

ISO/IEC JTC 1/SC 6

Secretariat: KATS

Voting begins on:  
2021-10-29

Voting terminates  
2022-03-18

## Telecommunications and information exchange between systems — Wireless Regional Area Networks (WRAN) — Specific requirements —

Part 22:

**Cognitive Wireless RAN Medium  
Access Control (MAC) and Physical  
Layer (PHY) Specifications: Policies  
and procedures for operation in the  
bands that allow spectrum sharing  
where the communications devices  
may opportunistically operate in the  
spectrum of primary service**

*Télécommunications et échange d'information entre systèmes —  
Réseaux régionaux sans fil (WRAN) — Exigences spécifiques —*

*Partie 22: Spécifications du contrôle d'accès du milieu sans fil cognitif  
(MAC) et de la couche physique (PHY) : Politiques et procédures pour  
le fonctionnement dans les bandes qui permettent le partage du  
spectre, où les dispositifs de communication peuvent fonctionner de  
manière opportuniste dans le spectre du service primaire*

RECIPIENTS OF THIS DRAFT ARE INVITED TO  
SUBMIT, WITH THEIR COMMENTS, NOTIFICATION  
OF ANY RELEVANT PATENT RIGHTS OF WHICH  
THEY ARE AWARE AND TO PROVIDE SUPPORTING  
DOCUMENTATION.

IN ADDITION TO THEIR EVALUATION AS  
BEING ACCEPTABLE FOR INDUSTRIAL, TECHNO-  
LOGICAL, COMMERCIAL AND USER PURPOSES,  
DRAFT INTERNATIONAL STANDARDS MAY ON  
OCCASION HAVE TO BE CONSIDERED IN THE  
LIGHT OF THEIR POTENTIAL TO BECOME STAND-  
ARDS TO WHICH REFERENCE MAY BE MADE IN  
NATIONAL REGULATIONS.



Reference number  
ISO/IEC/IEEE FDIS 8802-22:2021(E)

© IEEE 2020

## iTeh STANDARD PREVIEW (standards.iteh.ai)

ISO/IEC/IEEE FDIS 8802-22  
<https://standards.iteh.ai/catalog/standards/sist/f0bfe455-3663-4a56-8ac1-08cebc5905e8/iso-iec-ieee-fdis-8802-22>



### **COPYRIGHT PROTECTED DOCUMENT**

© IEEE 2020

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 IEEE at the address below.

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

Email: [stds.ipr@ieee.org](mailto:stds.ipr@ieee.org)  
Website: [www.ieee.org](http://www.ieee.org)

Published in Switzerland

## 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/IEC documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives) or [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs)).

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](http://www.iso.org/patents)) or the IEC list of patent declarations received (see [patents.iec.ch](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](http://www.iso.org/iso/foreword.html). In the IEC, see [www.iec.ch/understanding-standards](http://www.iec.ch/understanding-standards).

ISO/IEC/IEEE 8802-22 was prepared by the LAN/MAN of the IEEE Computer Society (as IEEE Std 802.22-2019) 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*.

This second edition cancels and replaces the first edition (ISO/IEC/IEEE 8802-22:2015), which has been technically revised.

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

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](http://www.iso.org/members.html) and [www.iec.ch/national-committees](http://www.iec.ch/national-committees).

**Abstract:** This standard specifies the air interface, including the cognitive medium access control layer (MAC) and physical layer (PHY), of point-to-multipoint wireless regional area networks (WRANs) comprised of a professional fixed base station (BS) with fixed and portable user terminals operating in the VHF/UHF TV broadcast bands between 54 MHz to 862 MHz, and potentially in the 1300 MHz to 1750 MHz, and 2700 MHz to 3700 MHz bands provided the regulatory regime allows it.

**Keywords:** broadband wireless access network, cognitive radio, fixed user terminals, IEEE 802.22™, portable user terminals, radio spectrum sensing, regional area network, WRAN standards

## iTeh STANDARD PREVIEW (standards.iteh.ai)

ISO/IEC/IEEE FDIS 8802-22  
<https://standards.iteh.ai/catalog/standards/sist/f0bfe455-3663-4a56-8ac1-08cebc5905e8/iso-iec-ieee-fdis-8802-22>

---

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

Copyright © 2020 by The Institute of Electrical and Electronics Engineers, Inc.  
All rights reserved. Published 5 May 2020. Printed in the United States of America.

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

Print: ISBN 978-1-5044-6148-1 STDPD23878  
PDF: ISBN 978-1-5044-6147-4 STD23878

*IEEE prohibits discrimination, harassment, and bullying.*

For more information, visit [http://www.ieee.org/web/aboutus/what\\_is/policies/p9-26.html](http://www.ieee.org/web/aboutus/what_is/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.

<https://standards.ieee.ai/catalog/standards/sist/f0bfe455-3663-4a56-8ac1->

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 US 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. An official 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 10 years. When a document is more than 10 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 IEEE Xplore 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

ISO/IEC/IEEE FDIS 8802-22  
<https://standards.ieee.org/catalog/standards/sist/f0bfe455-3663-4a56-8ac1-08cebc5905e8/iso-iec-ieee-fdis-8802-22>

Errata, if any, for IEEE standards can be accessed via <https://standards.ieee.org/standard/index.html>. Search for standard number and year of approval to access the web page of the published standard. Errata links are located under the Additional Resources Details section. Errata are also available in IEEE Xplore: <https://ieeexplore.ieee.org/browse/standards/collection/ieee/>. Users are encouraged to periodically check for errata.

## 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 <https://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

The following is a list of participants in the Wireless Regional Area Networks Working Group:

**Apurva N. Mody**, *Chair*  
**Oliver Holland**, *Vice Chair*  
**Ranga K. Reddy**, *Lead Editor*

Subir Das  
 Robert F. Heile

Gianfranco Miele

Paul Nikolich  
 Steve Shellhammer

## Historical participants

At the time this standard was submitted to the IEEE SA for approval, the following voting members had participated in the IEEE P802.22 Working Group until December 2011:

**Apurva N. Mody**, *Chair*  
**Gerald Chouinard**, *Vice Chair and Lead Editor*

Kyu Hwan An	Wen Gao	Bruce Kraemer
Chee Wei Ang	Ingo Gaspard	Steve Kuffner
Kwok Shum Au	Monisha Ghosh	Denis Kuwahara
Mark Austin	Joanna Guenin	Chang-Ho Lee
Anuj Batra	Jin Guo	Geunho Lee
John Benko	Thomas Gurley	Haeyoung Lee
Robert Berger	JaeSong Han	Jeong Suk Lee
Dagnachew Birru	Hiroshi Harada	Zhongding Lei
Scott Blue	Ahren Hartman	Wing Seng Leon
Monique Bourgeois Brown	Robert F. Heile	Barry Lewis
Gregory Buchwald	Anh Twan Hoang	Lingjie Li
Winston Caldwell	Michael Hoghooghi	Ying-Chang Liang
Ed Callaway	Mark Hopkins	Euntack Lim
Dave Cavalcanti	Victor Hou	Kyutae Lim
Kiran Challapali	Wendong Hu	Jiezhen Lin
Soo-Young Chang	Junhong Hui	Hang Liu
Remi Chayer	Duckdong Hwang	Jinnan Liu
Shiuh Yuan Chen	Sung Hyun Hwang	Michael Lynch
Tao Chen	Tae-In Hyon	Steve Mace
Jinxia Cheng	Yutaka Ikeda	David Magee
Aik Chindapol	Soon Ik Jeon	Ben Manny
InHwan Choi	Baowei Ji	David Mazzaresse
Liwen Chu	Ravi Kalavakunta	Tony Morella
Joon-Hwa Chun	Jerome J. Kalke	Peter Murray
Chris Clanton	Bub-Joo Kang	Max Muterspaugh
Charles Cook	Mark Kelley	Mullaguru Naidu
Charles Cooper	Ramon Khalona	Paul Nikolich
Carlos Cordeiro	Thomas Kiernan	John Notor
Subir Das	Byoung-Jo Kim	Moh Nouroozian
W. Carl Day	Chang-Joo Kim	Seungmok Oh
Upkar Dhaliwal	HakSun Kim	Barry O'Mahony
Johnny Dixon	Kihong Kim	Ashish Pandharipande
Peter Ecclesine	Sangbum Kim	Juha Pihlaja
Charles Einolf	Gwangzeen Ko	Patrick Pirat
Michael Fischer	Tom Kolze	Ron Porat



Jeff Poston	Dave Silk	JungSun Um
Jim Raab	Kirk Skeba	George Vlantis
Mohammad Rahman	Douglas Smith	Lei Wang
Ranga K. Reddy	Eli Sofer	Jianfeng Wang
Ivan Reede	Myung Sun Song	Yunbiao Wang
Edgar Reihl	Srikathyayani Srikanteswara	Tom Wasilewski
Jon Walter Rosdahl	Jayne Stancavage	Alfred Wiczorek
William Rose	Carl Stevenson	Kelly Williams
Luis Escobar Sanz	William Stiles	Yuchun Wu
Shigenobu Sasaki	Hideki Tanaka	Shiquan WuBo Xia
Jeffrey Schiffer	Clifford Tavares	Changlong Xu
Chris Seagren	Victor Tawil	ShanShan Xu
Alireza Seyedi	Shawn Taylor	Steve Yao
Cheng Shan	Paul Thompson	Yonghong Zeng
Steve Shellhammer	James Tomcik	Jianwei Zhang
		Xin Zhang

Major contributions to this standard were made by the following individuals:

Kwok Shum Au	Ramon Khalona	Ashish Pandharipande
John Benko	Thomas Kiernan	Patrick Pirat
Winston Caldwell	Kak-Sun Kim	Mohammad Rahman
Dave Cavalcanti	Kihong Kim	Ranga K. Reddy
Soo-Young Chang	Sangbum Kim	Ivan Reede
Gerald Chouinard	Gwangzeen Ko	Shigenobu Sasaki
Carlos Cordeiro	Steve Kuffner	Cheng Shan
Charles Einolf	Zhongding Lei	Steve Shellhammer
Wen Gao	Lingjie Li	Eli Sofer
Monisha Ghosh	Kyutae Lim	Carl Stevenson
Thomas Gurley	Jinnan Liu	Victor Tawil
Anh Twan Hoang	David Mazzarese	JungSun Um
Wendong Hu	Apurva N. Mody	George Vlantis
Sung Hyun Hwang	Peter Murray	Jianfeng Wang
Jerome J. Kalke	Mogh Nouroozian	Yonghong Zeng

The following members participated and voted on the development of IEEE Std 802.22a™-2014:

**Apurva N. Mody, Chair**  
**Chang-woo Pyo, Vice Chair**

When this amendment was sent to sponsor ballot, the Task Group a had the following membership:

**Ranga K. Reddy, Chair and Editor**

Winston Caldwell	Hynduk Kang	Shigenobu Sasaki
Charles Einolf	Gwangzeen Ko	Steven Shellhammer
Peter Flynn	Bruce Kraemer	Chunyi Song
Tom Gurley	Donghun Lee	Victor Tawil
Hiroshi Harada	Liru Lu	Keat-Beng Toh
Robert F. Heile	Michael Lynch	Junyi Wang
Byng Jeong Jang	Paul Nikolich	Bing Xuan Zhao
Jerry Kalke		Xin (Amy) Zhang

Major contributions were received from the following individuals:

Gerald Chouinard  
Charles Einolf

Sunghyun Hwang  
Gwangzeen Ko  
Chang-woo Pyo

Ranga K. Reddy  
Ivan Reede

The following members participated and voted on the development of IEEE Std 802.22b™-2015:

**Apurva N. Mody, Chair**  
**Chang-woo Pyo, Vice Chair**

When this amendment was sent to sponsor ballot, the Task Group b had the following membership:

**Chang-woo Pyo, Chair and Editor**  
**Sung Hyun Hwang, Vice Chair**  
**Gabriel Villardi, Secretary**

Gregory Buchwald  
Winston Caldwell  
Gerald Chouinard  
Subir Das  
Peter Flynn  
Thomas Gurley  
Hiroshi Harada  
Robert F. Heile  
Dien Hoang  
Byung Jang Jeong

Jerome J. Kalke  
Hynduk Kang  
Gwangzeen Ko  
Bruce Kraemer  
Donghun Lee  
PinHsun Lin  
Liru Lu  
Michael Lynch  
Apurva N. Mody  
Paul Nikolich

Masayuki Oodo  
Ranga K. Reddy  
Ivan Reede  
Shigenobu Sasaki  
Steve Shellhammer  
Chunyi Song  
Keat-Beng Toh  
Xin (Amy) Zhang  
Bing Xuan Zhao  
Lei Zhongding

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

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

Thomas Alexander  
Richard Alfvén  
Amelia Andersdotter  
Butch Anton  
Stefan Aust  
Harry Bims  
Kenneth Bow  
Nancy Bravin  
Vern Brethour  
Demetrio Bucaneg Jr.  
William Byrd  
C. Caicedo Bastidas  
Paul Cardinal  
Juan Carreon  
Pin Chang  
Todor Cooklev  
Alistair Duffy  
Michael Fischer  
Avraham Freedman  
Zhigang Gong  
Randall Groves

Robert F. Heile  
Marco Hernandez  
Werner Hoelzl  
Atsushi Ito  
Raj Jain  
SangKwon Jeong  
Pranav Jha  
Jerome Kalke  
Piotr Karocki  
Stuart Kerry  
Evgeny Khorov  
Yongbum Kim  
Jan Kruys  
Thomas Kurihara  
Alexander Lackpour  
Hyeong Ho Lee  
Michael Lynch  
Bruce Mackie  
Jeffery Masters  
Stephen McCann  
Apurva N. Mody

Ronald Murias  
Charles Ngethe  
Nick S. A. Nikjoo  
Paul Nikolich  
Bansi Patel  
Walter Pieniciak  
Clinton Powell  
Venkatesha Prasad  
R. K. Rannow  
Ranga K. Reddy  
Maximilian Riegel  
Naotaka Sato  
Thomas Starai  
Walter Struppler  
David Tepen  
David Thompson  
Mark-Rene Uchida  
Lisa Ward  
Scott Willy  
Andreas Wolf  
Oren Yuen

When the IEEE SA Standards Board approved this standard on 5 September 2019, it had the following membership:

**Gary Hoffman**, *Chair*  
**Ted Burse**, *Vice Chair*  
**Jean-Philippe Faure**, *Past Chair*  
**Konstantinos Karachalios**, *Secretary*

Masayuki Ariyoshi  
Stephen D. Dukes  
J. Travis Griffith  
Guido Hiertz  
Christel Hunter  
Joseph L. Koepfinger\*  
Thomas Koshy  
John D. Kulick

David J. Law  
Joseph Levy  
Howard Li  
Xiaohui Liu  
Kevin Lu  
Daleep Mohla  
Andrew Myles

Annette D. Reilly  
Dorothy Stanley  
Sha Wei  
Phil Wennblom  
Philip Winston  
Howard Wolfman  
Feng Wu  
Jingyi Zhou

\*Member Emeritus

## iTeh STANDARD PREVIEW (standards.iteh.ai)

[ISO/IEC/IEEE FDIS 8802-22](https://standards.iteh.ai/catalog/standards/sist/f0bfe455-3663-4a56-8ac1-08cebc5905e8/iso-iec-ieee-fdis-8802-22)  
<https://standards.iteh.ai/catalog/standards/sist/f0bfe455-3663-4a56-8ac1-08cebc5905e8/iso-iec-ieee-fdis-8802-22>

## Introduction

This introduction is not part of IEEE Std 802.22–2019, IEEE Standard for Information Technology—Telecommunications and information exchange between systems—Wireless Regional Area Networks (WRAN) Specific requirements—Part 22: Cognitive Wireless RAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications: Policies and Procedures for Operation in the Bands that Allow Spectrum Sharing where the Communications Devices May Opportunistically Operate in the Spectrum of Primary Service.

This standard specifies the air interface, including the cognitive radio MAC and PHY, of point-to-multipoint and backhaul WRANs comprised of a professional fixed BS with fixed and portable user terminals. The standard specifies operation in the bands that allow spectrum sharing where the communications devices may opportunistically operate in the spectrum of the primary service, such as the VHF/UHF TV broadcast bands between 54 MHz to 862 MHz, and the 1300 MHz to 1750 MHz and 2700 MHz to 3700 MHz bands provided the regulatory regime allows it.

## iTeh STANDARD PREVIEW (standards.iteh.ai)

[ISO/IEC/IEEE FDIS 8802-22](https://standards.iteh.ai/catalog/standards/sist/f0bfe455-3663-4a56-8ac1-08cebc5905e8/iso-iec-ieee-fdis-8802-22)  
<https://standards.iteh.ai/catalog/standards/sist/f0bfe455-3663-4a56-8ac1-08cebc5905e8/iso-iec-ieee-fdis-8802-22>

## Contents

1.	Overview .....	15
1.1	Scope .....	15
1.2	Purpose .....	15
1.3	Introduction .....	16
1.4	Word usage .....	19
2.	Normative references .....	20
3.	Definitions .....	22
4.	Abbreviations and acronyms .....	30
5.	System architecture .....	36
5.1	Reference architecture .....	36
5.2	Management reference architecture .....	40
6.	Packet Convergence sublayer .....	44
6.1	MAC SDU format .....	44
6.2	Classification .....	44
6.3	IEEE 802.3/Ethernet-specific part .....	46
6.4	IP specific part .....	47
7.	MAC Common Part sublayer .....	48
7.1	General .....	48
7.2	Addressing and connections .....	49
7.3	General superframe structure .....	50
7.4	General frame structure (on PHY-OM1) .....	52
7.5	General frame structure (on PHY-OM2) .....	55
7.6	General frame structure for a relay network .....	59
7.7	Control headers .....	66
7.8	MAC PDU formats .....	76
7.9	Management messages .....	92
7.10	Management of MAC PDUs .....	220
7.11	ARQ mechanism .....	240
7.12	Scheduling services .....	253
7.13	Bandwidth management .....	256
7.14	PHY support .....	262
7.15	Contention resolution .....	264
7.16	Initialization and network association .....	266
7.17	Ranging .....	312
7.18	Channel descriptor management .....	326
7.19	Multicast support .....	328
7.20	Quality of service .....	331
7.21	Incumbent protection .....	372
7.22	Self-coexistence .....	382
7.23	Quiet periods and sensing .....	400
7.24	Channel management .....	412

7.25	Synchronization of the IEEE 802.22 WRAN BSs and IEEE 802.22 A-BSs.....	417
7.26	Multi-channel operation on PHY-OM2 .....	417
7.27	Group Resource Allocation on PHY-OM2.....	437
8.	Security mechanism in IEEE 802.22 .....	441
8.1	Security Architecture for the Data/Control and Management Planes.....	442
8.2	SCM protocol.....	444
8.3	Key usage.....	471
8.4	Cryptographic methods.....	475
8.5	Certificate profile.....	482
8.6	Security sublayer 2—Security mechanisms for the cognitive functions .....	490
8.7	CPE privacy .....	503
9.	Operation Mode 1 (PHY-OM1).....	504
9.1	Symbol description .....	505
9.2	Data rates .....	508
9.3	Functional block diagram applicable to the PHY layer.....	509
9.4	Superframe and frame structures .....	510
9.5	CBP packet format.....	518
9.6	OFDM subcarrier allocation .....	520
9.7	Channel coding .....	528
9.8	Constellation mapping and modulation .....	550
9.9	Control mechanisms .....	554
9.10	Network synchronization.....	561
9.11	Frequency Control requirements .....	562
9.12	Antenna.....	562
9.13	RF mask.....	567
9.14	Receiver requirements .....	568
9.15	Multiple-input, multiple-output (MIMO) .....	569
9.16	Using PHY-OM1 in non-TV whitespace frequency bands .....	577
10.	PHY Operation Mode 2 (PHY-OM2).....	578
10.1	Symbol description .....	578
10.2	Data rates .....	585
10.3	Functional block diagram applicable to the PHY .....	598
10.4	Frame structure .....	599
10.5	CBP packet format.....	603
10.6	OFDM subcarrier allocation .....	603
10.7	Channel coding .....	612
10.8	Constellation mapping and modulation .....	619
10.9	Control mechanisms .....	623
10.10	Network synchronization.....	628
10.11	Frequency control requirements .....	628
10.12	Antenna.....	628
10.13	RF mask.....	628
10.14	Receiver requirements .....	629
10.15	MIMO pilot allocation.....	629
10.16	Using PHY-OM2 in non-TV Whitespace Frequency Bands.....	631

11.	Cognitive radio capability.....	632
11.1	General.....	632
11.2	Spectrum Manager operation.....	633
11.3	Spectrum Sensing Automaton .....	659
11.4	Spectrum sensing .....	672
11.5	Geolocation.....	685
11.6	Database service .....	690
11.7	Operation in non-TV white-space bands .....	691
12.	Configuration .....	692
13.	Parameters and connection management .....	693
13.1	Parameters, timers, message IEs.....	693
13.2	Well-known CIDs .....	705
13.3	ARQ parameters .....	709
14.	MIB structure .....	710
14.1	MIB description .....	710
14.2	MIB module definitions (ASN.1) .....	832
15.	Management plane interfaces and procedures .....	1230
15.1	Primitive format.....	1230
15.2	Primitive definitions .....	1231
Annex A (normative)	IEEE 802.22 regulatory domains and regulatory classes requirements .....	1336
A.1	Regulatory domains, regulatory classes, and professional installation .....	1336
A.2	Radio performance requirements .....	1338
A.3	Channel availability and sensing requirements .....	1343
A.4	Device identification requirements .....	1350
A.5	Channelization based on the regulatory domain.....	1351
A.6	Example of the regulatory framework in the UK .....	1355
Annex B (informative)	Multicarrier fine ranging method .....	1359
B.1	General description.....	1359
B.2	Practical embodiment of the proposed multicarrier fine ranging method .....	1365
B.3	References.....	1367
Annex C (informative)	Sensing .....	1368
C.1	Blind sensing techniques .....	1368
C.2	Signal specific sensing techniques.....	1377
C.3	References.....	1421
Annex D (informative)	Summary of the characteristics of the IEEE 802.22.1 beacon signal and protocols.....	1423
D.1	General.....	1423
D.2	Superframe structure.....	1423