IEEE P802.11
Wireless LANs

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| TGax PAR Extension Request |
| Date: 2018-07-12 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Osama Aboul-Magd | Huawei Technologies |  |  | Osama.aboulmagd@huawei.com |
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Abstract

This submission includes the TGax PAR extension Reuest.

R1: Updates the PAR with edits per 802 review and includes the comments received and responses to the received comments.

R2: added response to out of date reference and correct a typo

R3: Remove change to number of meetings to 3.3 and added explanation. Added copy of list of revisions from <http://www.ieee802.org/11/private/Draft_Standards/11ax/index.html> .

R4: Includes complete PAR

**P802.11ax**

This PAR is valid until 31-Dec-2018. The original PAR was approved on 27-Mar-2014, modified on 06-Dec-2017.

**PAR Extension Request Date:** 30-Apr-2018

**Extension Request Submitter Email:** dstanley1389@gmail.com

**Number of Previous Extensions Requested:** 0

**1. Number of years that the extension is being requested:** 2

**2. Why an Extension is Required (include actions to complete):** An extension is needed to complete Working Group and Sponsor

balloting of the draft amendment.

The Working Group letter ballot on the draft amendment (~600 pages) passed in July 2018 with 86% approval.

Comment resolution and subsequent WG balloting is planned, with an expectation to proceed to Sponsor Ballot in May 2019.

**3.1. What date did you begin writing the first draft:** 17-Mar-2016

**3.2. How many people are actively working on the project:** 150

**3.3. How many times a year does the working group meet?**

**In person:** 10

**Via teleconference:** 12

**3.4. How many times a year is a draft circulated to the working group:** 1

**3.5. What percentage of the Draft is stable:** 80%

**3.6. How many significant work revisions has the Draft been through:** 14

**4. When will/did initial sponsor balloting begin:** 01-May-2019

**When do you expect to submit the proposed standard to RevCom:** 01-Feb-2020

**Has this document already been adopted by another source? (if so please identify):** No

For an extension request, the information on the original PAR below is not open to modification.

**Submitter Email:** jrosdahl@ieee.org

**Type of Project:** Modify Existing Approved PAR

**PAR Request Date:** 13-Jul-2017

**PAR Approval Date:** 06-Dec-2017

**PAR Expiration Date:** 31-Dec-2018

**Status:** Modification to a Previously Approved PAR for an Amendment

**Root PAR:** P802.11ax **Approved on:** 27-Mar-2014

**1.1 Project Number:** P802.11ax

**1.2 Type of Document:** Standard

**1.3 Life Cycle:** Full Use

**2.1 Title:** 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 Enhancements for High Efficiency

WLAN

**Changes in title:** Standard for Information technologyTechnology --

Telecommunications and informationInformation exchangeExchange

betweenBetween systemsSystems Local and metropolitanMetropolitan

areaArea networksNetworks -- Specific requirementsRequirements

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

Layer (PHY) Specifications Amendment Enhancements for High

Efficiency WLAN

**3.1 Working Group:** Wireless LAN Working Group (C/LM/WG802.11)

**Contact Information for Working Group Chair**

**Name:** Dorothy Stanley

**Email Address:** dstanley1389@gmail.com

**Phone:** 630-363-1389

**Contact Information for Working Group Vice-Chair**

**Name:** Jon Rosdahl

**Email Address:** jrosdahl@ieee.org

**Phone:** 801-492-4023

**3.2 Sponsoring Society and Committee:** IEEE Computer Society/LAN/MAN Standards Committee (C/LM)

**Contact Information for Sponsor Chair**

**Name:** Paul Nikolich

**Email Address:** p.nikolich@ieee.org

**Phone:** 8572050050

**Contact Information for Standards Representative**

**Name:** James Gilb

**Email Address:** gilb@ieee.org

**Phone:** 858-229-4822

**4.1 Type of Ballot:** Individual

**4.2 Expected Date of submission of draft to the IEEE-SA for Initial Sponsor Ballot:** 11/2018

**4.3 Projected Completion Date for Submittal to RevCom**

**Note: Usual minimum time between initial sponsor ballot and submission to Revcom is 6 months.:** 08/2019

**5.1 Approximate number of people expected to be actively involved in the development of this project:** 250

**5.2.a. Scope of the complete standard:** The scope of this standard is to define one medium access control (MAC) and several physical layer

(PHY) specifications for wireless connectivity for fixed, portable, and moving stations (STAs) within a local area.

**5.2.b. Scope of the project:** This amendment defines standardized

modifications to both the IEEE 802.11 physical layers (PHY) and the

IEEE 802.11 Medium Access Control layer (MAC) that enable at least

one mode of operation capable of supporting at least four times

improvement in the average throughput per station (measured at the

MAC data service access point) in a dense deployment scenario, while

maintaining or improving the power efficiency per station.

This amendment defines operations in frequency bands between 1 GHz

and 7.125 GHz. The new amendment shall enable backward

compatibility and coexistence with legacy IEEE 802.11 devices

operating in the same band.

**Changes in scope of the project:** This amendment defines

standardized modifications to both the IEEE 802.11 physical layers

(PHY) and the IEEE 802.11 Medium Access Control layer (MAC) that

enable at least one mode of operation capable of supporting at least

four times improvement in the average throughput per station

(measured at the MAC data service access point) in a dense

deployment scenario, while maintaining or improving the power

efficiency per station. This amendment defines operations in frequency

bands between 1 GHz and 67.125 GHz. The new amendment shall

enable backward compatibility and coexistence with legacy IEEE

802.11 devices operating in the same band.

**5.3 Is the completion of this standard dependent upon the completion of another standard:** No

**5.4 Purpose:** The purpose of this standard is to provide wireless connectivity for fixed, portable, and moving stations within a local area. This

standard also offers regulatory bodies a means of standardizing access to one or more frequency bands for the purpose of local area

communication.

**5.5 Need for the Project:** Wireless LAN (WLAN) devices are currently being deployed in diverse environments. These environments are

characterized by the existence of many access points and non-AP stations in geographically limited areas. Increased interference from

neighbouring devices gives rise to performance degradation. Additionally WLAN devices are increasingly required to support a variety of

applications such as video, cloud access, and offloading. In particular video traffic is expected to be the dominant type of traffic in many high

efficiency WLAN deployments. With the real-time requirements of some of these applications, WLAN users demand improved performance in

delivering their applications, including improved power consumption for battery-operated devices.

Unlike previous amendments where the focus was on improving aggregate throughput, this amendment focuses on improving metrics that

reflect user experience, such as average per station throughput, the 5th percentile of per station throughput of a group of stations, and area

throughput. Improvements will be made to support environments such as wireless corporate office, outdoor hotspot, dense residential

apartments, and stadiums.

**5.6 Stakeholders for the Standard:** Manufacturers and users of semiconductors, personal computers, enterprise networking devices,

consumer electronic devices, home networking equipment, mobile devices, and cellular operators.

**Intellectual Property**

**6.1.a. Is the Sponsor aware of any copyright permissions needed for this project?:** No

**6.1.b. Is the Sponsor aware of possible registration activity related to this project?:** No

**7.1 Are there other standards or projects with a similar scope?:** No

**7.2 Joint Development**

**Is it the intent to develop this document jointly with another organization?:** No

**8.1 Additional Explanatory Notes:** 5.2.b

The focus of this amendment is on WLAN indoor and outdoor operation in the 2.4 GHz and the 5 GHz frequency bands. Additional bands

between 1 GHz and 7.125 GHz may be added as they become available.

\* The increase in average throughput per station is not limited to four times improvement. Improvement values in the range of 5-10 times are

targeted, depending on technology and scenario.

\* Outdoor operation is limited to stationary and pedestrian speeds.

\* Average throughput per station is directly proportional to both aggregate basic service set (BSS) throughput and area throughput. The 5th

percentile measure of the per station throughput may be used to determine that the desired distribution of throughput among a number of

stations in an area is satisfied. These metrics, along with the satisfaction of the packet delay and the packet error ratio (PER) requirements of

applications, will directly correspond to user experience in identified scenarios.

\* Since the values of the metrics of interest will depend on the scenario, the focus will be on the relative improvement of these metrics

compared to previous IEEE 802.11 amendments (IEEE 802.11n in 2.4 GHz and IEEE 802.11ac in 5 GHz).

\* The amendment will be evaluated with a set of typical deployment scenarios representative of the main expected usage models that are likely

to suffer bottlenecks in the coming years: residential, enterprise, indoor and outdoor hotspots. High Efficiency WLAN Study Group (HEW SG)

has initiated the creation of a high-level simulation scenario working document (ref: 11-13/1001r5) to model these scenarios. The simulation

scenarios may include system characteristics extracted from measured IEEE 802.11 operations in the field.

\* These scenarios highlight three categories of objectives to improve WLAN efficiency:

o Make more efficient use of spectrum resources in scenarios with a high density of STAs per BSS.

o Significantly increase spectral frequency reuse and manage interference between neighboring overlapping BSS (OBSS) in scenarios with a

high density of both STAs and BSSs.

o Increase robustness in outdoor propagation environments and uplink transmissions.

\* This project may include the capability to handle multiple simultaneous communications in both the spatial and frequency domains, in both

the uplink (UL) and downlink (DL) direction.

\* Power efficiency is intended to measure consumption of devices which can reasonably be assumed to be powered by batteries and will take

into account average power consumption for a given scenario.

PAR Modification changes:

4.2/4.3 update projected completion dates

5.1 update missing participation number

5.2b change Frequency from 6 GHZ to

7.125 GHz due to new band.

**Comments (from 802.3) and responses:**

**Amendment: High Efficiency WLAN**

[**PAR Extension**](https://mentor.ieee.org/802.11/dcn/18/11-18-0870-00-00ax-tgax-par-extension-request.docx)

* **2. – Perhaps you have an update for the stated May 2018 planned ballot. Recommend you delete the sentence and update only the number of ballots in the preceding sentence.**
	+ **Response: Changes made to section 2 to reflect the recent initial Working Group Letter Ballot approval.**
	+ **New text (redline):** “An extension is needed to complete WG and Sponsor ballotting of the draft amendment.
	The Working Group letter ballot on the draft amendment (600 pages) passed in July 2018 with 86% approval.
	Comment resolution and subsequent WG balloting is planned, with an expectation to proceed to Sponsor Ballot in May 2019. ”
	+ **New Text (clean): “**An extension is needed to complete Working Group and Sponsor balloting of the draft amendment.

The Working Group letter ballot on the draft amendment (~600 pages) passed in July 2018 with 86% approval.

Comment resolution and subsequent WG balloting is planned, with an expectation to proceed to Sponsor Ballot in May 2019.

* **3.x – Your numbers don’t make sense and are not sure if mix 802.1 and TG meetings in responses. We can’t come up with 10 for 3.3, the answer to 3.4 does not seem right and needs more explanation to make sense, and does not evidence that a two year extension will be sufficient. 3.4 drafts per year =1 and 4 years since PAR approval do not produce 3.6=14.**
	+ **Response below**.
	+ 3.3 The intent of the question is to asses the level of activity in on the project. We do not distinguish between TG/WG for this question, as all WG members are TG members. The TG meets 3 times in Plenary, 3 Interims, and often meet the week prior to either the Plenary or Interim.  The group has meet about 10 times in person per year. Similarly for teleconferences, the number indicates the approximate number of teleconferences related to P802.11ax development.
	+ 3.4 The draft has been circulated by WG Letter ballot 2016, 2017, and 2018 - once per year.
	The draft is expected to be circulated more frequently going forward.
	+ 3.6 The number of 14 reflects significant work revisions that the TG has reviewed and worked on in preparing to send to the WG. See a list of the drafts at <http://www.ieee802.org/11/private/Draft_Standards/11ax/index.html> , copied below:

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| * 2018-06-01
 | [Draft P802.11ax\_D3.0.pdf](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D3.0.pdf) | [Draft P802.11ax\_D3.0 Redline Compared to D2.0.pdf](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D3.0%20Redline%20Compared%20to%20D2.0.pdf) | [Draft P802.11ax\_D3.0 rtf and visio.zip](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D3.0%20rtf%20and%20visio.zip)[11-17-1682-13-00ax-comments-on-tgax-d2-0.xlsx](https://mentor.ieee.org/802.11/dcn/17/11-17-1682-13-00ax-comments-on-tgax-d2-0.xlsx) |
| 2018-04-18 | [Draft P802.11ax\_D2.3.pdf](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D2.3.pdf) | [Draft P802.11ax\_D2.3 Redline Compared to D2.2.pdf](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D2.3%20Redline%20Compared%20to%20D2.2.pdf) | [Draft P802.11ax\_D2.3 rtf and visio.zip](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D2.3%20rtf%20and%20visio.zip)[11-17-1682-09-00ax-comments-on-tgax-d2-0.xlsx](https://mentor.ieee.org/802.11/dcn/17/11-17-1682-09-00ax-comments-on-tgax-d2-0.xlsx) |
| 2018-02-15 | [Draft P802.11ax\_D2.2.pdf](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D2.2.pdf) | [Draft P802.11ax\_D2.2 Redline Compared to D2.1.pdf](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D2.2%20Redline%20Compared%20to%20D2.1.pdf) | [Draft P802.11ax\_D2.2 rtf and visio.zip](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D2.2%20rtf%20and%20visio.zip)[11-17-1682-07-00ax-comments-on-tgax-d2-0.xlsx](https://mentor.ieee.org/802.11/dcn/17/11-17-1682-07-00ax-comments-on-tgax-d2-0.xlsx) |
| 2018-01-06 | [Draft P802.11ax\_D2.1.pdf](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D2.1.pdf) | [Draft P802.11ax\_D2.1 Redline Compared to D2.0.pdf](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D2.1%20Redline%20Compared%20to%20D2.0.pdf) | [Draft P802.11ax\_D2.1 rtf and visio.zip](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D2.1%20rtf%20and%20visio.zip)[11-17-1682-04-00ax-comments-on-tgax-d2-0.xlsx](https://mentor.ieee.org/802.11/dcn/17/11-17-1682-04-00ax-comments-on-tgax-d2-0.xlsx) |
| 2017-10-04 | [Draft P802.11ax\_D2.0.pdf](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D2.0.pdf) | [Draft P802.11ax\_D2.0 Redline Compared to D1.0.pdf](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D2.0%20Redline%20Compared%20to%20D1.0.pdf) | [Draft P802.11ax\_D2.0 rtf and visio.zip](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D2.0%20rtf%20and%20visio.zip)[11-17-0010-14-00ax-comments-on-tgax-d1-0.xlsx](https://mentor.ieee.org/802.11/dcn/17/11-17-0010-14-00ax-comments-on-tgax-d1-0.xlsx) |
| 2017-08-18 | [Draft P802.11ax\_D1.4.pdf](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D1.4.pdf) | [Draft P802.11ax\_D1.4 Redline Compared to D1.3.pdf](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D1.4%20Redline%20Compared%20to%20D1.3.pdf) | [Draft P802.11ax\_D1.4 rtf and visio.zip](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D1.4%20rtf%20and%20visio.zip)[11-17-0010-13-00ax-comments-on-tgax-d1-0.xlsx](https://mentor.ieee.org/802.11/dcn/17/11-17-0010-13-00ax-comments-on-tgax-d1-0.xlsx) |
| 2017-06-05 | [Draft P802.11ax\_D1.3.pdf](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D1.3.pdf) | [Draft P802.11ax\_D1.3 Redline Compared to D1.2.pdf](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D1.3%20Redline%20Compared%20to%20D1.2.pdf) | [Draft P802.11ax\_D1.3 rtf and visio.zip](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D1.3%20rtf%20and%20visio.zip)[11-17-0010-12-00ax-comments-on-tgax-d1-0.xlsx](https://mentor.ieee.org/802.11/dcn/17/11-17-0010-12-00ax-comments-on-tgax-d1-0.xlsx) |
| 2017-04-14 | [Draft P802.11ax\_D1.2.pdf](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D1.2.pdf) | [Draft P802.11ax\_D1.2 Redline Compared to D1.1.pdf](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D1.2%20Redline%20Compared%20to%20D1.1.pdf) | [Draft P802.11ax\_D1.2 rtf.zip](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D1.2%20rtf.zip)[11-17-0010-11-00ax-comments-on-tgax-d1-0.xlsx](https://mentor.ieee.org/802.11/dcn/17/11-17-0010-11-00ax-comments-on-tgax-d1-0.xlsx) |
| 2017-02-10 | [Draft P802.11ax\_D1.1.pdf](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D1.1.pdf) | [Draft P802.11ax\_D1.1 Redline Compared to D1.0.pdf](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D1.1%20Redline%20Compared%20to%20D1.0.pdf) | [Draft P802.11ax\_D1.1 rtf.zip](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D1.1%20rtf.zip)[11-17-0010-07-00ax-comments-on-tgax-d1-0.xlsx](http://www.ieee802.org/11/private/Draft_Standards/11ax/11-17-0010-07-00ax-comments-on-tgax-d1-0.xlsx) |
| 2016-12-01 | [Draft P802.11ax\_D1.0.pdf](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D1.0.pdf) | [Draft P80211ax\_D1.0 Redline Compared to D0.5.pdf](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P80211ax_D1.0%20Redline%20Compared%20to%20D0.5.pdf) | [Draft P802.11ax\_D1.0 rtf.zip](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D1.0%20rtf.zip)[11-16-0535-10-00ax-comments-on-tgax-d0-1.xlsx](http://www.ieee802.org/11/private/Draft_Standards/11ax/11-16-0535-10-00ax-comments-on-tgax-d0-1.xlsx) |
| 2016-10-01 | [Draft P802.11ax\_D0.5.pdf](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D0.5.pdf) | [Draft P802.11ax\_D0.5 Redline Compared to D0.4.pdf](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D0.5%20Redline%20Compared%20to%20D0.4.pdf) | [Draft 802.11ax\_D0.5 rtf.zip](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D0.5%20rtf.zip)[11-16-0535-08-00ax-comments-on-tgax-d0-1.xlsx](http://www.ieee802.org/11/private/Draft_Standards/11ax/11-16-0535-08-00ax-comments-on-tgax-d0-1.xlsx) |
| 2016-08-30 | [Draft P802.11ax\_D0.4.pdf](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D0.4.pdf) | [Draft P802.11ax\_D0.4 Redline Compared to D0.3.pdf](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D0.4%20Redline%20Compared%20to%20D0.3.pdf) | [Draft P802.11ax\_D0.4 rtf.zip](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D0.4%20rtf.zip) |
| 2016-08-15 | [Draft P802.11ax\_D0.3.pdf](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D0.3.pdf) | [Draft P802.11ax\_D0.3 Redline Compared to D0.2.pdf](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D0.3%20Redline%20Compared%20to%20D0.2.pdf) | [Draft P802.11ax\_D0.3 rtf.zip](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D0.3%20rtf.zip) |
| 2016-06-06 | [Draft P802.11ax\_D0.2.pdf](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D0.2.pdf) | [Draft P802.11ax\_D0.2 Redline Compared to D0.1.pdf](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D0.2%20Redline%20Compared%20to%20D0.1.pdf) | [Draft P802.11ax\_D0.2 rtf.zip](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D0.2%20rtf.zip) |
| 2016-03-17 | [Draft P802.11ax\_D0.1.pdf](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D0.1.pdf) |  |  [Draft P802.11ax\_D0.3 rtf.zip](http://www.ieee802.org/11/private/Draft_Standards/11ax/Draft%20P802.11ax_D0.3%20rtf.zip) |

[**CSD Modification**](https://mentor.ieee.org/802.11/dcn/14/11-14-0169-01-0hew-ieee-802-11-hew-sg-proposed-csd.docx)

* + **General – Since you are modifying, you need to bring the text up to date (current text is predicting things in the past).**
		- Response:
		- Out of date references were deleted. The surrounding text is left and is still valid.
	+ **1.2.4, last paragraph, Distinct Identity – Putting a title on something doesn’t distinguish it when the amendment is merged at the first revision following approval.**
	+ Response:
	+ 1.2.4 – Note that the comment references 1.2.3 Distinct Identity, not 1.2.4.
	+ Change made: delete the last sentence
* **1.2.5, Technical feasibility – We find having to chase links user hostile and not an acceptable substitute for an appropriate summary of feasibiity.**
	+ Response:
	+ 1.2.5 – Summary text is there, and the detail is in the referenced links.

**References:**