
**Telecommunications and exchange
between information technology
systems — Requirements for local and
metropolitan area networks —**

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

**AMENDMENT 3: Enhancements for very
high throughput to support Chinese
millimeter wave frequency bands
(60 GHz and 45 GHz)**

*Télécommunications et échange entre systèmes informatiques —
Exigences pour les réseaux locaux et métropolitains —*

*Partie 11: Spécifications du contrôle d'accès du milieu sans fil (MAC)
et de la couche physique (PHY)*

*AMENDEMENT 3: Améliorations pour un très haut débit afin de
prendre en charge les bandes de fréquences millimétriques chinoises
(60 GHz et 45 GHz)*



Reference number
ISO/IEC/IEEE 8802-11:2018/Amd.3:2020(E)



Documents

Document Sharing Hub
© IEEE 2018



COPYRIGHT PROTECTED DOCUMENT

© IEEE 2018

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO or IEEE at the respective address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier; Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

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

Email: stds.ipr@ieee.org
Website: www.ieee.org

Foreword

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted (see www.iso.org/directives).

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.

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents) or the IEC list of patent declarations received (see <http://patents.iec.ch>).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

ISO/IEC/IEEE 8802-11:2018/Amd 3 was prepared by the LAN/MAN of the IEEE Computer Society (as IEEE Std 802.11aj-2018) and drafted in accordance with its editorial rules. It was adopted, under the "fast-track procedure" defined in the Partner Standards Development Organization cooperation agreement between ISO and IEEE, by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 6, *Telecommunications and information exchange between systems*.

A list of all parts in the ISO/IEC/IEEE 8802 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

IEEE Std 802.11aj™-2018

(Amendment to IEEE Std 802.11™-2016
as amended by IEEE Std 802.11ai™-2016
and IEEE Std 802.11ah™-2016)

**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 3: Enhancements for Very High Throughput to Support Chinese Millimeter Wave Frequency Bands (60 GHz and 45 GHz)

Sponsor

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

Approved 15 February 2018

IEEE-SA Standards Board

Abstract: The IEEE 802.11™ directional multi-gigabit (DMG) physical layer (PHY) and the medium access control (MAC) layer are modified by this amendment to IEEE Std 802.11™-2016 to enable operation in the Chinese millimeter wave frequency band around 60 GHz. This amendment also defines modifications to the IEEE 802.11 PHY and MAC layer to enable operation in the Chinese millimeter wave frequency band around 45 GHz.

Keywords: beamforming, CDMG, China directional multi-gigabit, China millimeter-wave multi-gigabit, CMMG, DBC, DCS, dynamic bandwidth control, dynamic channel selection, IEEE 802.11™, IEEE 802.11aj™, opportunistic transmission, spatial sharing

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

Copyright © 2018 by The Institute of Electrical and Electronics Engineers, Inc.
All rights reserved. Published 18 April 2018. 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.

PDF:	ISBN 978-1-5044-4633-4	STD22964
Print:	ISBN 978-1-5044-4634-1	STDPD22964

IEEE prohibits discrimination, harassment and bullying.

For more information, visit <http://www.ieee.org/web/aboutus/whatis/policies/p9-26.html>.

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.

Important Notices and Disclaimers Concerning IEEE Standards Documents

IEEE documents are made available for use subject to important notices and legal disclaimers. These notices and disclaimers, or a reference to this page, appear in all standards and may be found under the heading “Important Notices and Disclaimers Concerning IEEE Standards Documents.” They can also be obtained on request from IEEE or viewed at <http://standards.ieee.org/IPR/disclaimers.html>.

Notice and Disclaimer of Liability Concerning the Use of IEEE Standards Documents

IEEE Standards documents (standards, recommended practices, and guides), both full-use and trial-use, are developed within IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Association (“IEEE-SA”) Standards Board. IEEE (“the Institute”) develops its standards through a consensus development process, approved by the American National Standards Institute (“ANSI”), which brings together volunteers representing varied viewpoints and interests to achieve the final product. IEEE Standards are documents developed through scientific, academic, and industry-based technical working groups. Volunteers in IEEE working groups are not necessarily members of the Institute and participate without compensation from IEEE. While IEEE administers the process and establishes rules to promote fairness in the consensus development process, IEEE does not independently evaluate, test, or verify the accuracy of any of the information or the soundness of any judgments contained in its standards.

IEEE Standards do not guarantee or ensure safety, security, health, or environmental protection, or ensure against interference with or from other devices or networks. Implementers and users of IEEE Standards documents are responsible for determining and complying with all appropriate safety, security, environmental, health, and interference protection practices and all applicable laws and regulations.

IEEE does not warrant or represent the accuracy or content of the material contained in its standards, and expressly disclaims all warranties (express, implied and statutory) not included in this or any other document relating to the standard, including, but not limited to, the warranties of: merchantability; fitness for a particular purpose; non-infringement; and quality, accuracy, effectiveness, currency, or completeness of material. In addition, IEEE disclaims any and all conditions relating to: results; and workmanlike effort. IEEE standards documents are supplied “AS IS” and “WITH ALL FAULTS.”

Use of an IEEE standard is wholly voluntary. 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.

In publishing and making its standards available, IEEE is not suggesting or rendering professional or other services for, or on behalf of, any person or entity nor is IEEE undertaking to perform any duty owed by any other person or entity to another. Any person utilizing any IEEE Standards document, should rely upon his or her own independent judgment in the exercise of reasonable care in any given circumstances or, as appropriate, seek the advice of a competent professional in determining the appropriateness of a given IEEE standard.

IN NO EVENT SHALL IEEE BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO: PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE PUBLICATION, USE OF, OR RELIANCE UPON ANY STANDARD, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE AND REGARDLESS OF WHETHER SUCH DAMAGE WAS FORESEEABLE.

Translations

The IEEE consensus development process involves the review of documents in English only. In the event that an IEEE standard is translated, only the English version published by IEEE should be considered the approved IEEE standard.

Official statements

A statement, written or oral, that is not processed in accordance with the IEEE-SA Standards Board Operations Manual shall not be considered or inferred to be the official position of IEEE or any of its committees and shall not be considered to be, or be relied upon as, a formal position of IEEE. At lectures, symposia, seminars, or educational courses, an individual presenting information on IEEE standards shall make it clear that his or her views should be considered the personal views of that individual rather than the formal position of IEEE.

Comments on standards

Comments for revision of IEEE Standards documents are welcome from any interested party, regardless of membership affiliation with IEEE. However, IEEE does not provide consulting information or advice pertaining to IEEE Standards documents. Suggestions for changes in documents should be in the form of a proposed change of text, together with appropriate supporting comments. Since IEEE standards represent a consensus of concerned interests, it is important that any responses to comments and questions also receive 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 comments or questions except in those cases where the matter has previously been addressed. For the same reason, IEEE does not respond to interpretation requests. Any person who would like to participate in revisions to an IEEE standard is welcome to join the relevant IEEE working group.

Comments on standards should be submitted to the following address:

Secretary, IEEE-SA Standards Board
445 Hoes Lane
Piscataway, NJ 08854 USA

Laws and regulations

Users of IEEE Standards documents should consult all applicable laws and regulations. Compliance with the provisions of any IEEE Standards document does not imply compliance to any applicable regulatory requirements. Implementers of the standard are responsible for observing or referring to the applicable regulatory requirements. IEEE does not, by the publication of its standards, intend to urge action that is not in compliance with applicable laws, and these documents may not be construed as doing so.

Copyrights

IEEE draft and approved standards are copyrighted by IEEE under U.S. and international copyright laws. They are made available by IEEE and are adopted for a wide variety of both public and private uses. These include both use, by reference, in laws and regulations, and use in private self-regulation, standardization, and the promotion of engineering practices and methods. By making these documents available for use and adoption by public authorities and private users, IEEE does not waive any rights in copyright to the documents.

Photocopies

Subject to payment of the appropriate fee, IEEE will grant users a limited, non-exclusive license to photocopy portions of any individual standard for company or organizational internal use or individual, non-commercial use only. To arrange for payment of licensing fees, 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.

Updating of IEEE Standards documents

Users of IEEE Standards documents should be aware that these documents may be superseded at any time by the issuance of new editions or may be amended from time to time through the issuance of amendments, corrigenda, or errata. A current IEEE document at any point in time consists of the current edition of the document together with any amendments, corrigenda, or errata then in effect.

Every IEEE standard is subjected to review at least every ten years. When a document is more than ten years old and has not undergone a revision process, 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 order to determine whether a given document is the current edition and whether it has been amended through the issuance of amendments, corrigenda, or errata, visit the IEEE-SA Website at <http://ieeexplore.ieee.org> or contact IEEE at the address listed previously. For more information about the IEEE SA or IEEE's standards development process, visit the IEEE-SA Website at <http://standards.ieee.org>.

Errata

Errata, if any, for all IEEE standards can be accessed on the IEEE-SA Website at the following URL: <http://standards.ieee.org/findstds/errata/index.html>. Users are encouraged to check this URL for errata periodically.

Patents

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 by the IEEE with respect to the existence or validity of any patent rights in connection therewith. If a patent holder or patent applicant has filed a statement of assurance via an Accepted Letter of Assurance, then the statement is listed on the IEEE-SA Website at <http://standards.ieee.org/about/sasb/patcom/patents.html>. Letters of Assurance may indicate whether the Submitter is willing or unwilling to grant licenses under patent rights without compensation or under reasonable rates, with reasonable terms and conditions that are demonstrably free of any unfair discrimination to applicants desiring to obtain such licenses.

Essential Patent Claims may exist for which a Letter of Assurance has not been received. The IEEE is not responsible for identifying Essential Patent Claims for which a license may be required, for conducting inquiries into the legal validity or scope of Patents Claims, or determining whether any licensing terms or conditions provided in connection with submission of a Letter of Assurance, if any, or in any licensing agreements are reasonable or non-discriminatory. Users of this standard are expressly advised that determination of the validity of any patent rights, and the risk of infringement of such rights, is entirely their own responsibility. Further information may be obtained from the IEEE Standards Association.

Participants

At the time this amendment was submitted to the IEEE-SA Standards Board for approval, the IEEE 802.11 Working Group had the following officers:

Adrian P. Stephens, *Chair*
Jon W. Rosdahl and **Dorothy V. Stanley**, *Vice-chairs*
Stephen McCann, *Secretary*
Robert Stacey and **Peter Ecclesine**, *Technical Editors*

The following were the officers and members of Task Group aj:

Xiaoming Peng and **Jiamin Chen**, *Chair*
Haiming Wang, *Vice-Chair*
Jiamin Chen, *Technical Editor*
Shiwen He, *Sub-Technical Editor*

Osama S. Aboulmagd
Santosh P. Abraham
Shadi A. Abu Surra
Tomoko Adachi
Kare Agardh
Jaehyun Ahn
Jinsoo Ahn
Woojin Ahn
Dmitry Akhmetov
Carlos H. Aldana
Yaron Alpert
Carol Ansley
Tsuguhide Aoki
Lee R. Armstrong
James Arnold
Yusuke Asai
Alfred Asterjadhi
Kwok Shum S. Au
Vijay Auluck
Drayton Avera
Geert A. Awater
Shahnaz Azizi
Alireza Babaei
David Bagby
Eugene Baik
Gabor Bajko
Saehee Bang
Stephane Baron
Gwendolyn Barriac
Friedbert Berens
Nehru Bhandaru
Arjun Bharadwaj
Harry Bims
Mohammud Bocus
Andre Bourdoux
David Brandt
John Buffington
Ann Bynum
George Calcev
Chris Calvert
Radhakrishna Canchi
Fengming Cao
Rui Cao

Cagatay Capar
Laurent Cariou
William Carney
Sanghyun Chang
Clint F. Chaplin
Kwang-Cheng Chen
Lidong Chen
Teyan Chen
Paul Cheng
Minho Cheong
George Cherian
Dmitry Cherniavsky
Woon Hau Chin
Hangyu Cho
Joongwon Cho
Hyeyoung Choi
In-Kyeong Choi
Jinsoo Choi
Sangsung Choi
Sayantan Choudhury
Liwen Chu
Jinyoung Chun
John Coffey
Carlos Cordeiro
Subir Das
Rolf J. de Vegt
Malcolm Dowse
Praveen Dua
Donald E. Eastlake
Richard Edgar
Alecsander Eitan
Marc Emmelmann
Vinko Erceg
Zhong Fan
Ping Fang
Yonggang Fang
Vida Ferdowsi
Norman Finn
Matthew J. Fischer
Michael Fischer
Sho Furuichi
Eduard Garcia Villegas
Majid Ghanbarinejad

Chittabrata Ghosh
Monisha Ghosh
James P. Gilb
Tim Godfrey
Michael Grigat
Zion Hadad
David Halls
Mark Hamilton
Yoshikazu Hanatani
Thomas Handte
Christopher J. Hansen
Chris Hartman
Victor Hayes
Linhai He
Ahmadreza Hedayat
Robert F. Heile
Guido R. Hiertz
Duncan Ho
Song-Nam Hong
Koji Horisaki
Victor Hou
Jing-Rong Hsieh
Chunyu Hu
He Huang
Lei Huang
Po-Kai Huang
Rongsheng Huang
David Hunter
George Hurtarte
Brima Ibrahim
Yasuhiko Inoue
Koichi Ishihara
Kentaro Ishizu
Mitsuru Iwaoka
Junichi Iwatani
Alan Jauh
Jinjing Jiang
Liang Jin
Kyungtae Jo
Jari E. Jokela
Allan Jones
Vincent Knowles Jones
Kaushik Josiam

Carl W. Kain	Hui-Ling Lou	Emily H. Qi
Naveen K. Kakani	Chuck Lukaszewski	Dengyu Qiao
Hyunduk Kang	Jun Luo	Shouxing Qu
Richard H. Kennedy	Yi Luo	Yasantha Rajakarananayake
John Kenney	Kaiying Lv	Demir Rakanovic
Stuart J. Kerry	Michael Lynch	Enrico-Henrik Rantala
Evgeny Khorov	Jing Ma	Maximilian Riegel
Sangwon Ki	Narendar Madhavan	Mark Rison
Jeehoon Kim	Shigeru Maeda	Zhigang Rong
Jeongki Kim	Rahul Malik	Richard Roy
Jin Min Kim	Jouni K. Malinen	Kiseon Ryu
Joonsuk Kim	Alexander Maltsev	Bahareh Sadeghi
Kyeongpyo Kim	Hiroshi Mano	Takenori Sakamoto
Myeong-Jin Kim	James Marin	Kazuyuki Sakoda
Suhwook Kim	Roger Marks	Hemant Sampath
Yongho Kim	Simone Merlin	Ioannis Sarris
Youhan Kim	Filip Mestanov	Shigenobu Sasaki
Youngsoo Kim	James Miller	Naotaka Sato
Youn-Kwan Kim	Apurva Mody	Sigurd Schelstraete
Dimitri Kirimis	Bibhu Mohanty	Daniel Schneider
Anton Kiryanov	Pooya Monajemi	Andy Scott
Shoichi Kitazawa	Michael Montemurro	Jonathan Segev
David Kloper	Leo Montreuil	Yongho Seok
Jarkko Knecht	Sungho Moon	Peng Shao
Geonjung Ko	Hiroki Mori	Stephen J. Shellhammer
Fumihide Kojima	Kenichi Mori	Bazhong Shen
Tom Kolze	Masahito Mori	Ian Sherlock
Igal Kotzer	Hitoshi Morioka	Shusaku Shimada
Bruce P. Kraemer	Yuichi Morioka	Jung-Chul Shin
Rajesh Kumar	Hirofumi Motozuka	Robert Slater
Byung-Jae Kwak	Robert Mueller	Graham K. Smith
Jin-Sam Kwak	Andrew Myles	Ju-Hyung Son
Yong-Jin Kwon	Toshihisa Nabetani	Hayeong Song
Young Hoon H. Kwon	Yukimasa Nagai	Nah-Oak Song
Massinissa Lalam	Yuhei Nagao	Sudhir Srinivasa
Paul Lambert	Hiroki Nakano	Noel Stott
Zhou Lan	Sai Shankar S. Nandagopalan	Jung Hoon H. Suh
Leonardo Lanante	Chiu Ngo	Bo Sun
James Lansford	Paul Nikolich	Li-Hsiang Sun
Daewon Lee	Yujin Noh	Sheng Sun
Jae Seung S. Lee	John Notor	Yakun Sun
Jehun Lee	Knut Odman	Yanjun Sun
Joonsoo Lee	Minseok Oh	Kazuaki Takahashi
Wookbong Lee	Min-Seok Oh	Mineo Takai
Young Ha Lee	Robert Olesen	Yasushi Takatori
Zhongding Lei	Oghenekome Oteri	Sagar Tamhane
James Lepp	Kazuyuki Ozaki	Yusuke Tanaka
Joseph Levy	Santosh Ghanshyam G. Pandey	Tomoya Tandai
Dejian Li	Jiyong Pang	Kentaro Taniguchi
Guoqing Li	Thomas Pare	Alireza Tarighat
Huan-Bang Li	Eunsung Park	Bin Tian
Jing Li	Hyungu Park	Qingjiang Tian
Yanchun Li	Jeonghwan Park	Tao Tian
Dong Guk Lim	Sung-jin Park	Payam Torab
Wei Lin	Glenn Parsons	Filippo Tosato
Yingpei Lin	Abhishek Patil	Solomon B. Trainin
Chenchen Liu	Eldad Perahia	Toshimitsu Tsubaki
Der-Zheng Liu	Hakan Persson	Esa Tuomaala
Jianhan Liu	James E. Petranovich	Yoshio Urabe
Le Liu	Albert Petrick	Allert Van Zelst
Pei Liu	Walter Penciak	Lorenzo Vangelista
Yong Liu	Steve Pope	Prabodh Varshney
Peter Loc	Ron Porat	Venkata Ramanan
Artyom Lomayev	Rethnakaran Pulikoonattu	Venkatachalam Jayara

Ganesh Venkatesan
Sameer Vermani
George A. Vlantis
Chao Chun Wang
Huizhao Wang
James June J. Wang
Lei Wang
Qi Wang
Xiaofei Wang
Xuehuan Wang
Lisa Ward
Fujio Watanabe
Menzo M. Wentink
Leif Wilhelmsson
Eric Wong
Harry R. Worstell

Tianyu Wu
Yan Xin
Weimin Xing
Qi Xue
Akira Yamada
Rui Yang
Xun Yang
Yunsong Yang
Ke Yao
James Yee
Peter Yee
Hidetoshi Yokota
Su Khiong K. Yong
Christopher Young
Chinghwa Yu

Heejung Yu
Jian Yu
Mao Yu
Tevfik Yucek
Katsuo D. Yunoki
Hongyuan Zhang
Jiayin Zhang
Xingxin Zhang
Yan Zhang
Mu Zhao
Xiaowu Zhao
Jun Zheng
Yan Zhou
Chunhui Zhu
Lan Zhuo
Juan Carlos Zuniga

Major contributions were received from the following individuals:

Edward Au
Jiamin Chen
Jixin Chen
Qian Chen
Zhe Chen
Carlos Cordeiro
Guanglong Du
Marc Emmelmann
Xiaojing Fan
Wei Feng
Bo Gao
Xinlu Gao
Ning Ge
Nan Guo
Peng Hao
Shiwen He
Wei Hong
Frank Hsu
Jingyi Hu
Shanguo Huang
Yongming Huang

Depeng Jin
Bruce P. Kraemer
Dejian Li
Liang Li
Liguang Li
Zhiqiang Li
Ning Lin
Jianhan Liu
Pei Liu
Stephen McCann
Yong Niu
Xiaoming Peng
Eldad Perahia
Jon W. Rosdahl
Yongho Seok
Robert Stacey
Dorothy V. Stanley
Adrian P. Stephens
Li Su
Bo Sun
Kaibo Tian

Tong Tian
Payam Torab
Haiming Wang
Hao Wang
Zhenyu Xiao
Weimin Xing
Jun Xu
Guangqi Yang
Jianjun Yang
Luxi Yang
James Yee
Guangrong Yue
Jianfeng Zhai
Changming Zhang
Nianzu Zhang
Yan Zhang
Bo Zhao
Jianyi Zhou
Xiaowei Zhu
Lan Zhuo
Weixia Zou

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

Osama Aboulmagd	Lei Huang	Venkatesha Prasad
Tomoko Adachi	David Hunter	R. K. Rannow
Thomas Alexander	Tetsushi Ikegami	Yazhen Ren
Nobumitsu Amachi	Noriyuki Ikeuchi	Robert Robinson
Carol Ansley	Sergiu Iordanescu	Jon W. Rosdahl
Butch Anton	Akio Iso	Naotaka Sato
Alfred Asterjadhi	Atsushi Ito	Andy Scott
Kwok Shum Au	Raj Jain	Yongho Seok
Charles Barest	Chanyong Jeong	Ian Sherlock
Harry Bims	Sangkwon Jeong	Di Dieter Smely
Demetrio Bucaneg	Piotr Karocki	Ju-Hyung Son
William Byrd	Assaf Kasher	Dorothy V. Stanley
George Calcev	Stuart Kerry	Thomas Starai
William Carney	Yongbum Kim	Adrian P. Stephens
Juan Carreon	Youhan Kim	Walter Struppler
Jiamin Chen	Yasushi Kudoh	Li Su
Paul Chiuchiolo	Thomas Kurihara	Bo Sun
Keith Chow	George Kyle	Sheng Sun
Charles Cook	James Lepp	Wu Tao
Sourav Dutta	Joseph Levy	Jun Tian
Richard Edgar	Dejian Li	Mark-Rene Uchida
Ping Fang	Zhiqiang Li	Lorenzo Vangelista
Yonggang Fang	Arthur H Light	Dmitri Varsanofiev
Liu Fangfang	Yingpei Lin	Prabodh Varshney
Shulan Feng	Jinnan Liu	George Vlantis
Wei Feng	Pei Liu	Haiming Wang
Xiang Feng	Yu Liu	Hao Wang
Chi Kei Fong	Kaiying Lv	Lei Wang
Avraham Freedman	Yuanye Ma	Xiaofei Wang
Richard Fuller	Elvis Maculuba	Karl Weber
Bo Gao	Ignacio Marin Garcia	Leif Wilhelmsson
Joel Goergen	Jeffery Masters	Yunsong Yang
Mariana Goldhamer	Stephen Mccann	James Yee
David Goodall	Michael Montemurro	Oren Yuen
Randall Groves	Michael Newman	Changming Zhang
Du Guanglong	Nicks A. Nikjoo	Jiayin Zhang
Michael Gundlach	Paul Nikolich	Xingxin Zhang
Mark Hamilton	Yong Niu	Yong-Ping Zhang
Xiao Han	Robert O'Hara	Xiangyang Zhao
Shiwen He	Satoshi Oyama	Han Zhou
Marco Hernandez	Arumugam Paventhan	Zhen Zhou
Werner Hoelzl	Xiaoming Peng	Lan Zhuo

When the IEEE-SA Standards Board approved this amendment on 15 February 2018, it had the following membership:

Jean-Philippe Faure, Chair
Ted Burse, Vice Chair
John D. Kulick, Past Chair
Konstantinos Karachalios, Secretary

Chuck Adams	Ronald W. Hotchkiss	Mehmet Ulema
Masayuki Ariyoshi	Michael Janezic	Yingli Wen
Stephen Dukes	Joseph L. Koepfinger*	Howard Wolfman
Jianbin Fan	Hung Ling	Don Wright
J. Travis Griffith	Kevin Lu	Yu Yuan
Gary Hoffman	Annette D. Reilly	Daidi Zhong
	Gary Robinson	

*Member Emeritus

Introduction

This introduction is not part of IEEE Std 802.11aj-2018, IEEE Standard for Information technology—Local and metropolitan area networks—Specific requirements—Part 11: Wireless LAN MAC and PHY Specifications—Amendment 3: Enhancements for Very High Throughput to Support Chinese Millimeter Wave Frequency Bands (60 GHz and 45 GHz).

The purpose of this amendment is to support operation in the Chinese millimeter wave frequency bands (60 GHz and 45 GHz) to enable multi-Gb/s throughput.

Contents

1.	Overview	27
1.3	Supplementary information on purpose	27
3.	Definitions, acronyms, and abbreviations	28
3.2	Definitions specific to IEEE Std 802.11	28
3.4	Abbreviations and acronyms	29
4.	General description	30
4.3	Components of the IEEE 802.11 architecture	30
4.3.25	CDMG STA	30
4.3.26	CMMG STA	30
6.	Layer management	32
6.3	MLME SAP interface	32
6.3.3	Scan	32
6.3.3.3	MLME-SCAN.confirm	32
6.3.7	Associate	32
6.3.7.2	MLME-ASSOCIATE.request	32
6.3.7.3	MLME-ASSOCIATE.confirm	33
6.3.7.4	MLME-ASSOCIATE.indication	33
6.3.7.5	MLME-ASSOCIATE.response	34
6.3.8	Reassociate	35
6.3.8.2	MLME-REASSOCIATE.request	35
6.3.8.3	MLME-REASSOCIATE.confirm	35
6.3.8.4	MLME-REASSOCIATE.indication	36
6.3.8.5	MLME-REASSOCIATE.response	37
6.3.11	Start	37
6.3.11.2	MLME-START.request	37
6.3.26	TS management interface	38
6.3.26.1	General	38
6.3.26.2	MLME-ADDTS.request	39
6.3.26.3	MLME-ADDTS.confirm	39
6.3.26.4	MLME-ADDTS.indication	40
6.3.26.5	MLME-ADDTS.response	41
6.3.118	DCS procedure	42
6.3.118.1	General	42
6.3.118.2	MLME-DCSMEASUREMENT.request	42
6.3.118.3	MLME-DCSMEASUREMENT.indication	43
6.3.118.4	MLME-DCSMEASUREMENT.response	43
6.3.118.5	MLME-DCSMEASUREMENT.confirm	44
6.3.118.6	MLME-DCS.request	45
6.3.118.7	MLME-DCS.indication	45
6.3.118.8	MLME-DCS.response	46
6.3.118.9	MLME-DCS.confirm	47

9.	Frame formats	48
9.2	MAC frame formats	48
9.2.3	General frame format	48
9.2.4	Frame fields	48
9.2.4.1	Frame Control field	48
9.2.4.6a	CMMG Control field	49
9.3	Format of individual frame types	51
9.3.3	Management frames	51
9.3.3.6	Association Request frame format	51
9.3.3.7	Association Response frame format	51
9.3.3.8	Reassociation Request frame format	52
9.3.3.9	Reassociation Response frame format	52
9.3.3.10	Probe Request frame format	52
9.3.3.11	Probe Response frame format	53
9.3.4	Extension frames	53
9.3.4.2	DMG Beacon	53
9.4	Management and Extension frame body components	55
9.4.1	Fields that are not elements	55
9.4.1.7	Reason Code field	55
9.4.1.9	Status Code field	55
9.4.1.11	Action field	55
9.4.1.46	Band ID field	56
9.4.1.47a	CMMG Parameters field	56
9.4.1.61	CMMG MIMO Control field	56
9.4.1.62	CMMG Compressed Beamforming Report field	57
9.4.1.63	CMMG Operating Mode field	60
9.4.2	Elements	62
9.4.2.1	General	62
9.4.2.132	Extended Schedule element	62
9.4.2.134a	CMMG TSPEC element	65
9.4.2.147	Cluster Report element	65
9.4.2.217	CDMG Capabilities element	66
9.4.2.218	Dynamic Bandwidth Control element	68
9.4.2.219	CDMG Extended Schedule element	69
9.4.2.220	SSW Report element	71
9.4.2.221	Cluster Probe element	72
9.4.2.222	Extended Cluster Report element	73
9.4.2.223	Cluster Switch Announcement element	74
9.4.2.224	Enhanced Beam Tracking element	74
9.4.2.225	SPSH Report element	76
9.4.2.226	Clustering Interference Assessment element	77
9.4.2.227	CMMG Capabilities element	78
9.4.2.228	CMMG Operation element	86
9.4.2.229	CMMG Operating Mode Notification element	87
9.4.2.230	CMMG Link Margin element	87
9.4.2.231	CMMG Link Adaptation Acknowledgment element	88
9.5	Fields used in Management and Extension frame bodies and Control frames	89
9.5.1	Sector Sweep field	89
9.6	Action frame format details	89
9.6.8	Public Action details	89
9.6.8.1	Public Action frames	89
9.6.8.37	DCS Measurement Request frame format	90
9.6.8.38	DCS Measurement Response frame format	91

9.6.8.39	DCS Request frame format.....	93
9.6.8.40	DCS Response frame format	94
9.6.8.41	Extended Notification Period Request frame format.....	94
9.6.8.42	Extended Notification Period Response frame format	95
9.6.8.43	Extended Channel Splitting Request frame format	95
9.6.8.44	Extended Channel Splitting Response frame format.....	96
9.6.22	Unprotected DMG Action frame details.....	97
9.6.22.2	Announce frame format	97
9.6.22.3	BRP frame format.....	97
9.6.29	CDMG Action frame details.....	97
9.6.29.1	CDMG Action field	97
9.6.29.2	Notification Period Request frame format.....	98
9.6.29.3	Notification Period Response frame format	98
9.6.29.4	Channel Splitting Request frame format	99
9.6.29.5	Channel Splitting Response frame format.....	99
9.6.29.6	CDMG Allocation Request frame format.....	100
9.6.29.7	CDMG Allocation Response frame format	100
9.6.30	CMMG Action frame details	101
9.6.30.1	CMMG Action field.....	101
9.6.30.2	CMMG Compressed Beamforming frame format.....	101
9.6.30.3	Operating Mode Notification frame format.....	102
10.	MAC sublayer functional description.....	103
10.2	MAC architecture	103
10.2.1	General.....	103
10.3	DCF.....	104
10.3.2	Procedures common to the DCF and EDCAF	104
10.3.2.6a	CMMG RTS procedure	104
10.3.2.7	CTS and DMG CTS procedure.....	104
10.3.4	DCF access procedure	104
10.3.4.4	Recovery procedures and retransmit limits	104
10.7	Multirate support.....	105
10.7.1	Overview.....	105
10.7.7a	Multirate support for CMMG STAs.....	105
10.7.7a.1	Usage of CMMG Control modulation class	105
10.7.7a.2	Rate selection rules for Control frames transmitted by CMMG STAs.....	105
10.7.7a.3	Rate selection for group addressed Data and Management frames transmitted by CMMG STAs.....	106
10.7.7a.4	Rate selection for individually addressed Data and Management frames transmitted by CMMG STAs.....	106
10.7.7a.5	Rate selection for BRP packets for CMMG STAs	107
10.7.9	Modulation classes.....	108
10.7.14	Rate selection constraints for CMMG STAs	108
10.7.14.1	Rx supported CMMG MCS and NSS set	108
10.7.14.2	Tx supported CMMG MCS and NSS set.....	109
10.9a	CMMG Control field operation	109
10.12	A-MSDU operation.....	109
10.14	PPDU duration constraint	110
10.17	STBC operation	110
10.20	Group ID and partial AID in VHT and CMMG PPDU's	110
10.22	HCF.....	112
10.22.2	HCF contention based channel access (EDCA)	112

10.22.2.4	Obtaining an EDCA TXOP	112
10.22.2.7	Multiple frame transmission in an EDCA TXOP	113
10.22.2.12	EDCA channel access in a CMMG BSS	113
10.30	Sounding PPDU's	114
10.31	Link adaptation	115
10.31.4	Link adaptation using the CMMG Control field	115
10.31a	CMMG beamforming	117
10.32	Transmit beamforming	118
10.32.1	HT steering matrix calculations	118
10.32.5	Explicit feedback beamforming for CMMG STAs	118
10.34a	Null data packet (NDP) sounding for CMMG STAs	121
10.34a.1	NDP rules	121
10.34a.2	Transmission of a CMMG NDP	122
10.34a.3	Determination of CMMG NDP destination	122
10.34a.4	Determination of CMMG NDP source	123
10.36	DMG and CMMG channel access	123
10.36.1	General	123
10.36.2	Access periods within a beacon interval	123
10.36.3	ATI transmission rules	124
10.36.4	DTI transmission rules	125
10.36.5	Contention based access period (CBAP) transmission rules	125
10.36.6	Channel access in scheduled DTI	126
10.36.6.1	General	126
10.36.6.2	Service period (SP) allocation	126
10.36.6.6	DMG and CMMG protected period	126
10.36.7	Dynamic allocation of service period	131
10.36.7.3	Grant period (GP)	131
10.36.8	Dynamic truncation of service period	131
10.36.8.1	DMG dynamic truncation of service period	131
10.36.8.2	CDMG dynamic truncation of service period	132
10.36.10	Updating multiple NAVs	132
10.36.11	Opportunistic transmission in alternative channel for CDMG STAs	134
10.37	DMG and CMMG AP or PCP clustering	136
10.37.1	General	136
10.37.3	Cluster maintenance	137
10.37.3.4	Centralized AP or PCP cluster MAC requirements	137
10.37.5	Decentralized AP or PCP cluster request	137
10.37a	CDMG AP or PCP clustering	138
10.37a.1	General	138
10.37a.2	Cluster formation	138
10.37a.2.1	Decentralized CDMG AP or PCP cluster formation	138
10.37a.2.2	Centralized CDMG AP or PCP cluster formation	142
10.37a.3	Cluster maintenance	144
10.37a.3.1	General cluster maintenance	144
10.37a.3.2	Decentralized CDMG AP or PCP cluster maintenance	144
10.37a.3.3	Cluster coordination	145
10.37a.3.4	Centralized CDMG AP or PCP cluster maintenance	145
10.37a.3.5	Centralized CDMG AP or PCP cluster MAC requirements	146
10.37a.4	Cluster report and rescheduling	146
10.37a.5	Decentralized AP or PCP cluster request	147
10.37a.6	Spatial sharing in a CDMG AP or PCP cluster	147
10.38	DMG beamforming	149
10.38.1	General	149
10.38.9	CDMG enhanced beam tracking	149

10.39a	Link adaptation using the CMMG link measurement	152
10.39a.1	General	152
10.39a.2	CMMG TPC	152
10.39a.3	CMMG fast link adaptation	153
10.60	DBC mechanism for CDMG STAs	154
10.60.1	General	154
10.60.2	CDMG channel access	154
10.60.2.1	CDMG BSS operating on a 2.16 GHz channel	154
10.60.2.2	CDMG BSS operating on a 1.08 GHz channel	155
10.60.2.3	Synchronization of CDMG infrastructure BSS or PBSSs on the adjacent 1.08 GHz channels within a 2.16 GHz channel	157
10.60.3	Channel splitting of a 2.16 GHz channel	160
10.60.4	Channel expansion of a 1.08 GHz channel	161
10.60.5	Backward compatibility and interoperation	162
11.	MLME	166
11.1	Synchronization	166
11.1.4	Acquiring synchronization, scanning	166
11.1.4.3	Active scanning	166
11.2	Power management	167
11.2.3	Power management in a non-DMG infrastructure network	167
11.2.3.21	CMMG TXOP power save	167
11.2.7	Power management in a PBSS and DMG infrastructure BSS	168
11.2.7.3	PCP power management mode	168
11.32	Spatial sharing and interference mitigation for DMG STAs	168
11.32.1	General	168
11.49	DCS procedure	169
11.49.1	General	169
11.49.2	Assessing current channel condition	171
11.49.3	Requesting measurements for new operating channel	171
11.49.4	Reporting measurements	171
11.49.5	Requesting existing BSS to migrate to a new channel	171
11.49.6	Networking on the target channel	172
11.50	CMMG BSS operation	172
11.50.1	Basic CMMG BSS functionality	172
11.50.2	Channel selection methods for a CMMG BSS	173
11.50.3	Scanning requirements for CMMG STAs	173
11.50.4	Channel switching methods for a CMMG BSS	173
11.50.5	NAV assertion in a CMMG BSS	175
11.50.6	CMMG STAs antenna indication	175
11.50.7	BSS basic CMMG MCS and NSS set operation	176
12.	Security	177
12.2	Framework	177
12.2.2	Security methods	177
24.	China directional multi-gigabit (CDMG) PHY specification	178
24.1	CDMG PHY introduction	178
24.1.1	Scope	178
24.1.2	CDMG PHY functions	178
24.1.2.1	General	178

	24.1.2.2	PHY management entity (PLME).....	178
	24.1.2.3	Service specification method	178
24.2		CDMG PHY service interface	178
	24.2.1	Introduction.....	178
	24.2.2	TXVECTOR and RXVECTOR parameters	179
	24.2.3	TXSTATUS parameters	181
24.3		Common parameters	181
	24.3.1	Channelization	181
	24.3.2	Transmit mask.....	182
	24.3.3	Common requirements.....	182
		24.3.3.1 Introduction.....	182
		24.3.3.2 Center frequency tolerance	182
		24.3.3.3 Symbol clock tolerance.....	182
		24.3.3.4 Transmit center frequency leakage	183
		24.3.3.5 Transmit rampup and rampdown	183
		24.3.3.6 Antenna setting	183
		24.3.3.7 Maximum input requirement	183
		24.3.3.8 Receive sensitivity	183
	24.3.4	Timing-related parameters.....	184
	24.3.5	Mathematical conventions in the signal description.....	185
		24.3.5.1 General.....	185
		24.3.5.2 Windowing function	185
	24.3.6	Common preamble.....	185
		24.3.6.1 General.....	185
		24.3.6.2 Short Training field.....	185
		24.3.6.3 Channel Estimation field	186
	24.3.7	HCS calculation for headers of CDMG control mode and CDMG SC mode	186
	24.3.8	Common LDPC parity matrices	187
	24.3.9	Scrambler	187
	24.3.10	Received channel power indicator (RCPI) measurement	187
24.4		CDMG control mode	187
	24.4.1	Introduction.....	187
	24.4.2	PPDU format.....	187
	24.4.3	Transmission	187
		24.4.3.1 Preamble	187
		24.4.3.2 Header	188
		24.4.3.3 Data field.....	189
	24.4.4	Performance requirements	189
		24.4.4.1 Transmit requirements	189
		24.4.4.2 Receive requirements.....	190
24.5		CDMG SC mode.....	190
	24.5.1	Introduction.....	190
	24.5.2	PPDU format.....	190
	24.5.3	Transmission	191
		24.5.3.1 Header	191
		24.5.3.2 The Data field	193
	24.5.4	Performance requirements	195
		24.5.4.1 Transmit requirements	195
		24.5.4.2 Receive requirements.....	196
24.6		CDMG low-power SC mode	197
	24.6.1	Introduction.....	197
	24.6.2	Transmission	197
		24.6.2.1 Preamble	197
		24.6.2.2 Header	197

24.6.2.3	Data field.....	197
24.7	PHY transmit procedure	197
24.8	PHY receive procedure	198
24.9	Beamforming	198
24.9.1	Beamforming concept.....	198
24.9.2	Beamforming frame format	198
24.9.2.1	Sector-level sweep	198
24.9.2.2	Beam refinement.....	200
24.10	CDMG PLME.....	202
24.10.1	PLME SAP sublayer management primitives	202
24.10.2	CDMG PHY MIB	202
24.10.3	TXTIME calculation.....	202
24.10.4	PHY characteristics.....	203
25.	China millimeter-wave multi-gigabit (CMMG) PHY specification.....	204
25.1	Introduction.....	204
25.1.1	Introduction to the CMMG PHY	204
25.1.2	Scope.....	204
25.1.3	CMMG PHY functions.....	205
25.1.3.1	General.....	205
25.1.3.2	PHY management entity (PLME).....	205
25.1.3.3	Service specification method	205
25.1.3.4	PPDU formats	205
25.2	CMMG PHY service interface	205
25.2.1	Introduction.....	205
25.2.2	TXVECTOR and RXVECTOR parameters	206
25.3	Common parameters	209
25.3.1	Introduction.....	209
25.3.2	Common requirements.....	209
25.3.2.1	Introduction.....	209
25.3.2.2	Transmit RF delay	209
25.3.2.3	Center frequency tolerance	209
25.3.3	Time-related parameters	210
25.3.4	Mathematical conventions in the signal description.....	212
25.3.4.1	Notation	212
25.3.4.2	Subcarrier indices in use	212
25.3.4.3	Transmitted signal.....	212
25.3.4.4	Definition of tone rotation for OFDM mode transmission.....	214
25.3.4.5	The windowing function.....	215
25.3.5	CMMG PHY preamble.....	215
25.3.5.1	General.....	215
25.3.5.2	CMMG Short Training field	215
25.3.5.3	CMMG Channel Estimation field.....	216
25.3.6	CRC calculation	218
25.3.7	Scrambler	219
25.3.8	Common LDPC parity matrices	220
25.3.8.1	Introduction.....	220
25.3.8.2	General.....	220
25.3.9	CMMG SIG	222
25.3.9.1	General.....	222
25.3.9.2	Encoding of SIG	225
25.3.10	Duplication transmission on a 1080 MHz channel.....	225
25.3.11	h_{Filt} definition	226

25.3.12	Encoding of Data field	226
25.3.13	Received channel power indicator (RCPI) measurement	227
25.4	CMMG control mode	228
25.4.1	Introduction	228
25.4.2	PPDU format	228
25.4.3	CMMG preamble transmission	228
25.4.4	CMMG control mode SIG transmission	228
25.4.4.1	General	228
25.4.4.2	Generation of CRC bits	228
25.4.4.3	Scrambler	228
25.4.4.4	Encoding	228
25.4.4.5	Modulation	229
25.4.4.6	Spreading	229
25.4.5	CMMG control mode Data field	229
25.4.5.1	General	229
25.4.5.2	Scrambler	229
25.4.5.3	Encoder	230
25.4.5.4	Modulation	230
25.4.5.5	Spreading	230
25.4.6	CMMG control mode performance requirements	230
25.4.6.1	Transmit requirements	230
25.4.6.2	Receive requirements	231
25.5	CMMG SC mode	231
25.5.1	Introduction	231
25.5.2	Transmitter block diagram	231
25.5.3	Overview of the PPDU encoding process	232
25.5.3.1	General	232
25.5.3.2	Construction of CMMG SC mode SIG	232
25.5.3.3	Construction of CMMG SC mode PPDU	232
25.5.4	CMMG SC mode PPDU format	232
25.5.5	CMMG SC mode SIG transmission	233
25.5.5.1	SIG field	233
25.5.5.2	Generation of the CRC bits of SIG	233
25.5.5.3	Scrambler	233
25.5.5.4	Encoding and modulations	233
25.5.6	Data field transmission	234
25.5.6.1	General	234
25.5.6.2	Scrambler	234
25.5.6.3	Encoding	234
25.5.6.4	Symbol block padding zeros	234
25.5.6.5	Stream parser	235
25.5.6.6	Constellation mapping	236
25.5.6.7	Spatial expansion	237
25.5.6.8	Duplication transmission	239
25.5.7	Performance requirements	239
25.5.7.1	Transmit requirements	239
25.5.7.2	Receive requirements	241
25.6	CMMG OFDM mode	241
25.6.1	Introduction	241
25.6.2	CMMG OFDM mode PPDU format	241
25.6.3	Transmission block diagram	241
25.6.4	Overview of CMMG OFDM mode PPDU encoding process	242
25.6.4.1	General	242
25.6.4.2	Construction of CMMG OFDM mode SIG	242

25.6.4.3	Construction of CMMG OFDM mode PPDU	243
25.6.4.4	Construction of OSTF	243
25.6.4.5	Construction of OCEF	243
25.6.5	CMMG OFDM mode SIG fields	244
25.6.5.1	SIG fields	244
25.6.5.2	Modulation	244
25.6.5.3	Duplication	244
25.6.5.4	Symbol blocking, CSD, and GI insertion	244
25.6.5.5	Sample rate change	244
25.6.6	OSTF definition	245
25.6.7	OCEF definition	245
25.6.8	Data fields	248
25.6.8.1	General	248
25.6.8.2	Scrambler	248
25.6.8.3	Encoding	248
25.6.8.4	OFDM symbol padding zeros	248
25.6.8.5	Stream parser	249
25.6.8.6	Subcarrier modulation mapping	249
25.6.8.7	Tone mapping	252
25.6.8.8	Space-time block coding	252
25.6.8.9	Pilot subcarriers	253
25.6.8.10	Cyclic shift diversity (CSD) for OFDM mode data fields transmission	253
25.6.8.11	OFDM modulation	254
25.6.8.12	Duplication transmission	255
25.6.8.13	Beamforming	256
25.6.8.14	CMMG preamble format for sounding PPDU	257
25.6.9	Performance requirements	258
25.6.9.1	Transmit requirements	258
25.6.9.2	TX flatness	259
25.6.9.3	Receive requirements	260
25.7	Analog beamforming PHY frame format	260
25.7.1	TX sector sweep	260
25.7.2	Beam refinement	260
25.7.2.1	General	260
25.7.2.2	BRP packet structure	261
25.7.2.3	BRP packet SIG fields	261
25.7.2.4	Beam refinement AGC field	261
25.7.2.5	Beam refinement TRN-R field	262
25.7.2.6	Beam refinement TRN-T field	262
25.7.2.7	Channel measurement	262
25.7.2.8	BRP resampling in an OFDM mode packet	262
25.8	ZCZ sequence	263
25.9	Regulatory requirements	267
25.10	Channelization	267
25.11	Transmit spectrum mask	268
25.12	PHY transmit procedure	268
25.12.1	PHY transmit procedure for a CMMG SC mode transmission	268
25.12.2	PHY transmit procedure for a CMMG OFDM mode transmission	269
25.13	Receive procedure	272
25.13.1	SC mode receive procedure	272
25.14	CMMG PLME	273
25.14.1	PLME SAP sublayer management primitive	273
25.14.2	PHY MIB	273

25.14.3	TXTIME calculation.....	274
25.14.4	PHY characteristics.....	275
25.15	Parameters for CMMG MCSs	275
25.15.1	General.....	275
25.15.2	Parameters for CMMG MCSs with SC mode transmission	276
25.15.3	Parameters for CMMG MCSs with OFDM mode transmission.....	279
Annex B Protocol Implementation Conformance Statement (PICS) proforma		283
B.2	Abbreviations and special symbols.....	283
B.2.2	General abbreviations for Item and Support columns	283
B.4	PICS proforma	283
B.4.3	IUT configuration	283
B.4.30	CDMG features.....	283
B.4.31	CMMG features	285
Annex C ASN.1 encoding of the MAC and PHY MIB.....		286
C.3	MIB detail	286
Annex E Country elements and operating classes		300
E.1	Country information and operating classes	300
Annex W Informative procedures for CDMG STAs.....		301
W.1	Selection of candidate SPs for spatial sharing.....	301
W.2	N-phase beamforming codebook for CDMG STAs	301
W.2.1	General.....	301
W.2.2	1-D (dimensional) antenna array	302
W.2.3	2-D (dimensional) antenna array	303
W.3	Beam tracking and switching for enhanced beam tracking mechanism	304

Tables

Table 6-1—Supported TS management primitives	38
Table 9-18a—Subfields corresponding to link adaptation	49
Table 9-18b—MFB subfield in the CMMG Control field	50
Table 9-29—Association Request frame body	51
Table 9-30—Association Response frame body	51
Table 9-31—Reassociation Request frame body	52
Table 9-32—Reassociation Response frame body	52
Table 9-33—Probe Request frame body	52
Table 9-34—Probe Response frame body	53
Table 9-41—DMG Beacon frame body	53
Table 9-45—Reason codes	55
Table 9-46—Status codes	55
Table 9-47—Category values	55
Table 9-63—Band ID field	56
Table 9-76c—Subfields of the CMMG MIMO Control field	56
Table 9-76d—Order of angles in the CMMG Compressed Beamforming Report field	57
Table 9-76e—Quantization of angles	58
Table 9-76f—Compressed Beamforming Report field	58
Table 9-76g—Subcarriers for which a Matrix subfield is sent back	59
Table 9-76h—Average SNR of Space-Time Stream <i>i</i> subfield	60
Table 9-76i—Subfield values of the CMMG Operating Mode field	61
Table 9-77—Element IDs	62
Table 9-236—AllocationType subfield values	63
Table 9-236a—Protected Period subfield value for a CDMG STA operating on a 2.16 GHz channel	64
Table 9-236b—Protected Period subfield value for a CDMG STA operating on a 1.08 GHz channel	64
Table 9-262z—AllocationType subfield values for CDMG STAs	70
Table 9-262aa—Subfields of the CMMG Capabilities Info field	79
Table 9-262ab—Subfields of the A-MPDU Parameters field	82
Table 9-262ac—Supported CMMG MCS and NSS Set subfields	83
Table 9-262ad—Subfields of the Transmit Beamforming Capabilities field	84
Table 9-262ae—CMMG Operation Information field format	87
Table 9-262af—Activity field values	88
Table 9-307—Public Action field values	89
Table 9-325h—Optional subelement IDs for DCS Measurement Request frame	91
Table 9-325i—Optional subelement IDs for DCS Measurement Response frame	92
Table 9-325j—Extended Notification Period Request frame Action field format	94
Table 9-325k—Extended Notification Period Response frame Action field format	95
Table 9-325l—Extended Channel Splitting Request frame Action field format	95
Table 9-325m—Extended Channel Splitting Response frame Action field format	96
Table 9-416—Announce frame Action field format	97
Table 9-417—BRP frame Action field format	97
Table 9-421z—CDMG Action field values	98
Table 9-421aa—Notification Period Response frame Action field format	98
Table 9-421ab—Channel Splitting Response frame Action field format	99
Table 9-421ac—CDMG Allocation Response frame Action field format	100
Table 9-421ad—CMMG Action field values	101
Table 9-421ae—CMMG Compressed Beamforming frame Action field format	101
Table 9-421af—Operating Mode Notification frame Action field format	102
Table 10-6—Modulation classes	108
Table 10-9—Settings for the TXVECTOR parameters GROUP_ID and PARTIAL_AID for VHT STAs	111

Table 10-9a—Settings for the TXVECTOR parameter PARTIAL_AID for CMMG STAs	111
Table 10-12a—Channels indicated idle by the channel-list parameter	113
Table 10-18a—Rules for CMMG beamformee immediate feedback transmission responding to non-NDP sounding.....	119
Table 10-18b—Rules for CMMG beamformee immediate feedback transmission responding to NDP sounding.....	120
Table 11-a—Encoding of the Supported Channel Width Set field	166
Table 11-28—CMMG BSS operating channel width.....	172
Table 24-1—TXVECTOR and RXVECTOR parameters.....	179
Table 24-2—TXSTATUS parameters.....	181
Table 24-3—Receiver sensitivity	183
Table 24-4—Timing-related parameters	184
Table 24-5—CDMG control mode modulation and coding scheme	187
Table 24-6—CDMG control mode header fields	188
Table 24-7—CDMG robust PHY modes.....	190
Table 24-8—CDMG SC mode header fields.....	191
Table 24-9—CDMG SC mode modulation and coding schemes	192
Table 24-10—CDMG SC mode EVM requirements	195
Table 24-11—CDMG low-power SC mode modulation and coding schemes	197
Table 24-12—Zero filling for SC BRP packets with MCSs 1 to 9	201
Table 24-13—CDMG PHY MIB attribute default values	202
Table 24-14—CDMG PHY characteristics	203
Table 25-1—TXVECTOR and RXVECTOR parameters.....	206
Table 25-2—Receiver sensitivity	210
Table 25-3—Time-related parameters.....	210
Table 25-4—Frequently used parameters.....	211
Table 25-5—CH_BANDWIDTH and γ_k ,CBW	214
Table 25-6—Base matrix prototypes for codeword block length n_z bits, subblock size is z bits	221
Table 25-7—Fields in the CMMG SIG field.....	222
Table 25-8—Modulation and coding scheme for the CMMG control mode	228
Table 25-9—The Barker(L) sequences.....	229
Table 25-10—EVM requirement for control mode.....	230
Table 25-11—Cyclic shift values for the CMMG SIG field	234
Table 25-12—Values of mSE	235
Table 25-13—Values of $NCBPB$	235
Table 25-14—Values of $NDSPB$ and $NUWPB$	237
Table 25-15—Constellation mapper output to spatial mapper input.....	238
Table 25-16—EVM requirements for SC mode.....	240
Table 25-17—Number of OCEFs required for different numbers of space-time streams	246
Table 25-18—Modulation-dependent normalization factor	249
Table 25-19—BPSK encoding table.....	251
Table 25-20—QPSK encoding table	251
Table 25-21—16-QAM encoding table.....	251
Table 25-22—64-QAM encoding table.....	251
Table 25-23—Value of tone mapping parameter	252
Table 25-24—Constellation mapper output to spatial mapper input for STBC	252
Table 25-25—Pilot values for CBW 540 MHz transmission	253
Table 25-26—Pilot values for CBW 1080 MHz transmission.....	253
Table 25-27—Cyclic shift values for the data fields of an OFDM mode PPDU	254
Table 25-28—Maximum available space-time streams	258
Table 25-29—EVM requirements for OFDM.....	259
Table 25-30—The sequence set Z_{i32} , $i=1,2,3,4$	265
Table 25-31—The sequence set Z_{i64} , $i=1,2,3,4$	265
Table 25-32—The sequence set Z_{i128} , $i=1,2,3,4$	265

Table 25-33—The sequence set Zi256, i=1,2,3,4.....	266
Table 25-34—The sequence set Zi512, i=1,2,3,4.....	266
Table 25-35—Fields to specify CMMG channels.....	267
Table 25-36—CMMG PHY MIB attributes.....	273
Table 25-37—CMMG PHY characteristics.....	275
Table 25-38—CMMG SC MCSs for mandatory 540 MHz, Nss=1.....	276
Table 25-39—CMMG SC MCSs for optional 540 MHz, Nss=2 (Optional).....	276
Table 25-40—CMMG SC MCSs for optional 540 MHz, Nss=3 (Optional).....	277
Table 25-41—CMMG SC MCSs for optional 540 MHz, Nss=4 (Optional).....	277
Table 25-42—CMMG SC MCSs for mandatory 1080 MHz, Nss=1.....	277
Table 25-43—CMMG SC MCSs for optional 1080 MHz, Nss=2 (Optional).....	278
Table 25-44—CMMG SC MCSs for optional 1080 MHz, Nss=3 (Optional).....	278
Table 25-45—CMMG SC MCSs for optional 1080 MHz, Nss=4 (Optional).....	279
Table 25-46—CMMG OFDM MCSs for optional 540 MHz, Nss=1 (Optional).....	279
Table 25-47—CMMG OFDM MCSs for optional 540 MHz, Nss=2 (Optional).....	279
Table 25-48—CMMG OFDM MCSs for optional 540 MHz, Nss=3 (Optional).....	280
Table 25-49—CMMG OFDM MCSs for optional 540 MHz, Nss=4 (Optional).....	280
Table 25-50—CMMG OFDM MCSs for optional 1080 MHz, Nss=1 (Optional).....	281
Table 25-51—CMMG OFDM MCSs for optional 1080 MHz, Nss=2 (Optional).....	281
Table 25-52—CMMG OFDM MCSs for optional 1080 MHz, Nss=3 (Optional).....	281
Table 25-53—CMMG OFDM MCSs for optional 1080 MHz, Nss=4 (Optional).....	282
Table E-5—Operating classes in China.....	300

Figures

Figure 9-1—MAC frame format.....	48
Figure 9-15b—CMMG Control field	49
Figure 9-15c—MFB subfield in the CMMG Control field	50
Figure 9-15d—MSI/STBC subfield when the Unsolicited MFB subfield is 1.....	51
Figure 9-62—Clustering Control field format if the Discovery Mode field is 0.....	54
Figure 9-121d—CMMG MIMO Control field	56
Figure 9-121e—CMMG Operating Mode field.....	61
Figure 9-518—Allocation control subfield format (DMG).....	62
Figure 9-518a—Allocation Control subfield format (CDMG).....	63
Figure 9-524a—Constraint subfield format for CMMG STAs	65
Figure 9-524b—Interferer Channel Bandwidth subfield format	65
Figure 9-541—Cluster Report Control field format	65
Figure 9-589cj—CDMG Capabilities element format	66
Figure 9-589ck—CDMG STA Capability Information field format.....	66
Figure 9-589cl—Supported MCS Set subfield format	67
Figure 9-589cm—CDMG AP or PCP Capability Information field format	68
Figure 9-589cn—Dynamic Bandwidth Control element format	68
Figure 9-589co—DBC Control field format	68
Figure 9-589cp—CDMG Extended Schedule element format.....	70
Figure 9-589cq—Allocation field format.....	70
Figure 9-589cr—BF Control field format when both IsInitiatorTXSS and IsResponderTXSS subfields are equal to 1 and the BF Control field is transmitted in Grant or Grant Ack frames.....	71
Figure 9-589cs—BF Control field format in all other cases	71
Figure 9-589ct—SSW Report element format	71
Figure 9-589cu—Report Info field format when the SSW Report Control subfield is 1	72
Figure 9-589cv—Report Info field format when the SSW Report Control subfield is 0	72
Figure 9-589cw—Cluster Probe element format.....	73
Figure 9-589cx—Extended Cluster Report element format	73
Figure 9-589cy—Cluster Switch Announcement element format	74
Figure 9-589cz—Enhanced Beam Tracking element format	75
Figure 9-589da—E-BT Control field format.....	75
Figure 9-589db—Peer TX Antenna Parameter field format.....	76
Figure 9-589dc—SPSH Report element format	76
Figure 9-589dd—SPSH List field format.....	76
Figure 9-589de—Clustering Interference Assessment element format.....	77
Figure 9-589df—Clustering SPSH Control field format.....	77
Figure 9-589dg—CMMG Capabilities element format.....	78
Figure 9-589dh—CMMG Capabilities Info field.....	78
Figure 9-589di—A-MPDU Parameters field.....	82
Figure 9-589dj—Supported CMMG MCS and NSS Set field	82
Figure 9-589dk—Rx CMMG MCS Map and Tx CMMG MCS Map subfields and Basic CMMG MCS and NSS Set field.....	83
Figure 9-589dl—Transmit Beamforming Capabilities field	84
Figure 9-589dm—CMMG AP or PCP Capability Information field format.....	85
Figure 9-589dn—CMMG Operation element format.....	86
Figure 9-589do—CMMG Operation Information field.....	86
Figure 9-589dp—CMMG Operating Mode Notification element.....	87
Figure 9-589dq—CMMG Link Margin element format	87
Figure 9-589dr—CMMG Link Adaptation Acknowledgment element format.....	89
Figure 9-635—SSW field format	89
Figure 9-687f—DCS Measurement Request frame Action field format.....	90

Figure 9-687g—DCS Channel Measurement Request subelement format	91
Figure 9-687h— DCS Measurement Response frame Action field format.....	92
Figure 9-687i—DCS Channel Measurement Report subelement format	93
Figure 9-687j— DCS Request frame Action field format.....	93
Figure 9-687k— DCS Response frame Action field format	94
Figure 9-740e—Notification Period Request frame Action field format	98
Figure 9-740f—Channel Splitting Request frame Action field format	99
Figure 9-740g—CDMG Allocation Request frame Action field format.....	100
Figure 10-1—Non-DMG non-CMMG non-S1G STA MAC architecture	103
Figure 10-2a—CMMG STA MAC architecture.....	103
Figure 10-54a—Example of access periods within a BI for CMMG STAs	124
Figure 10-56a—An example of creating a CDMG protected period on two channels for CDMG STAs.....	129
Figure 10-57a—Opportunistic transmission in alternative channels for CDMG STAs.....	135
Figure 10-58a—Example of a decentralized AP or PCP cluster on a 1.08 GHz channel	139
Figure 10-58b—Example of decentralized clusters for two APs or PCPs of a synchronization pair	140
Figure 10-58c—Example of joining the CDMG AP or PCP cluster for a CDMG AP or PCP involved in a synchronization pair with another AP or PCP	141
Figure 10-58d—Example of spatial sharing with interference mitigation among multiple BSSs	149
Figure 10-84a—Example of an enhanced beam tracking procedure with the initiator requesting TRN-R	151
Figure 10-84b—Example of an enhanced beam tracking procedure with the initiator requesting TRN-T	151
Figure 10-104—Example of an AP or PCP that starts its infrastructure BSS or PBSS on channel 35 by transmitting DMG Beacon frames on both channel 2 and channel 35.....	155
Figure 10-105—Example of a CDMG AP or PCP that starts its infrastructure BSS or PBSS on channel 35 by transmitting DMG Beacon frames on channel 2 only	155
Figure 10-106—Two APs or PCPs with NPs arranged consecutively.....	159
Figure 10-107—Two APs or PCPs with BHIs arranged apart from each other.....	159
Figure 10-108—Service cessation for an AP or PCP on channel 35.....	159
Figure 10-109—Moving TBTT by a neighboring AP or PCP on channel 2	160
Figure 10-110—AP or PCP operating on channel 35 with independent beacon interval expanding the operating bandwidth to channel 2	162
Figure 10-111—AP or PCP operating on channel 35 without independent beacon interval expanding the operating bandwidth to channel 2	162
Figure 10-112—SPs or CBAPs allocated for DMG STAs on channel 2 with beacon intervals starting on channel 35	164
Figure 10-113—SPs or CBAPs allocated for DMG STAs on channel 2 without starting a beacon interval on channel 35	164
Figure 10-114—SPs or CBAPs allocated for DMG STAs on channel 2 with beacon intervals starting on channels 35 and 36.....	164
Figure 10-115—SPs or CBAPs allocated for DMG STAs on channel 2 without starting a beacon interval on channels 35 and 36	165
Figure 11-6a—PCP factor for a CDMG STA operating on a 1.08 GHz channel.....	166
Figure 11-54—Examples of using DCS procedure	169
Figure 11-55—Procedure of dynamic channel selection.....	170
Figure 24-1—Transmit mask.....	182
Figure 24-2—CDMG SC mode preamble	185
Figure 24-3—Channel Estimation field for SC packets	186
Figure 24-4—CDMG control mode PPDU format.....	187
Figure 24-5—CDMG control mode preamble.....	188
Figure 24-6—SC frame format.....	190
Figure 24-7—64-QAM constellation bit encoding.....	194
Figure 24-8—Typical Tx state machine (Training Length=0 is assumed; some optional features such as CDMG SC low-power mode are not shown).....	199
Figure 24-9—BRP packet structure (CDMG STAs).....	200

Figure 25-1—Packet structure for the SC mode PPDU with CBW 540 MHz	213
Figure 25-2—Packet structure for the SC mode PPDU with CBW 1080 MHz	213
Figure 25-3—Packet structure for the OFDM mode PPDU	213
Figure 25-4—Control mode preamble	216
Figure 25-5—CMMG SC mode preamble for CBW 540 MHz	217
Figure 25-6—CMMG SC mode preamble for CBW 1080 MHz	217
Figure 25-7—CMMG OFDM mode preamble for CBW 540 MHz	218
Figure 25-8—CMMG OFDM mode preamble for CBW 1080 MHz	218
Figure 25-9—16-bit CRC calculation	219
Figure 25-10—8-bit CRC calculation	219
Figure 25-11—Scrambler	219
Figure 25-12—CMMG SIG structure	222
Figure 25-13—CMMG control mode PPDU format	228
Figure 25-14—Constellation bit encoding for BPSK	229
Figure 25-15—Transmitter block diagram for CMMG SC mode SIG field	231
Figure 25-16—Transmitter block diagram for data fields of CMMG SC mode PPDUs	231
Figure 25-17—Format of CMMG SC mode PPDU	233
Figure 25-18—QPSK constellation bit encoding	236
Figure 25-19—16-QAM constellation bit encoding	236
Figure 25-20—64-QAM constellation bit encoding	237
Figure 25-21—Block transmission	238
Figure 25-22—Format of the CMMG OFDM mode PPDU	241
Figure 25-23—Transmitter block diagram for CMMG OFDM mode SIG fields	241
Figure 25-24—Transmitter block diagram for the data field of CMMG OFDM mode	242
Figure 25-25—Generation of OCEF symbols per frequency segment	247
Figure 25-26—BPSK, QPSK, 16-QAM, and 64-QAM constellation bit encoding	250
Figure 25-27—CMMG NDP format	257
Figure 25-28—BRP packet structure	261
Figure 25-29—TRN-R field definition	262
Figure 25-30—TRN-T field definition	262
Figure 25-31—Generation of ZCZ sequences set	263
Figure 25-32—Channelization for CBW 540 MHz	267
Figure 25-33—Channelization for CBW 1080 MHz	267
Figure 25-34—Example transmit spectral mask for a PPDU	268
Figure 25-35—PHY transmit procedure for a CMMG SC mode transmission	268
Figure 25-36—PHY transmit procedure for a CMMG OFDM mode transmission	269
Figure 25-37—Typical Tx state machine	271
Figure 25-38—PHY receive procedure for a CMMG SC mode transmission	272
Figure W-1—An arrange mode of 1-D uniform linear antenna array	302
Figure W-2—Beam patterns generated by the codebook	303
Figure W-3—An arrange mode of 2-D uniform linear antenna array	303

**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 3: Enhancements for Very High
Throughput to Support Chinese Millimeter Wave
Frequency Bands (60 GHz and 45 GHz)**

(This amendment is based on IEEE Std 802.11™-2016 as amended by IEEE Std 802.11ai™-2016 and IEEE Std 802.11ah™-2016.)

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

Editing instructions are shown ***bold italic***. Four editing instructions are used: change, delete, insert, and replace. ***Change*** is used to make corrections in existing text or tables. The editing instruction specifies the location of the change and describes what is being changed by using either ~~strike through~~ (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 instruction. ***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 because the changes will be incorporated into the base standard.¹

1. Overview

1.3 Supplementary information on purpose

Insert the following item at the end of the dashed list in 1.3:

- Defines the PHY and MAC enhancements to enable operation in the Chinese millimeter wave frequency bands (60 GHz and 45 GHz).

¹ Notes in text, tables, and figures are given for information only and do not contain requirements needed to implement the standard.

3. Definitions, acronyms, and abbreviations

3.2 Definitions specific to IEEE Std 802.11

Insert the following definitions into 3.2 in alphabetical order:

China directional multi-gigabit (CDMG): Pertaining to operation in DMG and where the channel is contained within the Chinese 60 GHz frequency band.

NOTE—The Chinese 60 GHz channel set is defined in Table E-5 in Annex E.

China directional multi-gigabit small band beacon interval (CDMG SBBI): A value, in units of TUs, represents the length of a beacon interval (BI) operating on a 1.08 GHz channel.

China millimeter-wave multi-gigabit (CMMG): Pertaining to operation in a frequency band containing a channel in 42.3 GHz to 47.3 GHz or 47.2 GHz to 48.4 GHz frequency bands.

NOTE—The Chinese 45 GHz channel set is defined in Table E-5 in Annex E.

China millimeter-wave multi-gigabit (CMMG) basic service set (BSS): A BSS in which DMG Beacon frames are transmitted by CMMG stations (STAs).

China millimeter-wave multi-gigabit (CMMG) duplicate physical layer (PHY) protocol data unit (PPDU) format: The data transmission (TXVECTOR parameter CH_BANDWIDTH equal to CBW1080) duplicates the transmission of a 540 MHz signal over every 540 MHz frequency segment.

China millimeter-wave multi-gigabit (CMMG) physical layer (PHY) protocol data unit (PPDU): A Clause 26 PPDU transmitted or received using the Clause 26 physical layer (PHY).

China millimeter-wave multi-gigabit (CMMG) beamformee: A CMMG station (STA) that receives a CMMG physical layer (PHY) protocol data unit (PPDU) that was transmitted using a beamforming steering matrix and that supports the CMMG transmit beamforming feedback mechanism as described in 10.34a.

China millimeter-wave multi-gigabit (CMMG) beamformer: A CMMG station (STA) that transmits a CMMG physical layer (PHY) protocol data unit (PPDU) using a beamforming steering matrix.

China millimeter-wave multi-gigabit (CMMG) single medium access control (MAC) protocol data unit (CMMG single MPDU): An MPDU that is the only MPDU in an aggregate MPDU (A-MPDU) carried in a CMMG physical layer (PHY) protocol data unit (PPDU) and that is carried in an A-MPDU subframe with the EOF subfield of the MPDU delimiter field equal to 1.

synchronizing access point (AP) or personal basic service set (PBSS) control point (PCP): A CDMG AP or PCP that is operating on a 1.08 GHz channel but still transmitting its DMG Beacon frames on the relevant 2.16 GHz channel with the AP or PCP Role subfield of the Dynamic Bandwidth Control element (9.4.2.218) set to 0 and providing synchronization service to a synchronized AP or PCP on the relevant 2.16 GHz channel.

synchronized access point (AP) or personal basic service set (PBSS) control point (PCP): A CDMG AP or PCP that is operating on a 1.08 GHz channel but still transmitting its DMG Beacon frames on the relevant 2.16 GHz channel with the AP or PCP Role subfield of the Dynamic Bandwidth Control element (9.4.2.218) set to 1 and synchronizing with the synchronizing AP or PCP on the relevant 2.16 GHz channel.

3.4 Abbreviations and acronyms

Insert the following abbreviations into 3.4 in alphabetical order:

CEF	channel estimation field
CDMG	China directional multi-gigabit
DBC	dynamic bandwidth control
DCS	dynamic channel selection
OCEF	OFDM channel estimation field
CMMG	China millimeter-wave multi-gigabit
SBBI	small band beacon interval
SCEF	single carrier channel estimation field
OSTF	OFDM short training field
ZCZ	zero correlation zone

4. General description

4.3 Components of the IEEE 802.11 architecture

Insert the following subclauses, 4.3.25 and 4.3.26, after 4.3.24:

4.3.25 CDMG STA

The IEEE 802.11 CDMG STA is a DMG STA that supports CDMG operation in Chinese 60 GHz frequency band when `dot11CDMGOptionImplemented` is true. In addition to CDMG features, a CDMG STA supports DMG features as described in 4.3.21. A CDMG STA also supports CDMG features as identified in Clause 10, Clause 11, and Clause 24. A CDMG STA supports transmission and reception of frames that are compliant with PHY specifications as defined in Clause 24. A CDMG STA is also a QoS STA. The basic channel access of a CDMG STA (see 10.36 and 10.60) allows it to operate in an Infrastructure BSS or in an IBSS or in a PBSS.

Besides supporting DMG PHY features defined in Clause 20, a CDMG STA also supports the PHY signaling as described in 24.4, 24.5, and 24.6. At a minimum, a CDMG STA supports the mandatory modulation and coding scheme (MCS) and PHY protocol data unit (PPDU) formats described in 24.4 and 24.5.

4.3.26 CMMG STA

The IEEE 802.11 CMMG STA operates in 42.3 GHz to 47.3 GHz or 47.2 GHz to 48.4 GHz frequency bands.

The main PHY features in a CMMG STA are the following:

- 540 MHz channel width
- Control mode and SC mode (directional transmit and receive)
- Single spatial stream MCS 0 (control mode transmit and receive) in all supported channel widths
- Single spatial stream MCSs 1 to 3 (SC mode transmit and receive) in all supported channel widths
- LDPC coding with length 672
- Normal guard interval as defined in Table 25-3
- Optional support for 1080 MHz channel width
- Optional support for CMMG MCSs 4 to 8 (SC mode transmit and receive)
- Optional support for CMMG MCSs 9 to 16 (OFDM mode transmit and receive)
- Optional support for short guard interval (transmit and receive)
- Optional support for LDPC coding with length 2016
- Optional support MIMO transmission (SC mode and OFDM mode transmit and receive)
- Optional support for STBC (transmit and receive)
- Optional support for transmit beamforming sounding (by sending a CMMG NDP)
- Optional support for responding to transmit beamforming sounding

The CMMG STA provides PHY and MAC features that can support a throughput of 1 Gb/s and greater, as measured at the MAC data service access point (SAP). A CMMG STA supports CMMG features as identified in Clause 10, Clause 11, and Clause 25. A CMMG STA operates in a CMMG BSS and supports transmission and reception of frames that are compliant with PHY specifications as defined in Clause 25. A CMMG STA is also a QoS STA. The basic channel access of a CMMG STA (see 10.36) allows it to operate in an Infrastructure BSS, in an IBSS, or in a PBSS. Certain CMMG features such as service period allocation are available only to CMMG STAs that are associated with an AP or with a PCP, while other

CMMG features such as EDCA operation in a PBSS do not require association. A CMMG STA supports beamforming (BF) as described in 10.38 and 20.10 and GCM encryption as described in 12.5.5.

A CMMG STA supports the PHY signaling as described in 25.4, 25.5, and 25.6. At a minimum, a CMMG STA supports the mandatory modulation and coding scheme (MCS) and PHY protocol data unit (PPDU) formats described in 25.4 and 25.5. A CMMG STA has PHY features that include a low-density parity check (LDPC) encoding, a preamble making use of zero correlation zone (ZCZ) sequences, and beamforming. The PPDU is always transmitted with the same channel spacing as described in Annex E.

A CMMG STA supports MAC features that provide channel access in an environment in which transmissions use a directional antenna pattern or use multiple input multiple output antenna pattern. A CMMG STA has MAC features that include frame aggregation, block ack features, service periods, contention based access periods, CMMG protected period, AP or PCP clustering, dynamic channel time management, reverse direction, spatial sharing, beamforming, and fast session transfer in a multi-band device. A CMMG STA is not a mesh STA. A CMMG STA follows the same channel access rules irrespective of the type of BSS in which it operates.

6. Layer management

6.3 MLME SAP interface

6.3.3 Scan

6.3.3.3 MLME-SCAN.confirm

6.3.3.3.2 Semantics of the service primitive

Insert the following rows at the end of the untitled table describing BSSDescriptions in 6.3.3.3.2:

Name	Type	Valid range	Description	IBSS adoption
CDMG Capabilities	CDMG Capabilities element	As defined in 9.4.2.217.	Specifies the parameters within the CDMG Capabilities element that are supported by the MAC entity. The parameter is present if dot11CDMGOptionImplemented is true; otherwise not present.	Do not adopt.
CMMG Capabilities	CMMG Capabilities element	As defined in 9.4.2.227.	Specifies the parameters within the CMMG Capabilities element that are supported by the MAC entity. The parameter is present if dot11CMMGOptionImplemented is true; otherwise not present.	Do not adopt.
CMMG Operation	CMMG Operation element	As defined in 9.4.2.228.	Specifies the parameters within the CMMG Operation element that are supported by the MAC entity. The parameter is present if dot11CMMGOptionImplemented is true; otherwise not present.	Do not adopt.

6.3.7 Associate

6.3.7.2 MLME-ASSOCIATE.request

6.3.7.2.2 Semantics of the service primitive

Insert the following parameters in the primitive parameters list in 6.3.7.2.2:

```
MLME-ASSOCIATE.request(
    ...
    CDMG Capabilities,
    CMMG Capabilities,
    VendorSpecificInfo
)
```

Insert the following rows before the VendorSpecificInfo row in the untitled table in 6.3.7.2.2:

Name	Type	Valid range	Description
CDMG Capabilities	CDMG Capabilities element	As defined in 9.4.2.217.	Specifies the parameters within the CDMG Capabilities element that are supported by the MAC entity. The parameter is present if dot11CDMGOptionImplemented is true; otherwise not present.
CMMG Capabilities	CMMG Capabilities element	As defined in 9.4.2.227.	Specifies the parameters within the CMMG Capabilities element that are supported by the MAC entity. The parameter is present if dot11CMMGOptionImplemented is true; otherwise not present.

6.3.7.3 MLME-ASSOCIATE.confirm

6.3.7.3.2 Semantics of the service primitive

Insert the following parameters in the primitive parameters list in 6.3.7.3.2:

The primitive parameters are as follows:

```
MLME-ASSOCIATE.confirm(
    ...
    CDMG Capabilities,
    CMMG Capabilities,
    VendorSpecificInfo
)
```

Insert the following rows before the VendorSpecificInfo row in the untitled table in 6.3.7.3.2:

Name	Type	Valid range	Description
CDMG Capabilities	CDMG Capabilities element	As defined in 9.4.2.217.	Specifies the parameters within the CDMG Capabilities element that are supported by the MAC entity. The parameter is present if dot11CDMGOptionImplemented is true; otherwise not present.
CMMG Capabilities	CMMG Capabilities element	As defined in 9.4.2.227.	Specifies the parameters within the CMMG Capabilities element that are supported by the MAC entity. The parameter is present if dot11CMMGOptionImplemented is true; otherwise not present.

6.3.7.4 MLME-ASSOCIATE.indication

6.3.7.4.2 Semantics of the service primitive

Insert the following parameters in the primitive parameters list in 6.3.7.4.2:

The primitive parameters are as follows:

MLME-ASSOCIATE.indication(

...
CDMG Capabilities,
CMMG Capabilities,
VendorSpecificInfo
)

Insert the following rows before the VendorSpecificInfo row in the untitled table in 6.3.7.4.2:

Name	Type	Valid range	Description
CDMG Capabilities	CDMG Capabilities element	As defined in 9.4.2.217.	Specifies the parameters within the CDMG Capabilities element that are supported by the MAC entity. The parameter is present if dot11CDMGOptionImplemented is true; otherwise not present.
CMMG Capabilities	CMMG Capabilities element	As defined in 9.4.2.227.	Specifies the parameters within the CMMG Capabilities element that are supported by the MAC entity. The parameter is present if dot11CMMGOptionImplemented is true; otherwise not present.

6.3.7.5 MLME-ASSOCIATE.response

6.3.7.5.2 Semantics of the service primitive

Insert the following parameters in the primitive parameters list in 6.3.7.5.2:

The primitive parameters are as follows:

MLME-ASSOCIATE.response(
 ...
CDMG Capabilities,
CMMG Capabilities,
VendorSpecificInfo
)

Insert the following rows before the VendorSpecificInfo row in the untitled table in 6.3.7.5.2:

Name	Type	Valid range	Description
CDMG Capabilities	CDMG Capabilities element	As defined in 9.4.2.217.	Specifies the parameters within the CDMG Capabilities element that are supported by the MAC entity. The parameter is present if dot11CDMGOptionImplemented is true; otherwise not present.
CMMG Capabilities	CMMG Capabilities element	As defined in 9.4.2.227.	Specifies the parameters within the CMMG Capabilities element that are supported by the MAC entity. The parameter is present if dot11CMMGOptionImplemented is true; otherwise not present.

6.3.8 Reassociate

6.3.8.2 MLME-REASSOCIATE.request

6.3.8.2.2 Semantics of the service primitive

Insert the following parameters in the primitive parameters list in 6.3.8.2.2:

The primitive parameters are as follows:

```
MLME-REASSOCIATE.request(  
    ...  
    CDMG Capabilities,  
    CMMG Capabilities,  
    VendorSpecificInfo  
)
```

Insert the following rows before the VendorSpecificInfo row in the untitled table in 6.3.8.2.2:

Name	Type	Valid range	Description
CDMG Capabilities	CDMG Capabilities element	As defined in 9.4.2.217.	Specifies the parameters within the CDMG Capabilities element that are supported by the MAC entity. The parameter is present if dot11CDMGOptionImplemented is true; otherwise not present.
CMMG Capabilities	CMMG Capabilities element	As defined in 9.4.2.227.	Specifies the parameters within the CMMG Capabilities element that are supported by the MAC entity. The parameter is present if dot11CMMGOptionImplemented is true; otherwise not present.

6.3.8.3 MLME-REASSOCIATE.confirm

6.3.8.3.2 Semantics of the service primitive

Insert the following parameters in the primitive parameters list in 6.3.8.3.2:

The primitive parameters are as follows:

```
MLME-REASSOCIATE.confirm(  
    ...  
    CDMG Capabilities,  
    CMMG Capabilities,  
    VendorSpecificInfo  
)
```

Insert the following rows before the VendorSpecificInfo row in the untitled table in 6.3.8.3.2:

Name	Type	Valid range	Description
CDMG Capabilities	CDMG Capabilities element	As defined in 9.4.2.217.	Specifies the parameters within the CDMG Capabilities element that are supported by the MAC entity. The parameter is present if dot11CDMGOptionImplemented is true; otherwise not present.
CMMG Capabilities	CMMG Capabilities element	As defined in 9.4.2.227.	Specifies the parameters within the CMMG Capabilities element that are supported by the MAC entity. The parameter is present if dot11CMMGOptionImplemented is true; otherwise not present.

6.3.8.4 MLME-REASSOCIATE.indication

6.3.8.4.2 Semantics of the service primitive

Insert the following parameters in the primitive parameters list in 6.3.8.4.2:

The primitive parameters are as follows:

```
MLME-REASSOCIATE.indication(
    ...
    CDMG Capabilities,
    CMMG Capabilities,
    VendorSpecificInfo
)
```

Insert the following rows before the VendorSpecificInfo row in the untitled table in 6.3.8.4.2:

Name	Type	Valid range	Description
CDMG Capabilities	CDMG Capabilities element	As defined in 9.4.2.217.	Specifies the parameters within the CDMG Capabilities element that are supported by the MAC entity. The parameter is present if dot11CDMGOptionImplemented is true; otherwise not present.
CMMG Capabilities	CMMG Capabilities element	As defined in 9.4.2.227.	Specifies the parameters within the CMMG Capabilities element that are supported by the MAC entity. The parameter is present if dot11CMMGOptionImplemented is true; otherwise not present.

6.3.8.5 MLME-REASSOCIATE.response

6.3.8.5.2 Semantics of the service primitive

Insert the following parameters in the primitive parameters list in 6.3.8.5.2:

The primitive parameters are as follows:

```
MLME-REASSOCIATE.response(  
    ...  
    CDMG Capabilities,  
    CMMG Capabilities,  
    VendorSpecificInfo  
)
```

Insert the following rows before the VendorSpecificInfo row in the untitled table in 6.3.8.5.2:

Name	Type	Valid range	Description
CDMG Capabilities	CDMG Capabilities element	As defined in 9.4.2.217.	Specifies the parameters within the CDMG Capabilities element that are supported by the MAC entity. The parameter is present if dot11CDMGOptionImplemented is true; otherwise not present.
CMMG Capabilities	CMMG Capabilities element	As defined in 9.4.2.227.	Specifies the parameters within the CMMG Capabilities element that are supported by the MAC entity. The parameter is present if dot11CMMGOptionImplemented is true; otherwise not present.

6.3.11 Start

6.3.11.2 MLME-START.request

6.3.11.2.2 Semantics of the service primitive

Insert the following parameters in the primitive parameters list in 6.3.11.2.2:

The primitive parameters are as follows:

```
MLME-START.request(  
    ...  
    CDMG Capabilities,  
    CMMG Capabilities,  
    CMMG Operation,  
    VendorSpecificInfo  
)
```

Insert the following rows before the VendorSpecificInfo row in the untitled table in 6.3.11.2.2:

Name	Type	Valid range	Description
CDMG Capabilities	CDMG Capabilities element	As defined in 9.4.2.217.	Specifies the parameters within the CDMG Capabilities element that are supported by the MAC entity. The parameter is present if dot11CDMGOptionImplemented is true.
CMMG Capabilities	CMMG Capabilities element	As defined in 9.4.2.227.	Specifies the parameters within the CMMG Capabilities element that are supported by the MAC entity. The parameter is present if dot11CMMGOptionImplemented is true and is absent otherwise.
CMMG Operation	CMMG Operation element	As defined in 9.4.2.228.	Specifies the parameters within the CMMG Operation element that are supported by the MAC entity. The parameter is present if dot11CMMGOptionImplemented is true; otherwise not present.

6.3.11.2.4 Effect of receipt

Insert the following paragraph before the last paragraph of 6.3.11.2.4:

If the MLME of a CMMG STA receives an MLME-START.request primitive with a Basic CMMG MCS and NSS Set field in the CMMG Operation parameter containing any unsupported <CMMG MCS, NSS> tuple, the MLME response in the resulting MLME-START.confirm primitive contains a ResultCode parameter that is not set to the value SUCCESS.

6.3.26 TS management interface

6.3.26.1 General

Change Table 6-1 as follows:

Table 6-1—Supported TS management primitives

Primitive	Request	Confirm	Indication	Response
ADDTS (in the context of establishing a TS)	DMG STA <u>CMMG STA</u> non-AP QoS STA	DMG STA <u>CMMG STA</u> non-AP QoS STA	DMG STA <u>CMMG STA</u> HC	DMG STA <u>CMMG STA</u> HC
ADDTS (in the context of requesting an allocation)	Non-AP and non-PCP DMG STA <u>CMMG STA</u>	Non-AP and non-PCP DMG STA <u>CMMG STA</u>	DMG AP or PCP <u>CMMG AP or PCP</u>	DMG AP or PCP <u>CMMG AP or PCP</u>
DELTS	DMG STA <u>CMMG STA</u> non-AP QoS STA HC	DMG STA <u>CMMG STA</u> non-AP QoS STA HC	DMG STA <u>CMMG STA</u> non-AP QoS STA HC	—
ADDTSRESERVE	HC	HC	non-AP QoS STA	non-AP QoS STA

6.3.26.2 MLME-ADDTS.request

6.3.26.2.2 Semantics of the service primitive

Change the primitive parameter list in 6.3.26.2.2 as follows:

The primitive parameters are as follows:

```
MLME-ADDTS.request (
    DialogToken,
    TSPEC,
    TCLAS,
    TCLASProcessing,
    U-APSD Coexistence,
    EBR,
    IntraAccessCategoryPriority,
    HigherLayerStreamID,
    STAAddress,
    DMG TSPEC,
    CMMG TSPEC,
    Multi-band,
    U-PID,
    MMS,
    VendorSpecificInfo
)
```

Insert the following row after the ‘DMG TSPEC’ row in the untitled table in 6.3.26.2.2:

Name	Type	Valid range	Description
CMMG TSPEC	CMMG TSPEC element	As defined in 9.4.2.134a.	Specifies the characteristics and QoS scheduling requirements of the CMMG allocation request.

6.3.26.3 MLME-ADDTS.confirm

6.3.26.3.2 Semantics of the service primitive

Change the primitive parameter list in 6.3.26.3.2 as follows:

The primitive parameters are as follows:

```
MLME-ADDTS.confirm(
    ResultCode,
    DialogToken,
    TSDelay,
    TSPEC,
    Schedule,
    TCLAS,
    TCLASProcessing,
    EBR,
    HigherLayerStreamID,
    STAAddress,
    DMG TSPEC,
```

CMMG TSPEC,
 Multi-band,
 U-PID,
 MMS,
 VendorSpecificInfo
)

Insert the following rows after the ‘DMG TSPEC’ row in the untitled table in 6.3.26.3.2:

Name	Type	Valid range	Description
CMMG TSPEC	CMMG TSPEC element	As defined in 9.4.2.228.	Specifies the characteristics and QoS scheduling requirements of the CMMG allocation request.

Change the first two paragraphs after the untitled table in 6.3.26.3.2 as follows:

For the ResultCode value of SUCCESS received by a non-DMG STA or a non-CMMG STA, the TSPEC and the optional TCLAS parameters describe the characteristics of the TS that has been created (or modified); and the specified (nonzero) parameters [with the exception of Service Start Time, Medium Time, and any possibly unspecified minimum set of parameters (see 10.22.4.3) in the TSPEC element in an ADDTS Request frame] exactly match those of the matching MLME-ADDTS.request primitive.

For other values of ResultCode received by a non-DMG STA or a non-CMMG STA, no new TS has been created. In the case of REJECTED_WITH_SUGGESTED_CHANGES, the TSPEC represents an alternative proposal by the HC based on information about the current status of the MAC entity. In the case of REJECTED_HOME_WITH_SUGGESTED_CHANGES, the TSPEC represents an alternative proposal by the HC based on information received from the SSPN interface. A TS is not created with this definition. If the suggested changes are acceptable to the STA, it is the responsibility of the STA to set up the TS with the suggested changes.

6.3.26.3.3 When generated

Change the second paragraph of 6.3.26.3.3 as follows:

This primitive is generated when that MLME-ADDTS.request primitive is found to contain invalid parameters, when a timeout occurs, or when the STA receives a response in the form of an ADDTS Response frame in the corresponding QoS Action frame from the HC, ~~or~~ DMG STA, or CMMG STA.

6.3.26.4 MLME-ADDTS.indication

6.3.26.4.1 Function

Change 6.3.26.4.1 as follows:

This primitive reports to the DMG STA’s SME, CMMG STA’s SME, or HC’s SME the request for adding (or modifying) a TS.

6.3.26.4.2 Semantics of the service primitive

Change the primitive parameter list in 6.3.26.4.2 as follows:

```
MLME-ADDTS.indication (
    DialogToken,
    STAAddress,
    TSPEC,
    TCLAS,
    TCLASProcessing,
    U-APSD Coexistence,
    EBR,
    IntraAccessCategoryPriority,
    HigherLayerStreamID,
    DMG TSPEC,
    CMMG TSPEC,
    Multi-band,
    U-PID,
    MMS,
    VendorSpecificInfo
)
```

Insert the following row after the ‘DMG TSPEC’ row in the untitled table in 6.3.26.4.2:

Name	Type	Valid range	Description
CMMG TSPEC	CMMG TSPEC element	As defined in 9.4.2.134a.	Specifies the characteristics and QoS (scheduling) requirements of the CMMG allocation request.

6.3.26.5 MLME-ADDTS.response

6.3.26.5.2 Semantics of the service primitive

Change the primitive parameter list in 6.3.26.5.2 as follows:

The primitive parameters are as follows:

```
MLME-ADDTS.response (
    ResultCode,
    DialogToken,
    STAAddress,
    TSDelay,
    TSPEC,
    Schedule,
    TCLAS,
    TCLASProcessing,
    U-APSD Coexistence,
    EBR,
    HigherLayerStreamID,
    DMG TSPEC,
    CMMG TSPEC,
    Multi-band,
```

U-PID,
 MMS,
 VendorSpecificInfo
)

Insert the following row after the 'DMG TSPEC' row in the untitled table in 6.3.26.5.2:

Name	Type	Valid range	Description
CMMG TSPEC	CMMG TSPEC element	As defined in 9.4.2.134a.	Specifies the characteristics and QoS (scheduling) requirements of the CMMG allocation request.

Insert the following subclause, 6.3.118, after 6.3.117.5.4:

6.3.118 DCS procedure

6.3.118.1 General

This subclause describes the management procedures associated with the dynamic channel selection mechanism.

6.3.118.2 MLME-DCSMEASUREMENT.request

6.3.118.2.1 Function

This primitive requests transmission of a DCS Measurement Request frame to the DCS responder AP or PCP with which to perform the DCS procedure.

6.3.118.2.2 Semantics of the service primitive

The primitive parameters are as follows:

MLME-DCSMEASUREMENT.request (
 DCSResponderAddress,
 DCSMeasurementRequest
)

Name	Type	Valid range	Description
DCSResponderAddress	MAC Address	Any valid individual MAC address.	Specifies the MAC address of the AP or PCP to which the DCS Measurement Request frame is transmitted.
DCSMeasurementRequest	DCS Measurement Request Action field	As defined in 9.6.8.37.	Specifies the parameters of the DCS measurement request.

6.3.118.2.3 When generated

This primitive is generated by the SME to request that a DCS Measurement Request frame be sent to the DCS responder AP or PCP with which to perform the DCS procedure.

6.3.118.2.4 Effect on receipt

On receipt of this primitive, the MLME indicates the MAC sublayer to construct and attempt to transmit a DCS Measurement Request frame.

6.3.118.3 MLME-DCSMEASUREMENT.indication

6.3.118.3.1 Function

This primitive indicates that a DCS Measurement Request frame is received.

6.3.118.3.2 Semantics of the service primitive

The primitive parameters are as follows:

MLME-DCSMEASUREMENT.indication (
 DCSRequesterAddress,
 DCSMeasurementRequest
)

Name	Type	Valid range	Description
DCSRequesterAddress	MAC Address	Any valid individual MAC address.	Specifies the MAC address of the AP or PCP from which the DCS Measurement Request frame is received.
DCSMeasurementRequest	DCS Measurement Request Action field	As defined in 9.6.8.37.	Specifies the parameters of the DCS measurement request.

6.3.118.3.3 When generated

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

6.3.118.3.4 Effect on receipt

Once the SME receives this primitive, the STA operates according to the procedure defined in 11.49.

6.3.118.4 MLME-DCSMEASUREMENT.response

6.3.118.4.1 Function

This primitive requests transmission of a DCS Measurement Report frame to the DCS requester AP or PCP with which to perform the DCS procedure.

6.3.118.4.2 Semantics of the service primitive

The primitive parameters are as follows:

MLME-DCSMEASUREMENT.response (
 DCSRequesterAddress,
 DCSMeasurementReport
)

Name	Type	Valid range	Description
DCSRequesterAddress	MAC Address	Any valid individual MAC address.	Specifies the MAC address of the AP or PCP to which the DCS Measurement Report frame is transmitted.
DCSMeasurementReport	DCS Measurement Report Action field	As defined in 9.6.8.40.	Specifies the parameters of the DCS measurement response.

6.3.118.4.3 When generated

This primitive is generated by the SME to request that a DCS Measurement Report frame be sent to the DCS requester AP or PCP with which to perform the DCS procedure.

6.3.118.4.4 Effect on receipt

On receipt of this primitive, the MLME indicates the MAC sublayer to construct and attempt to transmit a DCS Measurement Report frame.

6.3.118.5 MLME-DCSMEASUREMENT.confirm

6.3.118.5.1 Function

This primitive indicates that a DCS Measurement Report frame was received.

6.3.118.5.2 Semantics of the service primitive

The primitive parameters are as follows:

MLME-DCSMEASUREMENT.confirm (
 DCSResponderAddress,
 DCSMeasurementReport
)

Name	Type	Valid range	Description
DCSResponderAddress	MAC Address	Any valid individual MAC address.	Specifies the MAC address of the AP or PCP from which the DCS Measurement Report frame was received.
DCSMeasurementReport	DCS Measurement Report Action field	As defined in 9.6.8.40.	Specifies the parameters of the DCS measurement response.

6.3.118.5.3 When generated

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

6.3.118.5.4 Effect on receipt

Once the SME receives this primitive, the STA operates according to the procedure defined in 11.49.

6.3.118.6 MLME-DCS.request

6.3.118.6.1 Function

This primitive requests transmission of a DCS Request frame to the DCS responder AP or PCP with which to perform the DCS procedure.

6.3.118.6.2 Semantics of the service primitive

The primitive parameters are as follows:

```
MLME-DCS.request (
    DCSResponderAddress,
    DCSRequest
)
```

Name	Type	Valid range	Description
DCSResponderAddress	MAC Address	Any valid individual MAC address.	Specifies the MAC address of the AP or PCP to which the DCS Request frame is transmitted.
DCSRequest	DCS Request Action field	As defined in 9.6.8.39.	Specifies the parameters of the DCS request.

6.3.118.6.3 When generated

This primitive is generated by the SME to request that a DCS Request frame be sent to the DCS responder AP or PCP with which to perform the DCS procedure.

6.3.118.6.4 Effect on receipt

On receipt of this primitive, the MLME indicates the MAC sublayer to construct and attempt to transmit a DCS Request frame.

6.3.118.7 MLME-DCS.indication

6.3.118.7.1 Function

This primitive indicates that a DCS Request frame is received.

6.3.118.7.2 Semantics of the service primitive

The primitive parameters are as follows:

```
MLME-DCS.indication (
    DCSRequesterAddress,
    DCSRequest
)
```

Name	Type	Valid range	Description
DCSRequesterAddress	MAC Address	Any valid individual MAC address.	Specifies the MAC address of the AP or PCP from which the DCS Request frame is received.
DCSRequest	DCS Request Action field	As defined in 9.6.8.39.	Specifies the parameters of the DCS request.

6.3.118.7.3 When generated

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

6.3.118.7.4 Effect on receipt

Once the SME receives this primitive, the STA operates according to the procedure defined in 11.49.

6.3.118.8 MLME-DCS.response

6.3.118.8.1 Function

This primitive requests transmission of a DCS Response frame to the DCS requester AP or PCP with which to perform the DCS procedure.

6.3.118.8.2 Semantics of the service primitive

The primitive parameters are as follows:

MLME-DCS. Response (
 DCSRequesterAddress,
 DCSResponse
)

Name	Type	Valid range	Description
DCSRequesterAddress	MAC Address	Any valid individual MAC address.	Specifies the MAC address of the AP or PCP to which the DCS Measurement Report frame is transmitted.
DCS Response	DCS Response Action field	As defined in 9.6.8.40.	Specifies the parameters of the DCS response.

6.3.118.8.3 When generated

This primitive is generated by the SME to provide the results of a DCS request.

6.3.118.8.4 Effect on receipt

On receipt of this primitive, the MLME indicates the MAC layer to construct and attempt to transmit a DCS Response frame.