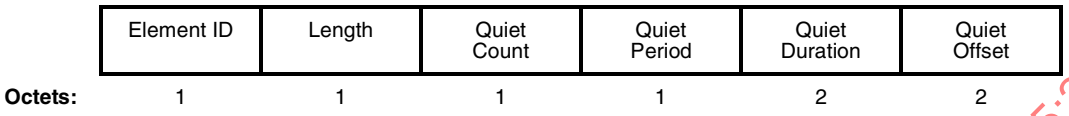

Figure 46r—Quiet element format

The Length field shall be set to 6.

The Quiet Count field shall be set to the number of TBTTs until the beacon interval during which the next quiet interval shall start. A value of 1 indicates the quiet interval will start during the beacon interval starting at the next TBTT. A value of 0 is reserved.

The Quiet Period field shall be set to the number of beacon intervals between the start of regularly scheduled quiet intervals defined by this Quiet element. A value of 0 indicates that no periodic quiet interval is defined.

The Quiet Duration field shall be set to the duration of the quiet interval, expressed in TUs.

The Quiet Offset field shall be set to the offset of the start of the quiet interval from the TBTT specified by the Quiet Count field, expressed in TUs. The value of the Quiet Offset field shall be less than one beacon interval.

The Quiet element may be included in Beacon frames, as described in 7.2.3.1, and Probe Response frames, as described in 7.2.3.9. The use of Quiet elements is described in 11.6.2.

7.3.2.24 IBSS DFS element

The IBSS DFS element contains information for DFS operation in an IBSS. The format of the IBSS DFS element is shown in Figure 46s.

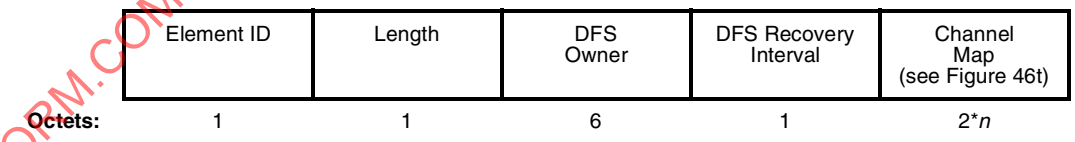

Figure 46s—IBSS DFS element format

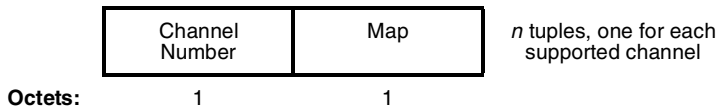

Figure 46t—Channel Map field format

The Length field is variable.

The DFS Owner field shall be set to the individual IEEE MAC address of the STA that is the currently known DFS Owner in the IBSS.

The DFS Recovery Interval field indicates the time interval that shall be used for DFS owner recovery, expressed as an integral number of beacon intervals. The DFS Recovery Interval value is static throughout the lifetime of the IBSS and is determined by the STA that starts the IBSS.

The Channel Map field shown in Figure 46t shall contain a Channel Number field and a Map field (see 7.3.2.22.1) for each channel supported by the STA transmitting the IBSS DFS element. Note that *n* in Figure 46s is the number of channels supported by the STA.

The IBSS DFS element may be included in Beacon frames, as described in 7.2.3.1, and Probe Response frames, as described in 7.2.3.9. The use of IBSS DFS elements is described in 11.6.7.2.

7.4 Action frame format details

This subclause describes the Action frame formats, including the Action Details field, allowed in each of the action categories defined in Table 19a in 7.3.1.11.

7.4.1 Spectrum management action details

Five Action frame formats are defined for spectrum management. An Action field, in the octet field immediately after the Category field, differentiates the five formats. The Action field values associated with each frame format are defined in Table 20e.

Table 20e—Spectrum management Action field values

Action field value	Description
0	Measurement Request
1	Measurement Report
2	TPC Request
3	TPC Report
4	Channel Switch Announcement
5–255	Reserved

7.4.1.1 Measurement Request frame format

The Measurement Request frame uses the Action frame body format and is transmitted by a STA requesting another STA to measure one or more channels. The format of the Measurement Request frame body is shown in Figure 46u.

The Category field shall be set to 0 (representing spectrum management).

The Action field shall be set to 0 (representing a Measurement Request frame).

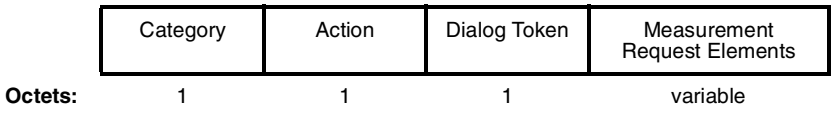

Figure 46u—Measurement Request frame body format

The Dialog Token field shall be set to a nonzero value chosen by the STA sending the measurement request to identify the request/report transaction.

The Measurement Request Elements field shall contain one or more of the Measurement Request elements described in 7.3.2.21. The number and length of the Measurement Request elements in a Measurement Request frame is limited by the maximum allowed MAC management PDU (MMPDU) size.

7.4.1.2 Measurement Report frame format

The Measurement Report frame uses the Action frame body format and is transmitted by a STA in response to a Measurement Request frame or by a STA autonomously providing measurement information. The format of the Measurement Report frame body is shown in Figure 46v.

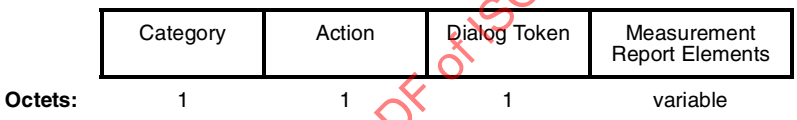

Figure 46v—Measurement Report frame body format

The Category field shall be set to 0 (representing spectrum management).

The Action field shall be set to 1 (representing a Measurement Report frame).

The Dialog Token field shall be set to the value in any corresponding Measurement Request frame. If the Measurement Report frame is not being transmitted in response to a Measurement Request frame, then the Dialog token shall be set to 0.

The Measurement Report Elements field shall contain one or more of the Measurement Report elements described in 7.3.2.22. The number and length of the Measurement Report elements in a Measurement Report frame is limited by the maximum allowed MMPDU size.

7.4.1.3 TPC Request frame format

The TPC Request frame uses the Action frame body format and is transmitted by a STA requesting another STA for transmit power and link margin information. The format of the TPC Request frame body is shown in Figure 46w.

The Category field shall be set to 0 (representing spectrum management).

The Action field shall be set to 2 (representing a TPC Request frame).

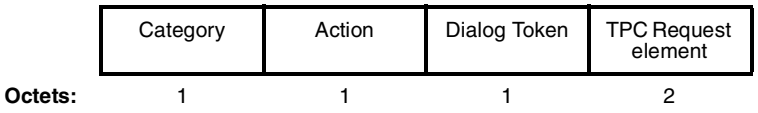

Figure 46w—TPC Request frame body format

The Dialog Token field shall be set to a nonzero value chosen by the STA sending the request to identify the transaction.

The TPC Request element shall be set as described in 7.3.2.17.

7.4.1.4 TPC Report frame format

The TPC Report frame uses the Action frame body format and is transmitted by a STA in response to a TPC Request frame. The format of the TPC Report frame body is shown in Figure 46x.

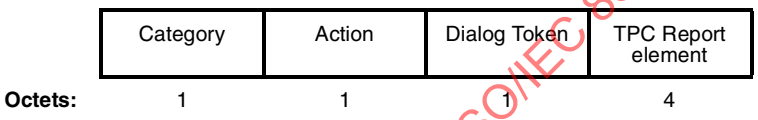

Figure 46x—TPC Report frame body format

The Category field shall be set to 0 (representing spectrum management).

The Action field shall be set to 3 (representing a TPC Report frame).

The Dialog Token field shall be set to the Dialog Token value in the corresponding TPC Request frame.

The TPC Report element shall be set as described 7.3.2.18.

7.4.1.5 Channel Switch Announcement frame format

The Channel Switch Announcement frame uses the Action frame body format and is transmitted by an AP in a BSS or a STA in an IBSS to advertise a channel switch. The format of the Channel Switch Announcement frame body is shown in Figure 46y.

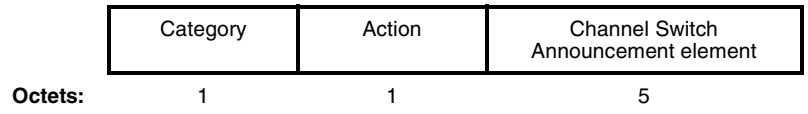

Figure 46y—Channel Switch Announcement frame body format

The Category field shall be set to 0 (representing spectrum management).

The Action field shall be set to 4 (representing a Channel Switch Announcement frame).

The Channel Switch Announcement element shall be set as described 7.3.2.20.

9. MAC sublayer functional description

9.2 Distributed coordination function (DCF)

9.2.3 Interframe space (IFS)

9.2.3.2 Point coordination function (PCF) IFS (PIFS)

Change the first paragraph of 9.2.3.2 as follows:

The PIFS shall be used only by STAs operating under the PCF to gain priority access to the medium at the start of the contention-free period (CFP) or by a STA to transmit a Channel Switch Announcement frame. A STA using the PCF shall be allowed to transmit CF traffic after its carrier sense (CS) mechanism (see 9.2.1) determines that the medium is idle at the TxPIFS slot boundary as defined in 9.2.10. A STA may also transmit a Channel Switch Announcement frame after its CS mechanism (see 9.2.1) determines that the medium is idle at the TxPIFS slot boundary. The use of the PIFS by STAs operating under the PCF is described in 9.3. The use of PIFS by STAs transmitting a Channel Switch Announcement frame is described in 11.6.7.1.

10. Layer management

10.3 MAC sublayer management entity (MLME) service access point (SAP) interface

10.3.2 Scan

10.3.2.2 MLME-SCAN.confirm

10.3.2.2.2 Semantics of the service primitive

Insert the following elements at the end of the untitled table listing the elements of BSSDescription in 10.3.2.2.2:

Name	Type	Valid range	Description
Country	As defined in the Country element	As defined in the Country element	The information required to identify the regulatory domain in which the STA is located and to configure its physical layer (PHY) for operation in that regulatory domain. Present only when TPC functionality is required, as specified in 11.5, or when dot11MultiDomainCapabilityEnabled is true.
IBSS DFS Recovery Interval	Integer	1–255	Only present if BSSType = INDEPENDENT. The time interval that shall be used for DFS recovery. Present only when DFS functionality is required, as specified in 11.6.

10.3.6 Associate

10.3.6.1 MLME-ASSOCIATE.request

10.3.6.1.2 Semantics of the service primitive

Change the following primitive parameter list in 10.3.6.1.2:

MLME-ASSOCIATE.request(
PeerSTAAddress,
AssociateFailureTimeout,
CapabilityInformation,
ListenInterval,
Supported Channels
)

Insert the following row at the end of the untitled table defining the primitive parameters in 10.3.6.1.2:

Name	Type	Valid range	Description
Supported Channels	As defined in the Supported Channels element	As defined in the Supported Channels element	The list of channels in which the STA is capable of operating. Present only when DFS functionality is required, as specified in 11.6.

10.3.7 Reassociate

10.3.7.1 MLME-REASSOCIATE.request

10.3.7.1.2 Semantics of the service primitive

Change the following primitive parameter list in 10.3.7.1.2:

MLME-REASSOCIATE.request(
NewAPAddress,
ReassociateFailureTimeout,
CapabilityInformation,
ListenInterval,
Supported Channels
)

Insert the following row at the end of the untitled table defining the primitive parameters in 10.3.7.1.2:

Name	Type	Valid range	Description
Supported Channels	As defined in the Supported Channels element	As defined in the Supported Channels element	The list of channels in which the STA is capable of operating. Present only when DFS functionality is required, as specified in 11.6.

10.3.10 Start

10.3.10.1 MLME-START.request

10.3.10.1.2 Semantics of the service primitive

Change the following primitive parameter list in 10.3.10.1.2:

MLME-START.request(

SSID,
BSSType,
BeaconPeriod,
DTIMPeriod,
CF parameter set,
PHY parameter set,
IBSS parameter set,
ProbeDelay,
CapabilityInformation,
BSSBasicRateSet,
OperationalRateSet,
Country,
IBSS DFS Recovery Interval
)

Insert the following rows at the end of the untitled table defining the primitive parameters in 10.3.10.1.2:

Name	Type	Valid range	Description
Country	As defined in the Country element	As defined in the Country element	The information required to identify the regulatory domain in which the STA is located and to configure its PHY for operation in that regulatory domain. Present only when TPC functionality is required, as specified in 11.5, or when dot11MultiDomainCapabilityEnabled is true.
IBSS DFS Recovery Interval	Integer	1–255	Present only if BSSType = INDEPENDENT. The time interval that shall be used for DFS recovery. Present only when DFS functionality is required, as specified in 11.6.

Insert 10.3.11 through 10.3.16.2.4 after 10.3.10.2.4 as follows:

10.3.11 Spectrum management protocol layer model

The layer management extensions for measurement and channel switching assume a certain partition of spectrum management functionality between the MLME and station management entity (SME). This partitioning assumes that policy decisions (e.g., regarding measurement and channel switching) reside in the SME, while the protocol for measurement, switch timing, and the associated frame exchanges resides within the MLME (see Figure 67a).

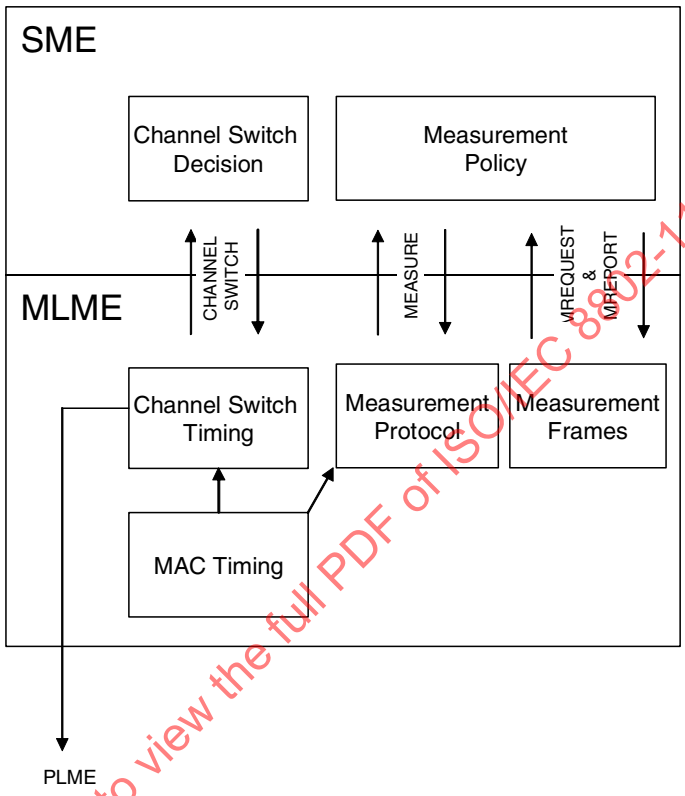

Figure 67a—Layer management model

The informative diagrams within this subclause further illustrate the spectrum management protocol model adopted. Figure 67b and Figure 67c depict the measurement process for a peer STA to accept and reject a measurement request, respectively. Figure 67d illustrates the TPC adaptation process. Lastly, Figure 67e depicts the management process for a channel switch using a Channel Switch Announcement frame.

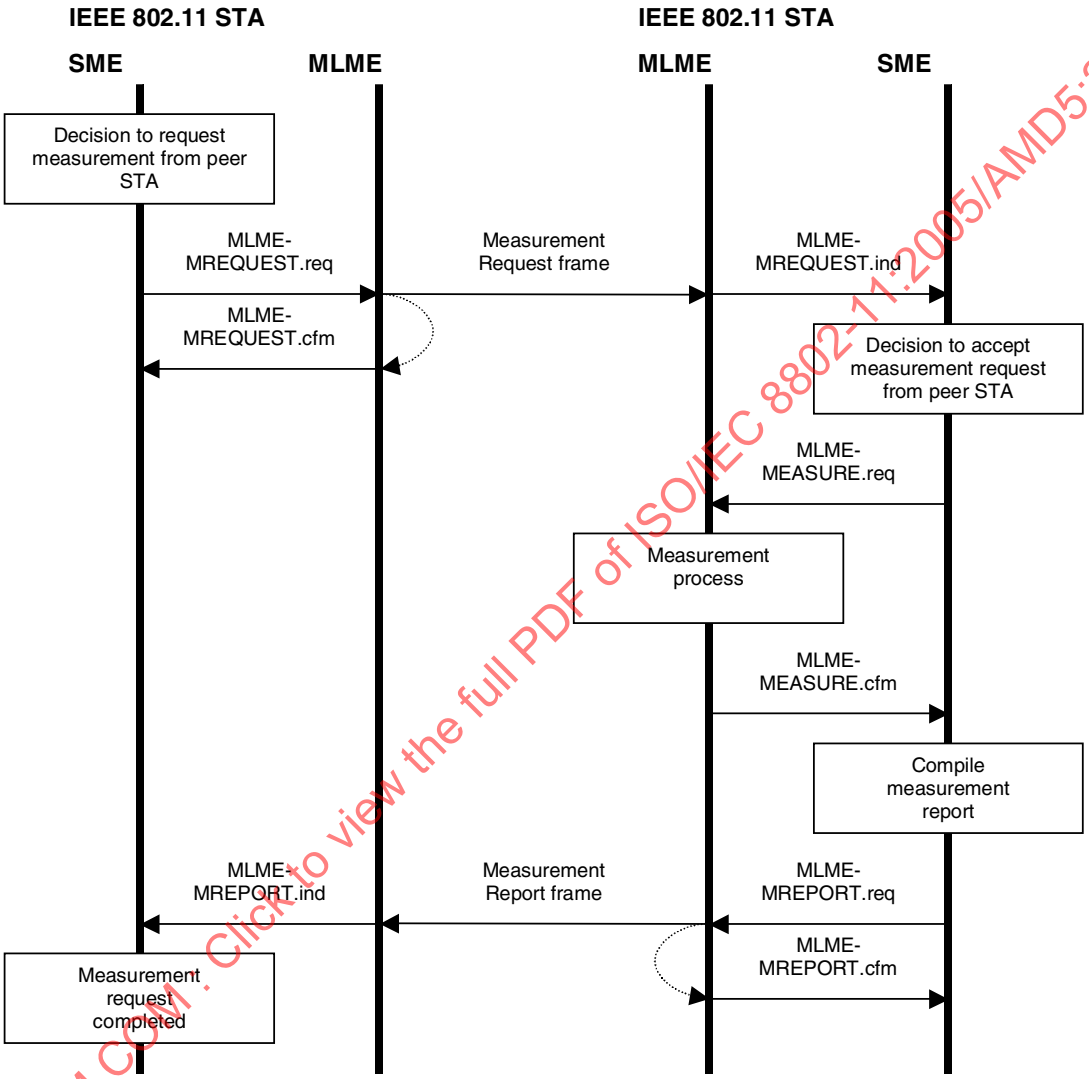

Figure 67b—Measurement request—accepted

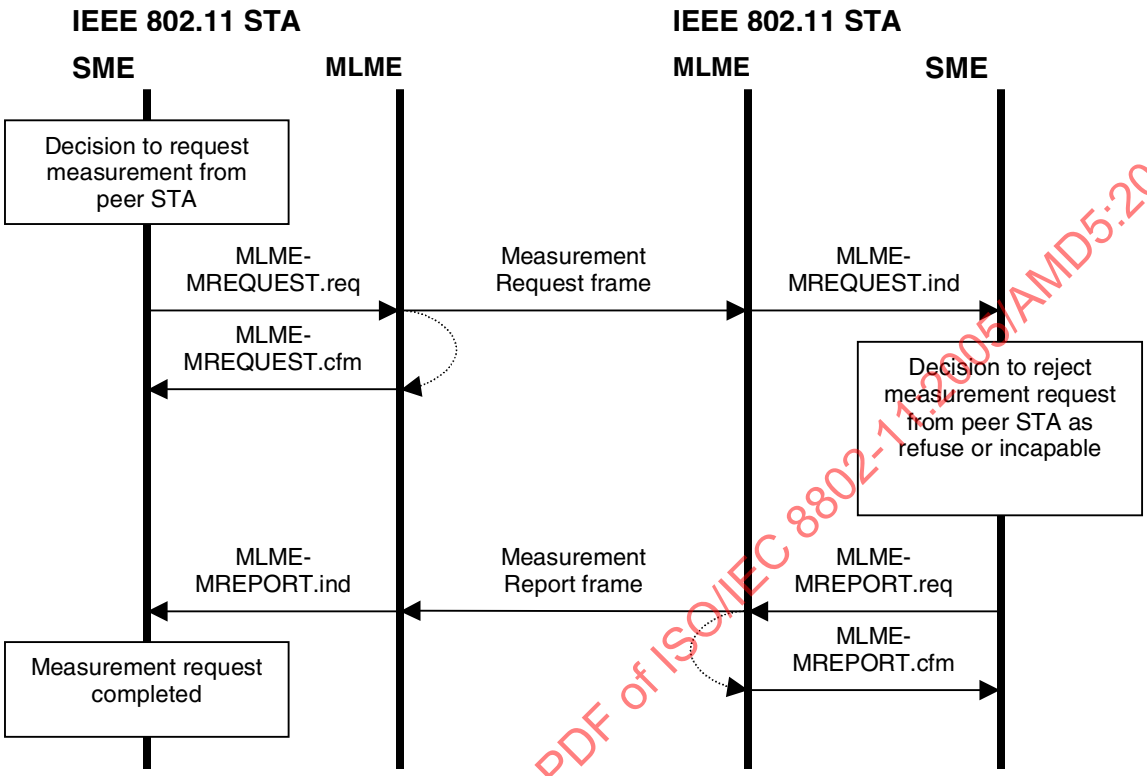

Figure 67c—Measurement request - rejected

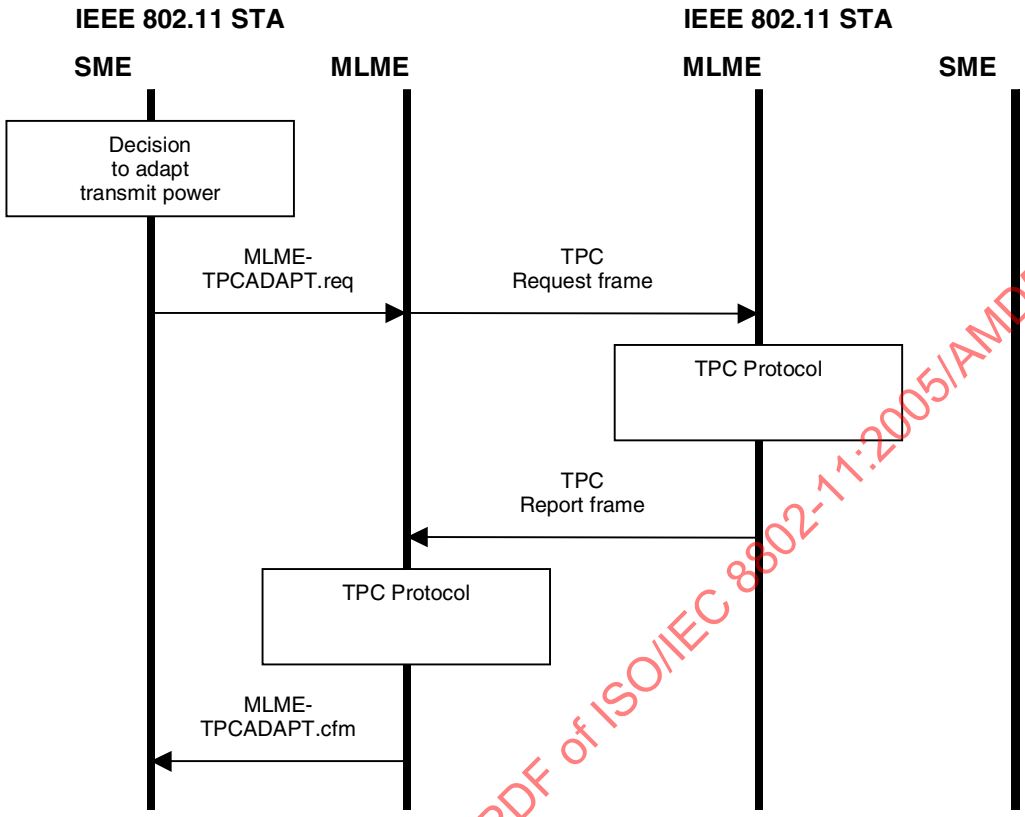

Figure 67d—TPC adaptation

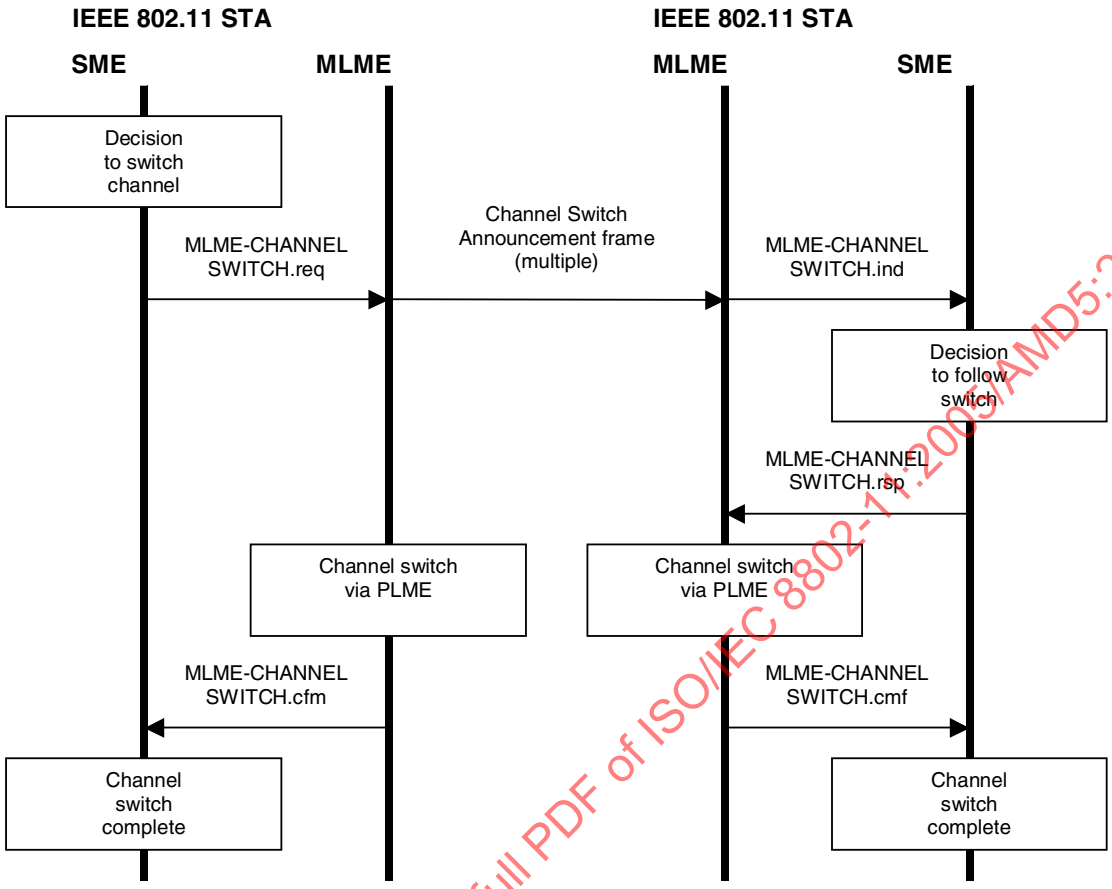

Figure 67e—Channel switch

10.3.12 Measurement request

This set of primitives supports the signaling of measurement requests between peer SMEs.

10.3.12.1 MLME-MREQUEST.request

10.3.12.1.1 Function

This primitive requests the transmission of a measurement request to a peer entity.

10.3.12.1.2 Semantics of the service primitive

The primitive parameters are as follows:

MLME-MREQUEST.request(
Peer MAC Address,
Dialog Token,
Measurement Request Set
)

Name	Type	Valid range	Description
Peer MAC Address	MACAddress	Any valid individual or group MAC Address	The address of the peer MAC entity to which the measurement request shall be set.
Dialog Token	Integer	0–255	The dialog token to identify the measurement transaction.
Measurement Request Set	Set of measurement requests, each as defined in the Measurement Request element	Set of measurement requests, each as defined in the Measurement Request element	A set of measurement requests, each containing a Measurement Token, Measurement Request Mode, Measurement Type, and a Measurement Request.

10.3.12.1.3 When generated

This primitive is generated by the SME to request that a Measurement Request frame be sent to a peer entity to initiate one or more measurements.

10.3.12.1.4 Effect of receipt

On receipt of this primitive, the MLME shall construct a Measurement Request frame containing the set of Measurement Request elements specified. This frame shall then be scheduled for transmission.

10.3.12.2 MLME-MREQUEST.confirm

10.3.12.2.1 Function

This primitive reports the result of a request to send a Measurement Request frame.

10.3.12.2.2 Semantics of the service primitive

The primitive parameters are as follows:

MLME-MREQUEST.confirm(
ResultCode
)

Name	Type	Valid range	Description
ResultCode	Enumeration	SUCCESS, INVALID PARAMETERS, or UNSPECIFIED FAILURE	Reports the outcome of a request to send a Measurement Request frame.

10.3.12.2.3 When generated

This primitive is generated by the MLME when the request to transmit a Measurement Request frame completes.

10.3.12.2.4 Effect of receipt

On receipt of this primitive, the SME shall evaluate the result code.

10.3.12.3 MLME-MREQUEST.indication

10.3.12.3.1 Function

This primitive indicates that a Measurement Request frame has been received requesting the measurement of one or more channels.

10.3.12.3.2 Semantics of the service primitive

The primitive parameters are as follows:

MLME-MREQUEST.indication(
Peer MAC Address,
Dialog Token,
Measurement Request Set
)

Name	Type	Valid range	Description
Peer MAC Address	MACAddress	Any valid individual Address	The address of the peer MAC entity from which the measurement request was received.
Dialog Token	Integer	0–255	The dialog token to identify the measurement transaction.
Measurement Request Set	Set of measurement requests, each as defined in the Measurement Request element	Set of measurement requests, each as defined in the Measurement Request element	A set of measurement requests, each containing a Measurement Token, Measurement Request Mode, Measurement Type, and a Measurement Request.

10.3.12.3.3 When generated

This primitive is generated by the MLME when a valid Measurement Request frame is received.

10.3.12.3.4 Effect of receipt

On receipt of this primitive, the SME shall either reject the request or commence the requested measurements.

10.3.13 Channel measurement

This set of primitives supports the requesting and reporting of measurement data.

10.3.13.1 MLME-MEASURE.request

10.3.13.1.1 Function

This primitive is generated by the SME to request that the MLME initiate specified measurements.

10.3.13.1.2 Semantics of the service primitive

The primitive parameters are as follows:

MLME-MEASURE.request(
Dialog Token,
Measurement Request Set
)

Name	Type	Valid range	Description
Dialog Token	Integer	0–255	The Dialog Token to identify the measurement transaction.
Measurement Request Set	Set of measurement requests, each as defined in the Measurement Request element	Set of measurement requests, each as defined in the Measurement Request element	A set of measurement requests, each containing a Measurement Token, Measurement Request Mode, Measurement Type, and a Measurement Request.

10.3.13.1.3 When generated

This primitive is generated by the SME to request that the MLME initiate the specified measurements.

10.3.13.1.4 Effect of receipt

On receipt of this primitive, the MLME shall commence the measurement process.

10.3.13.2 MLME-MEASURE.confirm

10.3.13.2.1 Function

This primitive reports the result of a measurement.

10.3.13.2.2 Semantics of the service primitive

The primitive parameters are as follows:

MLME-MEASURE.confirm(
ResultCode,
Dialog Token,
Measurement Report Set
)

Name	Type	Valid range	Description
ResultCode	Enumeration	SUCCESS, INVALID PARAMETERS, or UNSPECIFIED FAILURE	The outcome of the measurement request.
Dialog Token	Integer	0–255	The dialog token to identify the measurement transaction.
Measurement Report Set	Set of measurement reports, each as defined in the Measurement Report element	Set of measurement reports, each as defined in the Measurement Report element	A set of measurement reports, each containing a Measurement Token, Measurement Report Mode, Measurement Type, and a Measurement Report.

10.3.13.2.3 When generated

This primitive is generated by the MLME to report the results when a measurement set completes.

10.3.13.2.4 Effect of receipt

On receipt of this primitive, the SME shall evaluate the result code and, if appropriate, shall store the channel measurements pending communication to the requesting entity or for local use.

10.3.14 Measurement report

This set of primitives supports the signaling of measurement reports.

10.3.14.1 MLME-MREPORT.request

10.3.14.1.1 Function

This primitive supports the signaling of measurement reports between peer SMEs.

10.3.14.1.2 Semantics of the service primitive

The primitive parameters are as follows:

MLME-MREPORT.request(
Peer MAC Address,
Dialog Token,
Measurement Report Set
)

Name	Type	Valid range	Description
Peer MAC Address	MACAddress	Any valid individual MAC Address	The address of the peer MAC entity to which the measurement report shall be set.
Dialog Token	Integer	0–255	The dialog token to identify the measurement transaction. Set to 0 for an autonomous report.
Measurement Report Set	Set of measurement reports, each as defined in the Measurement Report element	Set of measurement reports, each as defined in the Measurement Report element	A set of measurement reports, each containing a Measurement Token, Measurement Report Mode, Measurement Type, and a Measurement Report.

10.3.14.1.3 When generated

This primitive is generated by the SME to request that a frame be sent to a peer entity to report the results of measuring one or more channels.

10.3.14.1.4 Effect of receipt

On receipt of this primitive, the MLME shall construct a Measurement Report frame containing the set of measurement reports. This frame shall then be scheduled for transmission.

10.3.14.2 MLME-MREPORT.confirm

10.3.14.2.1 Function

This primitive reports the result of a request to send a Measurement Report frame.

10.3.14.2.2 Semantics of the service primitive

The primitive parameters are as follows:

MLME-MREPORT.confirm(
ResultCode
)

Name	Type	Valid range	Description
ResultCode	Enumeration	SUCCESS, INVALID PARAMETERS, or UNSPECIFIED FAILURE	Reports the outcome of a request to send a Measurement Request frame.

10.3.14.2.3 When generated

This primitive is generated by the MLME when the request to transmit a Measurement Report frame completes.

10.3.14.2.4 Effect of receipt

On receipt of this primitive, the SME shall evaluate the result code.

10.3.14.3 MLME-MREPORT.indication

10.3.14.3.1 Function

This primitive indicates that a Measurement Report frame has been received from a peer entity. This management report may be in response to an earlier measurement request (e.g., MLME-MREQUEST.request) or may be an autonomous report.

10.3.14.3.2 Semantics of the service primitive

The primitive parameters are as follows:

MLME-MREPORT.indication(
Peer MAC Address,
Dialog Token,
Measurement Report Set
)

Name	Type	Valid range	Description
Peer MAC Address	MACAddress	Any valid individual MAC Address	The address of the peer MAC entity from which the Measurement Report frame was received.
Dialog Token	Integer	0–255	The dialog token to identify the measurement transaction. Set to 0 for an autonomous report.
Measurement Report Set	Set of measurement reports, each as defined in the Measurement Report element	Set of measurement reports, each as defined in the Measurement Report element	A set of measurement reports, each containing a Measurement Token, Measurement Report Mode, Measurement Type, and a Measurement Report.

10.3.14.3.3 When generated

This primitive is generated by the MLME when a valid Measurement Report frame is received.

10.3.14.3.4 Effect of receipt

On receipt of this primitive, measurement data may be available for SME processes, such as channel selection.

10.3.15 Channel switch

10.3.15.1 MLME-CHANNELSWITCH.request

10.3.15.1.1 Function

This primitive requests a switch to a new operating channel.

10.3.15.1.2 Semantics of the service primitive

The primitive parameters are as follows:

MLME-CHANNELSWITCH.request(
Mode,
Channel Number,
Channel Switch Count
)

Name	Type	Valid range	Description
Mode	Integer	0, 1	Channel switch mode, as defined for the Channel Switch Announcement element.
Channel Number	Integer	As defined in 17.3.8.3.3	Specifies the new channel number.
Channel Switch Count	Integer	0–255	Specifies the number of TBTTs until the channel switch event, as described for the Channel Switch Announcement element.

10.3.15.1.3 When generated

This primitive is generated by the SME to schedule a channel switch and announce this switch to peer entities in the BSS.

10.3.15.1.4 Effect of receipt

On receipt of this primitive, the MLME shall schedule the channel switch event and announce this switch to other STAs in the BSS using the Channel Switch Announcement frame or element. The MLME shall ensure the timing of frame transmission takes into account the activation delay. The actual channel switch may be achieved at the appropriate time through the MLME-PLME interface using the PLME-SET primitive of the dot11CurrentFrequency MIB attribute.

10.3.15.2 MLME-CHANNELSWITCH.confirm

10.3.15.2.1 Function

This primitive reports the result of a request to switch channel.

10.3.15.2.2 Semantics of the service primitive

The primitive parameters are as follows:

MLME-CHANNELSWITCH.confirm(
ResultCode
)

Name	Type	Valid range	Description
ResultCode	Enumeration	SUCCESS, INVALID PARAMETERS, or UNSPECIFIED FAILURE	Reports the result of a channel switch request.

10.3.15.2.3 When generated

This primitive is generated by the MLME when a channel switch request completes. Possible unspecified failure causes include an inability to schedule a channel switch announcement.

10.3.15.2.4 Effect of receipt

The SME is notified of the results of the channel switch procedure.

10.3.15.3 MLME-CHANNELSWITCH.indication

10.3.15.3.1 Function

This primitive indicates that a channel switch announcement has been received from a peer entity.

10.3.15.3.2 Semantics of the service primitive

The primitive parameters are as follows:

MLME-CHANNELSWITCH.indication(
Peer MAC Address,
Mode,
Channel Number,
Channel Switch Count
)

Name	Type	Valid range	Description
Peer MAC Address	MACAddress	Any valid individual MAC Address	The address of the peer MAC entity from which the Measurement Report frame was received.
Mode	Integer	0, 1	Channel switch mode, as defined for the Channel Switch Announcement element.
Channel Number	Integer	As defined in 17.3.8.3.3	Specifies the new channel number.
Channel Switch Count	Integer	0–255	Specifies the number of TBTTs until the channel switch event, as described for the Channel Switch Announcement element.

10.3.15.3.3 When generated

This primitive is generated by the MLME when a valid Channel Switch Announcement frame is received.

10.3.15.3.4 Effect of receipt

On receipt of this primitive, the SME shall decide whether to accept the switch.

10.3.15.4 MLME-CHANNELSWITCH.response

10.3.15.4.1 Function

This primitive is used to schedule an accepted channel switch.

10.3.15.4.2 Semantics of the service primitive

The primitive parameters are as follows:

MLME-CHANNELSWITCH.response(
Mode,
Channel Number,
Channel Switch Count
)

Name	Type	Valid range	Description
Mode	Integer	0, 1	Channel switch mode, as defined for the Channel Switch Announcement element.
Channel Number	Integer	As defined in 17.3.8.3.3	Specifies the new channel number.
Channel Switch Count	Integer	0–255	Specifies the number of TBTTs until the channel switch event. as described for the Channel Switch Announcement element.

10.3.15.4.3 When generated

This primitive is generated by the SME to schedule an accepted channel switch request.

10.3.15.4.4 Effect of receipt

On receipt of this primitive, the MLME shall schedule the channel switch. The actual channel switch may be achieved at the appropriate time through the MLME-PLME interface using the PLME-SET primitive of the dot11CurrentFrequncy MIB attribute.

10.3.16 TPC request

This set of primitives supports the adaptation of transmit power between peer entities as described in 11.5.4.

10.3.16.1 MLME-TPCADAPT.request

10.3.16.1.1 Function

This primitive supports the adaptation of transmit power between peer entities as specified in 11.5.4.

10.3.16.1.2 Semantics of the service primitive

The primitive parameters are as follows:

MLME-TPCADAPT.request(
Peer MAC Address,
Dialog Token
)

Name	Type	Valid range	Description
Peer MAC Address	MACAddress	Any valid individual or group MAC Address	The address of the peer MAC entity to which the TPC request shall be set.
Dialog Token	Integer	0–255	The dialog token to identify the TPC transaction.

10.3.16.1.3 When generated

This primitive is generated by the SME to request that a TPC Request frame be sent to a peer entity to request that entity to report transmit power and link margin information.

10.3.16.1.4 Effect of receipt

On receipt of this primitive, the MLME shall construct a TPC Request frame. This frame shall then be scheduled for transmission.

10.3.16.2 MLME-TPCADAPT.confirm

10.3.16.2.1 Function

This primitive reports the result of the TPC adaptation procedure.

10.3.16.2.2 Semantics of the service primitive

The primitive parameters are as follows:

MLME-TPCADAPT.confirm(
ResultCode
)

Name	Type	Valid range	Description
ResultCode	Enumeration	SUCCESS, INVALID PARAMETERS, or UNSPECIFIED FAILURE	Reports the outcome of a request to send a TPC Request frame.

10.3.16.2.3 When generated

This primitive is generated by the MLME when the TPC adaptation procedure completes.

10.3.16.2.4 Effect of receipt

The SME is notified of the results of the TCP adaptation procedure.

11. MLME

Insert 11.5 through 11.6.7.2 after 11.4 as follows and renumber figures and tables, as appropriate:

11.5 TPC procedures

ERC/DEC/(99)23 requires 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. This amendment describes such a mechanism, referred to as transmit power control (TPC).

This subclause describes TPC procedures that may be used to satisfy these and similar future regulatory requirements in Europe. The procedures may also satisfy comparable needs in other regulatory domains and other frequency bands and may be useful for other purposes (e.g., reduction of interference, range control, reduction of power consumption).

STAs shall use the TPC procedures defined in this subclause if dot11SpectrumManagementRequired is true. dot11SpectrumManagementRequired shall be set to TRUE when regulatory authorities require TPC. It may also be set to TRUE in other circumstances. The TPC procedures provide for the following:

— Association of STAs with an AP in a BSS based on the STA's power capability (see 11.5.1).

— Specification of regulatory and local maximum transmit power levels for the current channel (see 11.5.2).

— Selection of a transmit power for each transmission in a channel within constraints imposed by regulatory and local requirements (see 11.5.3).

— Adaptation of transmit power based on a range of information, including path loss and link margin estimates (see 11.5.4).

For the purposes of TPC, the following statements apply:

— A STA with dot11SpectrumManagementRequired set to TRUE shall not operate in a BSS or IBSS unless the Spectrum Management bit is set to 1 in the Capability Information field in Beacon frames and Probe Response frames received from other STAs in the BSS or IBSS, *with the following exception*.

