
**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 4: Further Higher Data Rate
Extension in the 2.4 GHz Band**

*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 4: Extension supplémentaire de débit supérieur dans la
bande de 2,4 GHz*

ISO/IEC 8802-11:2005/Amd.4:2006(E)
IEEE Std 802.11g-2003
(Amendment to IEEE Std 802.11-1999)

PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

ISO

Case postale 56 • CH-1211 Geneva 20

Tel. + 41 22 749 01 11

Fax + 41 22 749 09 47

E-mail copyright@iso.org

IEEE Std 802.11g™-2003

(Amendment to IEEE Std 802.11™, 1999 Edition (Reaff 2003))

as amended by

IEEE Stds 802.11a™-1999, 802.11b™-1999,
802.11b™-1999/Cor 1-2001, and 802.11d™-2001)

802.11g™

**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 4: Further Higher Data Rate Extension
in the 2.4 GHz Band**

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.



Published by
The Institute of Electrical and Electronics Engineers, Inc.
3 Park Avenue, New York, NY 10016-5997, USA

27 June 2003

Print: SH95134
PDF: SS95134



Documents

Document Sharing Hub

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

**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 4: Further Higher Data Rate
Extension in the 2.4 GHz Band**

Sponsor

**LAN/MAN Standards Committee
of the
IEEE Computer Society**

Approved 12 June 2003

IEEE-SA Standards Board

Abstract: Changes and additions to IEEE Std 802.11, 1999 Edition, as amended by IEEE Stds 802.11a-1999, 802.11b-1999, 802.11b-1999/Cor 1-2001, and 802.11d-2001, are provided to support the further higher data rate extension for operation in the 2.4 GHz band.

Keywords: LAN, local area network, radio frequency, wireless

The Institute of Electrical and Electronics Engineers, Inc.
3 Park Avenue, New York, NY 10016-5997, USA

Copyright © 2003 by the Institute of Electrical and Electronics Engineers, Inc.
All rights reserved. Published 25 June 2003. Printed in the United States of America.

IEEE and 802 are registered trademarks in the U.S. Patent & Trademark Office, owned by the Institute of Electrical and Electronics Engineers, Incorporated.

Print: ISBN 0-7381-3700-6 SH95134
PDF: ISBN 0-7381-3701-4 SS95134

No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without the prior written permission of the publisher.

International Standard ISO/IEC 8802-11:2005/Amd.4:2006(E)

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

Amendment 4 to ISO/IEC 8802-11:2005 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 6, *Telecommunications and information exchange between systems*.



International Organization for Standardization / International Electrotechnical Commission
Case postale 56 • CH-1211 Genève 20 • Switzerland

IEEE Standards documents are developed within the IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Association (IEEE-SA) Standards Board. The IEEE develops its standards through a consensus development process, approved by the American National Standards Institute, which brings together volunteers representing varied viewpoints and interests to achieve the final product. Volunteers are not necessarily members of the Institute and serve without compensation. While the IEEE administers the process and establishes rules to promote fairness in the consensus development process, the IEEE does not independently evaluate, test, or verify the accuracy of any of the information contained in its standards.

Use of an IEEE Standard is wholly voluntary. The IEEE disclaims liability for any personal injury, property or other damage, of any nature whatsoever, whether special, indirect, consequential, or compensatory, directly or indirectly resulting from the publication, use of, or reliance upon this, or any other IEEE Standard document.

The IEEE does not warrant or represent the accuracy or content of the material contained herein, and expressly disclaims any express or implied warranty, including any implied warranty of merchantability or fitness for a specific purpose, or that the use of the material contained herein is free from patent infringement. IEEE Standards documents are supplied “**AS IS**.”

The existence of an IEEE Standard does not imply that there are no other ways to produce, test, measure, purchase, market, or provide other goods and services related to the scope of the IEEE Standard. Furthermore, the viewpoint expressed at the time a standard is approved and issued is subject to change brought about through developments in the state of the art and comments received from users of the standard. Every IEEE Standard is subjected to review at least every five years for revision or reaffirmation. When a document is more than five years old and has not been reaffirmed, it is reasonable to conclude that its contents, although still of some value, do not wholly reflect the present state of the art. Users are cautioned to check to determine that they have the latest edition of any IEEE Standard.

In publishing and making this document available, the IEEE is not suggesting or rendering professional or other services for, or on behalf of, any person or entity. Nor is the IEEE undertaking to perform any duty owed by any other person or entity to another. Any person utilizing this, and any other IEEE Standards document, should rely upon the advice of a competent professional in determining the exercise of reasonable care in any given circumstances.

Interpretations: Occasionally questions may arise regarding the meaning of portions of standards as they relate to specific applications. When the need for interpretations is brought to the attention of IEEE, the Institute will initiate action to prepare appropriate responses. Since IEEE Standards represent a consensus of concerned interests, it is important to ensure that any interpretation has also received the concurrence of a balance of interests. For this reason, IEEE and the members of its societies and Standards Coordinating Committees are not able to provide an instant response to interpretation requests except in those cases where the matter has previously received formal consideration.

Comments for revision of IEEE Standards are welcome from any interested party, regardless of membership affiliation with IEEE. Suggestions for changes in documents should be in the form of a proposed change of text, together with appropriate supporting comments. Comments on standards and requests for interpretations should be addressed to:

Secretary, IEEE-SA Standards Board
445 Hoes Lane
P.O. Box 1331
Piscataway, NJ 08855-1331
USA

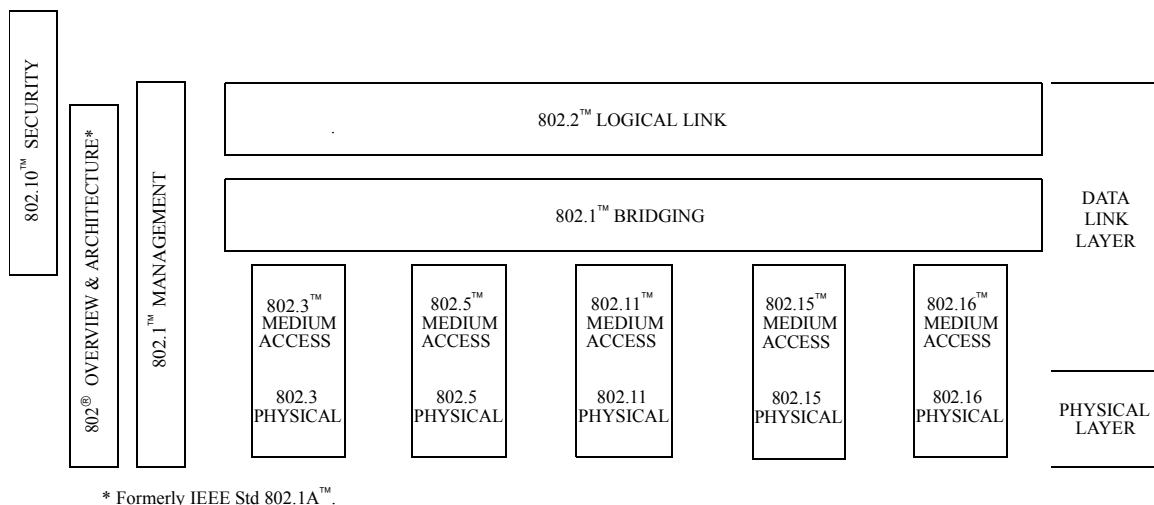
Note: Attention is called to the possibility that implementation of this standard may require use of subject matter covered by patent rights. By publication of this standard, no position is taken with respect to the existence or validity of any patent rights in connection therewith. The IEEE shall not be responsible for identifying patents for which a license may be required by an IEEE standard or for conducting inquiries into the legal validity or scope of those patents that are brought to its attention. A patent holder has filed a statement of assurance that it will grant licenses under these rights without compensation or under reasonable rates and nondiscriminatory, reasonable terms and conditions to all applicants desiring to obtain such licenses. The IEEE makes no representation as to the reasonableness of rates and/or terms and conditions of the license agreements offered by patent holders. Further information may be obtained from the IEEE Standards Department.

Authorization to photocopy portions of any individual standard for internal or personal use is granted by the Institute of Electrical and Electronics Engineers, Inc., provided that the appropriate fee is paid to Copyright Clearance Center. To arrange for payment of licensing fee, please contact Copyright Clearance Center, Customer Service, 222 Rosewood Drive, Danvers, MA 01923 USA; +1 978 750 8400. Permission to photocopy portions of any individual standard for educational classroom use can also be obtained through the Copyright Clearance Center.

Introduction

This introduction is not part of IEEE Std 802.11g-2003 (Amendment to IEEE Std 802.11, 1999 Edition, as amended by IEEE Std 802.11a-1999, 802.11b-1999, 802.11b-1999/Cor 1-2001, and 802.11d-2001), 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 4: Further Higher Data Rate Extension in the 2.4 GHz Band.

This amendment is part of a family of standards for local and metropolitan area networks. The relationship between the standard and other members of the family is shown below. (The numbers in the figure refer to IEEE standard designations.¹)



This family of standards deals with the Physical and Data Link layers as defined by the International Organization for Standardization (ISO) Open Systems Interconnection (OSI) Basic Reference Model (ISO/IEC 7498-1: 1994). The access standards define five types of medium access technologies and associated physical media, each appropriate for particular applications or system objectives. Some access standards have been withdrawn and other types are under investigation.

The standards defining the technologies noted above are as follows:

- IEEE Std 802.² *Overview and Architecture.* This standard provides an overview to the family of IEEE 802 Standards.
- IEEE Std 802.1B™ and 802.1k™ [ISO/IEC 15802-2] *LAN/MAN Management.* Defines an OSI management-compatible architecture and services and protocol elements for use in a LAN/MAN environment for performing remote management.
- IEEE Std 802.1D™ *Media Access Control (MAC) Bridges.* Specifies an architecture and protocol for the interconnection of IEEE 802 LANs below the MAC service boundary.

¹The IEEE standard designations referred to in the above figure and list are trademarks owned by the Institute of Electrical and Electronics Engineers, Incorporated.

²The IEEE 802 Overview and Architecture Specification, originally known as IEEE Std 802.1A, has been renumbered as IEEE Std 802. This has been done to accommodate recognition of the base standard in a family of standards. References to IEEE Std 802.1A should be considered as references to IEEE Std 802.

- IEEE Std 802.1E™
[ISO/IEC 15802-4] *System Load Protocol.* Specifies a set of services and protocol for those aspects those aspects of management concerned with the loading of systems on IEEE 802 LANs.
- IEEE Std 802.1F™ *Common Definitions and Procedures for IEEE 802 Management Information.*
- IEEE Std 802.1G™
[ISO/IEC 15802-5]: *Remote Media Access Control (MAC) Bridging.* Specifies extensions for the interconnection, using non-LAN systems communication technologies, of geographically separated IEEE 802 LANs below the level of the logical link control protocol.
- IEEE Std 802.1H™
[ISO/IEC TR 11802-5] *Recommended Practice for Media Access Control (MAC) Bridging of Ethernet V2.0 in IEEE 802 Local Area Networks.*
- IEEE Std 802.1Q™ *Virtual Bridged Local Area Networks.* Defines an architecture for Virtual Bridged LANs, the services provided in Virtual Bridged LANs, and the protocols and algorithms involved in the provision of those services.
- IEEE Std 802.2
[ISO/IEC 8802-2] *Logical Link Control.*
- IEEE Std 802.3 *CSMA/CD Access Method and Physical Layer Specifications.*
- IEEE Std 802.5
[ISO/IEC 8802-5] *Token Ring Access Method and Physical Layer Specifications.*
- IEEE Std 802.10 *Standard for Interoperable LAN Security (SILS).* Currently approved: Secure Data Exchange (SDE).
- IEEE Std 802.11
[ISO/IEC 8802-11] *Wireless LAN Medium Access Control (MAC) Sublayer and Physical Layer Specifications.*
- IEEE Std 802.15 *Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for: Wireless Personal Area Networks.*
- IEEE Std 802.16 *Air Interface for Fixed Broadband Wireless Access Systems.*

The reader of this standard is urged to become familiar with the complete family of standards.

Participants

When the IEEE 802.11 Working Group approved this standard, it had the following membership:

Stuart J. Kerry, *Chair*
Al Petrick and **Harry Worstell**, *Vice-Chairs*
Tim Godfrey, *Secretary*
Brian Mathews, *Publicity Standing Committee*
Teik-Kheong Tan, *Wireless Next-Generation Standing Committee*

John Fakatselis, *Chair Task Group e*
Duncan Kitchin, *Vice-Chair Task Group e*
David Bagby, *Chair Task Group f*
Mika Kasslin, *Chair Task Group h*
David Halasz, *Chair Task Group i*

When the IEEE 802.11 Working Group approved this standard, the Task Group G had the following membership:

Matthew B. Shoemake, *Chair*
John Terry, *Vice-Chair*
Carl F. Andren, *Technical Editor*
Kevin Smart, *Secretary*

Tomoko Adachi
Areg Alimian
Richard Allen
Keith Amann
Merwyn Andrade
Butch Anton
Mitch Aramaki
Takashi Aramaki
Larry Arnett
Geert A. Awater
Floyd Backes
David Bagby
Jay Bain
Dennis J. Baker
Bala Balachander
Raja Banerjee
Boyd Bangerter
Simon Barber
Gil Bar-Noy
John Barr
Kevin M. Barry
Anuj Batra
Tomer Bentzion
Mathilde Benveniste
Simon Black
Jan Boer
Jim Brennan
Ronald Brockmann
Alistair G. Butt
Nancy Cam-Winget
Bill Carney
Pat Carson
Clint Chaplin
Hung-Kun Chen
Yi-Ming Chen
Greg Chesson
Alan Chickinsky
Aik Chindapol
Leigh M. Chinitz

Bong-Rak Choi
Sunghyun Choi
Ken Clements
John T. Coffey
Terry Cole
Paul Congdon
Craig Conkling
Todor Cooklev
Thomas P. Costas
Wm. Caldwell Crosswy
Peter Dahl
Barry Davis
Rolf De Vegt
Javier del Prado
Michael Derby
Georg Dickmann
Wim Diepstraten
Roger Durand
Eryk Dutkiewicz
Mary DuVal
Donald E. Eastlake III
Dennis Eaton
Peter Ecclesine
Jon Edney
Christoph Euscher
John Fakatselis
Lars Falk
Augustin J. Farrugia
Weishi Feng
Norm Finn
Matthew James Fischer
Kenji Fujisawa
Marcus Gahler
James Gardner
Atul Garg
Al Garrett
Vafa Ghazi
Tim Godfrey
Wataru Gohda

Peter Goidas
Alex Gorokhov
Rik Graulus
Evan Green
Larry Green
Patrick Green
Kerry Greer
Daqing Gu
Srikanth Gummadi
Fred Haisch
David Halasz
Steve D. Halford
Mark Hamilton
Christopher J. Hansen
Yasuo Harada
Amer A. Hassan
Kevin Hayes
Victor Hayes
Chris Heegard
Robert Heile
Garth Hillman
Christopher Hinsz
Jun Hirano
Mikael Hjelm
Jin-Meng Ho
Maarten Hoeben
Michael Hoghooghi
Allen Hollister
Srinath Hosur
Russell Housley
Frank P. Howley, Jr.
Dave Hudak
John Hughes
David Hunter
David Hytha
Hiroshi IdeDaichi Imamura
Yasuhiko Inoue
Katsumi Ishii
Eric Jacobsen

Marc Jalfon
 Peter Johansson
 David Johnston
 V. K. Jones
 Bobby Jose
 Daryl Kaiser
 Srinivas Kandala
 Jeyhan Karaoguz
 Kevin Karcz
 Mika Kasslin
 Patrick Kelly
 Stuart J. Kerry
 Andrew K. Khieu
 Jamshid Khun-Jush
 Ryoji Kido
 Dukhyun Kim
 Edward Kim
 Je Woo Kim
 Joonsuk Kim
 Ziv Kimhi
 Duncan Kitchin
 Günter Kleindl
 Cees Klik
 David Kline
 John M. Kowalski
 Bruce P. Kraemer
 Thomas Kuehnelt
 Denis Kuwahara
 Joe KwakPaul A. Lambert
 David S. Landeta
 Jim Lansford
 Colin Lanzl
 Kim Laraqui
 Jon LaRosa
 David J. Leach, Jr.
 Dongjun Lee
 Richard van Leeuwen
 Martin Lefkowitz
 Uriel Lemberger
 Onno Letanche
 Mike Lewis
 Sheung Li
 Jie Liang
 Isaac Lim Wei Lih
 Huashih A. Lin
 Shawn Liu
 Titus Lo
 Peter Loc
 Ralph Lombardo, Jr.
 Luke Ludeman
 Yeong-Chang Maa
 Akira Maeki
 Douglas Makishima
 Mahalingam Mani
 Roger Marks
 Brian Mathews
 Jo-Ellen F Mathews
 Mark Mathews
 Thomas Maufer
 Conrad Maxwell
 Justin McCann
 Kelly McClellan
 Gary McCoy
 Bill McFarland
 Gary McGarr
 Bill McIntosh
 Jorge Medina
 Mehul Mehta
 Pratik Mehta

Robert C. Meier
 Graham Melville
 Klaus Meyer
 Robert Miller
 Partho Mishra
 Yasuhiko Mizoguchi
 Leo Monteban
 Michael Montemurro
 Tim Moore
 Mike Moreton
 Roy Morris
 Robert Moskowitz
 Oliver Muelhens
 Peter Murphy
 Peter Murray
 Andrew Myles
 Ravi Narasimhan
 Kevin Negus
 David B. Nelson
 Dan Nemits
 Chiu Ngo
 Qiang Ni
 Gunnar Nitsche
 Erwin R. Noble
 Hiroshi Nomura
 Tzvetan D. Novkov
 Ivan Oakes
 Bob O'Hara
 Yoshihiro Ohtani
 Kazuhiro Okanou
 Lior Ophir
 Richard H. Paine
 Mike Paljug
 Vijay M. Patel
 Lizy Paul
 Sebastien Perrot
 Al Petrick
 James Portaro
 Al Potter
 Mike Press
 Ron Provencio
 Henry Ptasinski
 Raad Raad
 Ali Raissinia
 Murali Ramadoss
 Noman Rangwala
 Ivan Reede
 Stanley A. Reible
 Danny Rettig
 Edward Reuss
 Bill Rhyne
 Jim Richards
 David Richkas
 Maximilian Riegel
 Carlos A. Rios
 Benno Ritter
 Kent G. Rollins
 Stefan Rommer
 Jon Rosdahl
 Pejman Roshan
 Reinhard Ruckriem
 Ali Sadri
 Kenichi Sakusabe
 Antonio Salloum Salazar
 John H. Santhoff
 Anil K. Sanwalka
 Sid Schrum
 Erik Schylander
 Michael Seals
 Joe Sensendorf

Yangmin Shen
 Matthew Sherman
 William Shvodian
 David Skellern
 Donald I. Sloan
 Andrew Smith
 Dave Smith
 Yoram Solomon
 Wei-Jei Song
 Amjad Soomro
 Gary Spiess
 Dorothy V. Stanley
 Adrian Stephens
 Carl R. Stevenson
 Paul F Struhsaker
 Michael Su
 Masahiro Takagi
 Minoru Takemoto
 Pek-Yew Tan
 Teik-Kheong Tan
 Takuma Tanimoto
 Roger Teague
 Carl Temme
 Yossi Texerman
 Jerry A. Thrasher
 James D. Tomcik
 Walt Trzaskus
 Allen Tsai
 Chih C. Tsien
 Tom Tsoulogiannis
 Toru Ueda
 Naoki Urano
 Niels Van Erven
 Wim J. van Houtum
 Richard van Nee
 Patrick Vandenamee
 Dmitri Varsanofiev
 Jagannatha L. Venkatesha
 Madan Venugopal
 Nanci Vogtli
 Dennis Volpano
 Toan X. Vu
 Tim Wakeley
 Jesse R. Walker
 Brad Wallace
 Thierry Walrant
 Christopher Ware
 Fujio Watanabe
 Mark Webster
 Menzo Wentink
 Robert Whelan
 Michael Wilhoyte
 Richard G.C. Williams
 Steven D. Williams
 Timothy G. Wong
 Harry Worstell
 Charles R. Wright
 Micheal Wright
 Liwen Wu
 Yang Xiao
 Shugong Xu
 Jung Yee
 Kit Yong
 Albert Young
 Heejung Yu
 Patrick Yu
 Glen Zorn
 Arnoud Zwemmer
 Jim Zyren

The following members of the balloting committee voted on this standard. Balloters may have voted for approval, disapproval, or abstention.

Butch Anton	Victor Hayes	Satoshi Oyama
Eladio Arvelo	Gerald Heller	Sebastien Perrot
David Bagby	Srinivas Kandala	Ian Perryman
John Barnett	Stuart J. Kerry	Subbu Ponnuswamy
John Barr	Thomas A. Kim	Hugo Pues
Jan Boer	Yongsuk Kim	Vikram Punj
Mitchell Buchman	John M. Kowalski	Charles Rice
Kimara Chin	Pi-Cheng Law	Maximilian Riegel
Keith Chow	Amir Leshem	Jon Rosdahl
Terry Cole	Daniel Levesque	Douglas Sanderson
Michael Coletta	Sheung Li	Michael Seals
Todor Cooklev	Jeb Linton	Stephen Shellhammer
Todd Cooper	Kyle Maus	Matthew Sherman
Guru Dutt Dhingra	Michael McInnis	Neil Shipp
Thomas Dineen	George Miao	Gil Shultz
Sourav Dutta	Apurva Mody	Kevin Smart
Peter Ecclesine	Leo Monteban	Amjad Soomro
Darrell Fletcher	Mike Moreton	Minoru Takemoto
Keng Fong	Andrew Myles	Jerry A. Thrasher
Avraham Freedman	Charles Ngethe	Dmitri Varsanofiev
Michele Gammel	Paul Nikolich	Hung-yu Wei
Andrew Germano	Erwin R. Noble	Edward Woodrow
James Gilb	Ellis Nolley	Harry Worstell
Tim Godfrey	Timothy O'Farrell	Jung Yee
Rajugopal Gubbi	Bob O'Hara	Oren Yuen
Qiang Guo		Arnoud Zwemmer

When the IEEE-SA Standards Board approved this standard on 12 June 2003, it had the following membership:

Don Wright, *Chair*
Howard M. Frazier, *Vice Chair*
Judith Gorman, *Secretary*

H. Stephen Berger	Donald M. Heirman	Daleep C. Mohla
Joe Bruder	Laura Hitchcock	William J. Moylan
Bob Davis	Richard H. Hulett	Paul Nikolich
Richard DeBlasio	Anant Jain	Gary Robinson
Julian Forster*	Lowell G. Johnson	Malcolm V. Thaden
Toshio Fukuda	Joseph L. Koepfinger*	Geoffrey O. Thompson
Arnold M. Greenspan	Tom McGean	Doug Topping
Raymond Hapeman	Steve Mills	Howard L. Wolfman

*Member Emeritus

Also included are the following nonvoting IEEE-SA Standards Board liaisons:

Alan Cookson, *NIST Representative*
 Satish K. Aggarwal, *NRC Representative*

Michelle Turner
IEEE Standards Project Editor

CONTENTS

3.	Definitions	2
4.	Abbreviations and acronyms	2
7.	Frame formats	2
7.2	Format of individual frame types.....	2
7.2.1	Control frames	2
7.2.1.2	CTS frame format	2
7.2.3	Management frames.....	2
7.2.3.1	Beacon frame format	3
7.2.3.4	Association Request frame format.....	3
7.2.3.5	Association Response frame format	4
7.2.3.6	Reassociation Request frame format	4
7.2.3.7	Reassociation Response frame format.....	4
7.2.3.8	Probe Request frame format	5
7.2.3.9	Probe Response frame format.....	5
7.3	Management frame body components.....	6
7.3.1	Fixed fields	6
7.3.1.4	Capability Information field	6
7.3.1.9	Status code field.....	8
7.3.2	Information elements	8
7.3.2.2	Supported Rates element	8
7.3.2.13	ERP Information element	9
7.3.2.14	Extended Supported Rates element	10
9.	MAC sublayer functional description.....	11
9.2	DCF.....	11
9.2.11	NAV distribution	11
9.2.12	Determination of PLME aCWmin characteristics	11
9.6	Multirate support.....	12
9.7	Frame exchange sequences.....	13
9.10	Protection mechanism	13
10.	Layer management.....	14
10.4	PLME SAP interface	14
10.4.4	PLME-DSSSTESTMODE.....	14
10.4.4.2	PLME-DSSSTESTMODE.request	14
18.	High Rate direct sequence spread spectrum (HR/DSSS) PHY specification.....	14
18.2	High Rate PLCP sublayer	14
18.2.2	PPDU format.....	14
18.2.2.2	Short PPDU format (optional)	14

19.	Extended Rate PHY specification.....	15
19.1	Overview.....	15
19.1.1	Introduction.....	15
19.1.2	Operational modes.....	15
19.1.3	Scope.....	16
19.1.4	Extended Rate PHY functions.....	16
19.2	PHY specific service parameter list.....	17
19.3	Extended Rate PLCP sublayer.....	18
19.3.1	Introduction.....	18
19.3.2	PPDU format.....	18
19.3.2.1	Long preamble PPDU format.....	19
19.3.2.1.1	ERP PLCP length field calculation.....	19
19.3.2.1.2	ERP-PBCC PLCP length (LENGTH) field calculation.....	19
19.3.2.2	Short preamble PPDU format.....	20
19.3.2.3	ERP-OFDM PPDU format.....	20
19.3.2.4	DSSS-OFDM long preamble PPDU format.....	21
19.3.2.4.1	DSSS-OFDM PLCP length field calculation.....	21
19.3.2.5	Short DSSS-OFDM PLCP PPDU format.....	22
19.3.3	PLCP data modulation and rate change.....	22
19.3.3.1	Long and short preamble formats.....	22
19.3.3.2	ERP-PBCC 22 Mbit/s and 33 Mbit/s formats.....	23
19.3.3.3	ERP-OFDM format.....	25
19.3.3.4	Long & short DSSS-OFDM PLCP format.....	25
19.3.3.4.1	Overview of the DSSS-OFDM PLCP PSDU encoding process...	26
19.3.3.4.2	Long sync training sequence definition.....	26
19.3.3.4.3	OFDM signal field definition.....	26
19.3.3.4.4	Data symbol definition.....	26
19.3.3.4.5	DSSS-OFDM signal extension.....	27
19.3.4	PLCP transmit procedure.....	27
19.3.5	CCA.....	27
19.3.6	PLCP receive procedure.....	27
19.4	ERP PMD operating specifications (general).....	28
19.4.1	Regulatory requirements.....	28
19.4.2	Operating channel frequencies.....	28
19.4.3	Transmit and receive in-band and out-of-band spurious emissions.....	28
19.4.4	Slot time.....	28
19.4.5	SIFS value.....	28
19.4.6	CCA performance.....	28
19.4.7	PMD transmit specifications.....	29
19.4.7.1	Transmit power levels.....	29
19.4.7.2	Transmit center frequency tolerance.....	29
19.4.7.3	Symbol clock frequency tolerance.....	29
19.5	ERP operation specifications.....	29
19.5.1	Receiver minimum input level sensitivity.....	29
19.5.2	Adjacent channel rejection.....	30
19.5.3	Receive maximum input level capability.....	30
19.5.4	Transmit spectral mask.....	30
19.6	ERP-PBCC operation specifications.....	30
19.6.1	Receiver minimum input level sensitivity.....	30
19.6.2	Receiver adjacent channel rejection.....	30

19.7 DSSS-OFDM operation specifications	31
19.7.1 Overview	31
19.7.2 Single carrier to multicarrier transition requirements	31
19.7.2.1 Spectral binding requirement	32
19.7.2.1.1 Common linear distortions	33
19.7.2.1.2 Symbol shaping unique to the DSSS-OFDM segment	33
19.7.2.1.3 Pulse shaping unique to the single carrier segment	35
19.7.2.2 Sample-power matching requirement	37
19.7.2.3 Transition time alignment	38
19.7.2.4 Single carrier termination	39
19.7.2.5 Transition carrier frequency requirement	39
19.7.2.6 Transition carrier phase requirement	39
19.7.2.7 Transmit modulation accuracy requirement	41
19.8 ERP PLME	42
19.8.1 PLME SAP	42
19.8.2 MIB	42
19.8.3 TXTIME	42
19.8.3.1 ERP-OFDM TXTIME calculations	44
19.8.3.2 ERP-PBCC TXTIME calculations	45
19.8.3.3 DSSS-OFDM TXTIME calculations	45
19.8.4 ERP-OFDM PLCP PSDU definition	46
19.9 Extended Rate PMD sublayer	47
19.9.1 Scope and field of application	47
19.9.2 Overview of service	47
19.9.3 Overview of Interactions	47
19.9.4 Basic service and options	47
19.9.4.1 PMD_SAP peer-to-peer service primitives	47
19.9.4.2 PMD_SAP sublayer-to-sublayer service primitives	47
19.9.4.3 PMD_SAP service primitive parameters	48
19.9.5 PMD_SAP detailed service specification	50
19.9.5.1 PMD_DATA.request	50
19.9.5.2 PMD_DATA.indicate	50
19.9.5.3 PMD_MODULATION.request	50
19.9.5.4 PMD_PREAMBLE.request	51
19.9.5.5 PMD_TXSTART.request	51
19.9.5.6 PMD_TXEND.request	51
19.9.5.7 PMD_ANTSEL.request	51
19.9.5.8 PMD_TXPRWLVL.request	51
19.9.5.9 PMD_RATE.request	51
19.9.5.10 PMD_RSSI.indicate	51
19.9.5.11 PMD_SQ.indicate	51
19.9.5.12 PMD_CS.indicate	51
19.9.5.13 PMD_ED.indicate	51
Annex A (normative) Protocol implementation conformance statement (PICS) proforma	52
Annex C (normative) Formal description of MAC operation	58
Annex D (normative) ASN.1 coding of MAC and PHY MIB	64

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 4: Further Higher Data Rate
Extension in the 2.4 GHz Band

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

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***. Four editing instructions are used: change, delete, insert, and replace. ***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 ~~striketrough~~ (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. ***Replace*** is used to make large changes in existing text, subclauses, tables, or figures by removing existing material and replacing it with new material. Editorial notes will not be carried over into future editions.

3. Definitions

Insert additional definitions after 3.40 and renumber appropriately as follows:

3.41 protection mechanism: Any procedure that attempts to update the NAV of all receiving STAs prior to the transmission of a frame that may or may not be understood by receivers.

3.42 protection mechanism frame: Any frame that is sent as part of a protection mechanism procedure.

4. Abbreviations and acronyms

Insert the following abbreviations alphabetically in the list in Clause 4:

DSSS-OFDM	PHYs using DSSS-OFDM modulation under 19.7 rules
ERP	extended rate PHYs conforming to Clause 19
ERP-PBCC	PHYs using extended rate PBCC modulation under 19.6 rules
ERP-CCK	PHYs using CCK modulation under Clause 19 rules
ERP-DSSS	PHYs using DSSS modulation under Clause 19 rules
ERP-DSSS/CCK	PHYs using DSSS or CCK modulation under Clause 19 rules
ERP-OFDM	PHYs using OFDM modulation under 19.5 rules
EVM	error vector magnitude
NonERP	non-extended rate PHYs conforming to Clause 15 or Clause 18, but not to Clause 19

7. Frame formats

7.2 Format of individual frame types

7.2.1 Control frames

7.2.1.2 CTS frame format

Insert the following paragraph at the end of 7.2.1.2

If the CTS is the first frame in the exchange and the pending data or management frame requires acknowledgment, the duration value is the time, in microseconds, required to transmit the pending data or management frame, plus one SIFS interval, one ACK frame, and an additional SIFS interval. If the CTS is the first frame in the exchange and the pending data or management frame does not require acknowledgment, the duration value is the time, in microseconds, required to transmit the pending data or management frame, plus one SIFS interval. If the calculated duration includes a fractional microsecond, that value is rounded to the next higher integer.

7.2.3 Management frames

Insert the following sentence after the last paragraph:

Gaps may exist in the ordering of fixed fields and elements within frames. The order that remains shall be ascending.

7.2.3.1 Beacon frame format*Change the note in row 7 of Table 5:***Table 5—Beacon frame body**

Order	Information	Notes
7	DS Parameter Set	The DS Parameter Set information element is present within Beacon frames generated by STAs using direct-sequence Clause 15, Clause 18, and Clause 19 PHYs.

*Insert the following rows in Table 5:***Table 5—Beacon frame body**

Order	Information	Notes
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.

7.2.3.4 Association Request frame format*Insert the following row in Table 7:***Table 7—Association Request frame body**

Order	Information	Notes
5	Extended Supported Rates	The Extended Supported Rates element is present whenever there are more than eight supported rates, and it is optional otherwise.

7.2.3.5 Association Response frame format

Insert the following row in Table 8:

Table 8—Association Response frame body

Order	Information	Notes
5	Extended Supported Rates	The Extended Supported Rates element is present whenever there are more than eight supported rates, and it is optional otherwise.

7.2.3.6 Reassociation Request frame format

Insert the following row in Table 9:

Table 9—Reassociation Request frame body

Order	Information	Notes
6	Extended Supported Rates	The Extended Supported Rates element is present whenever there are more than eight supported rates, and it is optional otherwise.

7.2.3.7 Reassociation Response frame format

Insert the following row in Table 10:

Table 10—Reassociation Response frame body

Order	Information	Notes
5	Extended Supported Rates	The Extended Supported Rates element is present whenever there are more than eight supported rates, and it is optional otherwise.

7.2.3.8 Probe Request frame format

Insert the following row in Table 11:

Table 11—Probe Request frame body

Order	Information	Notes
4	Extended Supported Rates	The Extended Supported Rates element is present whenever there are more than eight supported rates, and it is optional otherwise.

7.2.3.9 Probe Response frame format

Change row 7 of Table 12 as shown:

Table 12—Probe Response frame body

Order	Information	Notes
7	DS Parameter Set	The DS Parameter Set information element is present within Beacon frames generated by STAs using direct-sequence Clause 15, Clause 18, and Clause 19 PHYs.

Insert the following rows in Table 12:

Table 12—Probe Response frame body

Order	Information	Notes
18	ERP Information	ERP Information element is present within Probe Response frames generated by STAs using ERP PHYs and is optionally present in other cases.
19	Extended Supported Rates	The Extended Supported Rates element is present whenever there are more than eight supported rates, and it is optional otherwise.

7.3 Management frame body components

7.3.1 Fixed fields

7.3.1.4 Capability Information field

Change the first and second paragraphs in 7.3.1.4 as shown:

The Capability Information field contains a number of subfields that are used to indicate requested or advertised optional capabilities.

The length of the Capability Information field is 2 octets. The Capability Information field consists of the following subfields: ESS, IBSS, CF-Pollable, CF-Poll Request, Privacy, Short Preamble, Packet Binary Convolutional Code (PBCC), and Channel Agility, Short Slot Time, and DSSS-OFDM. The format of the Capability Information field is 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.

Replace Figure 27 with the following:

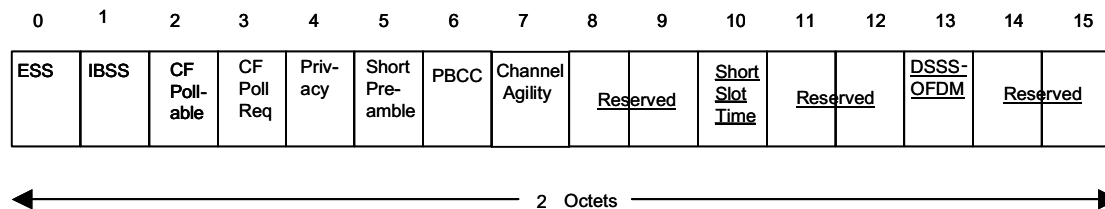


Figure 27—Capability Information fixed field

Change the ninth paragraph in 7.3.1.4 and insert text following the paragraph as shown:

APs (as well as STAs in IBSSs) shall set the Short Preamble subfield to 1 in transmitted Beacon, Probe Response, Association Response, and Reassociation Response management MMPDUs to indicate that the use of the Short Preamble ~~option~~, as described in 18.2.2.2, is allowed within this BSS. To indicate that the use of the Short Preamble ~~option~~ is not allowed, the Short Preamble subfield shall be set to 0 in Beacon, Probe Response, Association Response, and Reassociation Response management MMPDUs transmitted within the BSS.

Insert the following text following the ninth paragraph in 7.3.1.4:

ERP STAs shall set the MIB variable `dot11ShortPreambleOptionImplemented` to true as all ERP STAs support both long and short preamble formats.

Change the eleventh paragraph in 7.3.1.4 as shown:

APs (as well as STAs in IBSSs) shall set the PBCC subfield to 1 in transmitted Beacon, Probe Response, Association Response, and Reassociation Response management MMPDUs to indicate that the ~~use of the~~ PBCC Modulation option, as described in 18.4.6.6 and 19.6, is allowed within the BSS. To indicate that the ~~use of the~~ PBCC Modulation option is not allowed, the PBCC subfield shall be set to 0 in Beacon, Probe Response, Association Response, and Reassociation Response management MMPDUs transmitted within the BSS.

Change the thirteenth paragraph in 7.3.1.4 as shown:

Bit 7 of the Capability Information field shall be used to indicate Channel Agility capability by the High Rate direct sequence spread spectrum (HR/DSSS) or ERP PHYs. STAs shall set the Channel Agility bit to 1 when Channel Agility is in use and shall set it to 0 otherwise.

Insert the following paragraphs before the last paragraph of 7.3.1.4:

STAs shall set the Short Slot Time subfield to 1 in transmitted Association Request and Reassociation Request MMPDUs when the MIB attribute dot11ShortSlotTimeOptionImplemented and dot11ShortSlotTimeOptionEnabled are true. Otherwise, the STA shall set the Short Slot Time subfield to 0 in transmitted Association Request and Reassociation Request MMPDUs.

If a STA that does not support Short Slot Time associates, the AP shall use long slot time beginning at the first Beacon subsequent to the association of the long slot time STA. APs shall set the Short Slot Time subfield in transmitted Beacon, Probe Response, Association Response, and Reassociation Response MMPDUs to indicate the currently used slot time value within this BSS.

STAs shall set the MAC variable aSlotTime to the short slot value upon transmission or reception of Beacon, Probe Response, Association Response, and Reassociation Response MMPDUs from the BSS that the STA has joined or started and that have the short slot subfield set to 1 when the MIB attribute dot11ShortSlotTimeOptionImplemented is true. STAs shall set the MAC variable aSlotTime to the long slot value upon transmission or reception of Beacon, Probe Response, Association Response, and Reassociation Response MMPDUs from the BSS that the STA has joined or started and that have the short slot subfield set to 0 when the MIB attribute dot11ShortSlotTimeOptionImplemented is true. STAs shall set the MAC variable aSlotTime to the long slot value at all times when the MIB attribute dot11ShortSlotTimeOptionImplemented is false. When the dot11ShortSlotTimeOptionImplemented MIB attribute is not present, or when the PHY supports only a single slot time value, then the STA shall set the MAC variable aSlotTime to the slot value appropriate for the attached PHY.

For IBSS, the Short Slot Time subfield shall be set to 0.

APs as well as STAs in IBSSs shall set the DSSS-OFDM subfield to 1 in transmitted Beacon, Probe Response, Association Response, and Reassociation Response management MMPDUs to indicate that the use of DSSS-OFDM, as described in 19.7, is allowed within this BSS or by STAs that want to use DSSS-OFDM within an IBSS. To indicate that the use of DSSS-OFDM is not allowed, the DSSS-OFDM subfield shall be set to 0 in Beacon, Probe Response, Association Response, and Reassociation Response MMPDUs transmitted within the BSS.

STAs shall set the DSSS-OFDM subfield to 1 in transmitted Association Request and Reassociation Request MMPDUs when the MIB attribute dot11DSSS-OFDMOptionImplemented and dot11DSSS-OFDMOptionEnabled are true. Otherwise, STAs shall set the DSSS-OFDM subfield to 0 in transmitted Association Request and Reassociation Request MMPDUs.

Change the last paragraph in 7.3.1.4 as shown:

Unused bits ~~8–15~~ of the Capability Information field are reserved.

7.3.1.9 Status code field

Replace the last row in Table 19 with the following:

Table 19—Status codes

Status code	Meaning
22–24	Reserved
25	Association denied due to requesting station not supporting the Short Slot Time option
26	Association denied due to requesting station not supporting the DSSS-OFDM option
27–65 535	Reserved

7.3.2 Information elements

Replace the last row of Table 20 with the following:

Table 20—Element IDs

Information element	Element ID
Reserved	17–41
ERP Information	42
Reserved	43–49
Extended Supported Rates	50
Reserved	51–255

7.3.2.2 Supported Rates element

Change the first two paragraphs of 7.3.2.2 as follows:

The Supported Rates element specifies ~~the values up to eight rates~~ in the Operational-Rate-Set parameter, as described in the MLME_Join.request and MLME_Start.request primitives. The information field is encoded as 1 to 8 octets, where each octet describes a single Supported Rate. If the number of rates in the Operational Rate Set exceeds eight, then an Extended Supported Rate element shall be generated to specify the remaining supported rates. The use of the Extended Supported Rates element is optional otherwise.

Within Beacon, Probe Response, Association Response, and Reassociation Response management frames, each Supported Rate belonging to the BSS basic rate set is encoded as an octet with the MSB (bit 7) set to 1 and bits 6 through 0 are set to the appropriate value from the valid range column of the DATA_RATE row of the table in 10.4.4.2 (e.g., a 1 Mbit/s rate belonging to the BSS basic rate set is encoded as X'82'). Rates not belonging to the BSS basic rate set are encoded with the MSB set to 0, and bits 6 through 0 are set to the appropriate value from the valid range column of the DATA_RATE row of the table in 10.4.4.2 (e.g., a 2 Mbit/s rate not belonging to the BSS basic rate set is encoded as X'04'). The MSB of each Supported Rate octet in other management frame types is ignored by receiving STAs.

Insert the following paragraph at the end of 7.3.2.2:

If the DSSS-OFDM bit is set to 1 in the transmitted Capability Information field of an MMPDU, then any supported rates transmitted in that frame that include rates that are common to both DSSS-OFDM and ERP-OFDM shall be interpreted by receiving and transmitting STA to indicate support for both DSSS-OFDM and ERP-OFDM at the indicated rate. However, if any of those rates are indicated as basic (a rate in the BSSBasicRateSet), then the basic rate designation shall be interpreted by receiving and transmitting STA to apply only for the ERP-OFDM modulation and rate. If the PBCC bit is set to 1 in the transmitted capability field of an MMPDU, then any supported rates transmitted in that frame that include rates that are common to both PBCC and CCK shall be interpreted by receiving and transmitting STA to indicate support for both PBCC and CCK at the indicated rate. However, if any of those rates are indicated as basic, then the basic rate designation shall be interpreted by receiving and transmitting STA to apply only for the CCK modulation and rate. That is, if the rate is indicated as basic, the basic designation does not apply to DSSS-OFDM, PBCC, or ERP-PBCC.

Insert the following subclauses (7.3.2.13 and 7.3.2.14) at the end of 7.3.2:

7.3.2.13 ERP Information element

The ERP Information element contains information on the presence of Clause 15 or Clause 18 stations in the BSS that are not capable of Clause 19 (ERP-OFDM) data rates. It also contains the requirement of the ERP Information element sender (AP in a BSS or STA in an IBSS) as to the use of protection mechanisms to optimize BSS performance and as to the use of long or short Barker preambles. See Figure 42E for a definition of the frame element.

If one or more NonERP STAs are associated in the BSS, the Use_Protection bit shall be set to 1 in transmitted ERP Information Elements.

In an IBSS, the setting of the Use_Protection bit is left to the STA. In an IBSS, there is no uniform concept of association; therefore, a typical algorithm for setting the Use_Protection bit will take into account the traffic pattern and history on the network. If a member of an IBSS detects one or more NonERP STAs that are members of the same IBSS, then the Use_Protection bit should be set to 1 in the ERP Information Element of transmitted Beacon and Probe Response frames.

The NonERP_Present bit shall be set to 1 when a NonERP STA is associated with the BSS. Examples of when the NonERP present bit may additionally be set to 1 include, but are not limited to, when

- a) A NonERP infrastructure or independent BSS is overlapping (a NonERP BSS may be detected by the reception of a Beacon where the supported rates contain only Clause 15 or Clause 18 rates).
- b) In an IBSS, if a Beacon frame is received from one of the IBSS participants where the supported rate set contains only Clause 15 or Clause 18 rates.
- c) A management frame (excluding a Probe Request) is received where the supported rate set includes only Clause 15 or Clause 18 rates.

ERP APs and ERP STAs shall invoke the use of a protection mechanism after transmission or reception of the Use_Protection bit with a value of 1 in an MMPDU to or from the BSS that the ERP AP or ERP STA has joined or started. ERP APs and ERP STAs may additionally invoke protection mechanism use at other times. ERP APs and ERP STAs may disable protection mechanism use after transmission or reception of the Use_Protection bit with a value of 0 in an MMPDU to or from the BSS that the ERP AP or ERP STA has joined or started.

When there are no NonERP STAs associated with the BSS and the ERP Information Element sender's dot11ShortPreambleOptionImplemented MIB variable is set to true, then the Barker_Preamble_Mode bit may be set to 0. The Barker_Preamble_Mode bit shall be set to 1 by the ERP Information Element sender if

one or more associated NonERP STAs are not short preamble capable as indicated in their Capability Information field, or if the ERP Information Element senders dot11ShortPreambleOptionImplemented MIB variable is set to false.

If a member of an IBSS detects one or more non-short preamble-capable STAs that are members of the same IBSS, then the Barker_Preamble_Mode bit should be set to 1 in the transmitted ERP Information Element.

ERP APs and ERP STAs shall use long preambles when transmitting Clause 15, Clause 18, and Clause 19 frames after transmission or reception of an ERP Information Element with a Barker_Preamble_Mode value of 1 in an MMPDU to or from the BSS that the ERP AP or ERP STA has joined or started, regardless of the value of the short preamble capability bit from the same received or transmitted MMPDU that contained the ERP Information Element. ERP APs and ERP STAs may additionally use long preambles when transmitting Clause 15, Clause 18, and Clause 19 frames at other times. ERP APs and ERP STAs may use short preambles when transmitting Clause 15, Clause 18, and Clause 19 frames after transmission or reception of an ERP Information Element with a Barker_Preamble_Mode value of 0 in an MMPDU to or from the BSS that the ERP AP or ERP STA has joined or started, regardless of the value of the short preamble capability bit from the same received or transmitted MMPDU. NonERP STAs and NonERP APs may also follow the rules given in this paragraph.

Recommended behavior for setting the Use_Protection bit is contained in 9.10.

The ERP Information element shall have the form shown in Figure 42E.

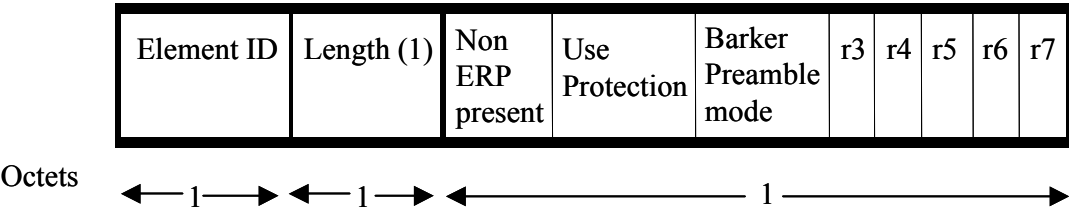


Figure 42E—ERP Information element

Bits r3 through r7 are reserved, set to 0, and are ignored on reception. Note that the length of this element is flexible and may be expanded in the future.

7.3.2.14 Extended Supported Rates element

The Extended Supported Rates element specifies the rates in the OperationalRateSet as described in the MLME_JOIN.request and MLME_START.request primitives that are not carried in the Supported Rates element. The information field is encoded as 1 to 255 octets where each octet describes a single supported rate.

Within Beacon, Probe Response, Association Response, and Reassociation Response management frames, each supported rate belonging to the BSS basic rate set, as defined in 10.3.10.1, is encoded as an octet with the msb (bit 7) set to 1 and bits 6 through 0 are set to the appropriate value from the valid range column of the DATA_RATE row of the table in 10.4.4.2 (e.g., a 1 Mbit/s rate belonging to the BSS basic rate set is encoded as X'82'). Rates not belonging to the BSS basic rate set are encoded with the msb set to 0, and bits 6 through 0 are set to the appropriate value from the valid range column of the DATA_RATE row of the table in 10.4.4.2 (e.g., a 2 Mbit/s rate not belonging to the BSS basic rate set is encoded as X'04'). The msb of each octet in the Extended Supported Rate element in other management frame types is ignored by receiving STAs.

BSS basic rate set information in Beacon and Probe Response management frames is used by STAs in order to avoid associating with a BSS if they do not support all the data rates in the BSS basic rate set.

For stations supporting eight or fewer data rates, this element is optional for inclusion in all of the frame types that include the supported rates element. For stations supporting more than eight data rates, this element shall be included in all of the frame types that include the supported rates element.

The Extended Supported Rates element has the format shown in Figure 42F.

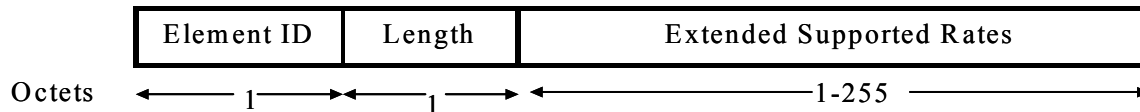


Figure 42F—Extended Supported Rates element format

9. MAC sublayer functional description

9.2 DCF

Change the eleventh paragraph in 9.2 as shown:

The medium access protocol allows for stations to support different sets of data rates. All STAs shall be able to receive and transmit at all the data rates in the aBasicRateSet specified parameter of the MLME_Join.request and MLME_Start.request primitives. To support the proper operation of the RTS/CTS and the virtual CS mechanism, all STAs shall be able to detect the RTS and CTS frames. ~~For this reason, the RTS and CTS frames shall be transmitted at one of the rates in the BSS basic rate set. (See 9.6 for a description of multirate operation.)~~

Insert the following subclauses after 9.2.10:

9.2.11 NAV distribution

When a node needs to distribute NAV information, for instance, to reserve the medium for a transmission of a non-basic rate frame (that may not be heard by other nodes in the BSS), the node may first transmit a CTS frame with the RA field equal to its own MAC address (CTS-to-self) and with a duration value that protects the pending transmission, plus possibly an ACK frame.

The CTS-to-self NAV distribution mechanism is lower in network overhead cost than is the RTS/CTS NAV distribution mechanism, but CTS-to-self is less robust against hidden nodes and collisions than RTS/CTS. STAs employing a NAV distribution mechanism should choose a mechanism such as CTS-to-self or RTS/CTS that is appropriate for the given network conditions. If errors occur when employing the CTS-to-self mechanism, STAs should switch to a more robust mechanism.

9.2.12 Determination of PLME aCWmin characteristics

In the case of the Clause 19 Extended Rate PHY, the aCWmin value is dependent on the requestor's characteristic rate set. The characteristic rate set is equal to the IBSS's supported rate set when the STA is operating as a member of an IBSS. It is equal to the AP's supported rate set when the STA is associated with an AP. At all other times, it is equal to the STA's mandatory rate set. The MAC variable aCWmin is set to aCWmin(0) if the characteristic rate set includes only rates in the set 1, 2, 5.5, 11 otherwise, aCWmin is set to aCWmin(1). If the returned value for aCWmin is a scalar, then the MAC always sets the variable aCWmin to the returned scalar value of aCWmin.