IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IEEE 802.11 Study Group on Light Communications  January, 2018 Irvine Meeting Minutes | | | | |
| Date: 2018-01-19 | | | | |
| Author: | | | | |
| Name | Affiliation | Address | Phone | Email |
| Volker Jungnickel | Fraunhofer HHI |  |  | [volker.jungnickel@hhi.fraunhofer.de](mailto:volker.jungnickel@hhi.fraunhofer.de) |
| Ryan Mennecke | Applied Physics Labs |  |  | [rmennec@gmail.com](mailto:rmennec@gmail.com) |
| Olliver Luo | Huawei |  |  | [oliver.luo@hisilicon.com](mailto:oliver.luo@hisilicon.com) |
| Nikola Serafimovski | pureLifi |  |  | [nikola.serafimovski@purelifi.com](mailto:nikola.serafimovski@purelifi.com) |

Abstract

Study Group on Light Communications meeting minutes from the IEEE 802.11 Orlando meeting, November 2017.

**IEEE 802.11 Study Group on Light Communications**

**Monday, January 16, 2018, PM2 Session**

Attendance: around 30-35 people

1. The IEEE 802.11 LC SG meeting was called to order at by the Chair, Nikola Serafimovski (pureLiFi).
2. The Chair reviewed the IEEE-SA patent policy, logistics, and reminders, including meeting guidelines and attendance recording procedures.
   * It is reminded all to record their attendance.
3. Chair introduced the schedule for the week

* Finalization of CSD and PAR

1. Approve the minutes from the November meeting
   * Chair asked if there are discussions. No discussion. The minutes were approved.
2. Approve the minutes from two teleconferences

Doc 1831r3 contains the comments and resolutions prepared in the teleconferences. Main comments:

* + One or multiple PHY layer specifications?
  + Discussion in telcos was undecided
  + Range of requirements from 10 Mbps to 5 Gbps, hard to cover with single PHY, TG13 in 802.15 has 3 PHYs i) low bandwidth – high spectral efficiency, ii) high bandwidth – low spectral efficiency, iii) high bandwidth – high spectral efficiency
  + Each PHY mode has another amendment, one PHY can have multiple modes
  + One PHY with multiple modes that can address different requirements
  + Image Sensor Communication should be regarded, besides Photodiodes
  + OFDM and Single Carrier would be 2 different PHYs
  + Language should be general enough
  + Needs not to be too precise at this point in the process, Devices can have very different characteristics

1. Chair discussed Draft of the PAR doc. 1604r5

It was mentioned that there is a difficulty here is that solution is unknown, what has to be changed in the standard. The main text is as follows.

Standard defines a new PHY layer and modifications to the 802.11 MAC that enable operation of light communications (LC).

The new PHY specified in this amendment enables

* + Uplink and downlink operations only in 380 nm to 5,000 nm band,
  + All modes of operation achieve at least a min. throughput of 10 Mb/s, and at least one mode of operation with min. throughput of 5 Gb/s
  + Interoperation among LEDs with different modulation bandwidths

The changes to the MAC clauses are limited to:

* hybrid coordination functions channel access
* power management modes of operation (excluding new modes)
* Rules for overlapping BSS detection and mitigation

and modifications to other clauses necessary to support the above changes.

* Fast session transfer between LC and radio (PHYs operating in 72 GHz and lower bands)

Discussion about to keep or to remove this sentence: will be discussed tomorrow again

There was a long discussion of 10 Mbps for the lower limit, as it is not the same as 1 Mbps agreed upon in 802.15. But the discussion on these points was already closed.

There was a discussion if two limitations should be kept, and about what is the meaning of minimum/maximum. The two numbers indicate two different targets due to use cases etc.. All modes of operation should achieve at least 10 Mbps.

There was a discussion to include different types of receivers, such as photodiodes and image sensors, and to have a straw poll about to include that in the PAR.

It was mentioned that the image sensor topic was not included in the feasibility study, despite there is a lot of progress in research, at least in Asia. It was argues that to redo the feasibility study would need a lot of work to be done.

There was a straw poll to change the minimum data rate from 10 Mb/s to 1 Mb/s.

Y: 4 N: 21 A: 3

There was a second straw poll to change the high data rate from 5 Gb/s to 1 Gb/s.

Y: 6 N: 13 A: 7

The meeting recessed at 5:57 p.m..

**Tuesday, January 17, 2018, PM2 Session**

Attendance: around 25 people

1. The IEEE 802.11 LC SG meeting was called to order at by the Chair, Nikola Serafimovski (pureLiFi).
2. The Chair reviewed the IEEE-SA patent policy, logistics, and reminders, including meeting guidelines and attendance recording procedures.
   * It is reminded all to record their attendance.
3. Chair introduced the schedule for the meeting

* Finalization of CSD and PAR
* There will be a short progress report during mid-week plenary

1. Chair continued discussion on PAR
   * Interoperability among different light solid state sources with different modulation bandwidth
   * There was a discussion to widen the scope also to include other light sources
   * But any other light source (halogen etc.) would not be able to operate at the modulation bandwidth under consideration here
   * The PAR needs to have a well-defined scope and not include everything
   * Discussion was ongoing regarding fast session transfer
   * It was suggested to include “fast **and secure** session transfer” as security is one of the important points here, needs to have a security validation of such handover process
   * It was mentioned that fast session transfer for LC may have no difference to other media
   * Not clear what “fast and secure” means
   * Add “existing” to “power management modes of operation” and delete “(excluding new ones)”
   * Change to “The amendment will support existing features of the 802.11 including but not limited to”
   * Change to “Fast session transfer between LC and other 802.11 PHYs”
   * Add “fast secure BSS transition”
   * It was mentioned that adding the word “secure” was meant to keep an eye on the properties of the new medium and its implications on the security mechanisms
   * Change to “This amendment defines a new PHY that provides”
   * FST is expected to be similar to 60 GHz
   * Back to security: could be part of the Need statement for the project, which would make the Scope statement much clearer
   * There is consensus on including “The project needs to assess the security of the transition between the new LC PHY and the existing 802.11 PHYs ans well as supporting Fast Session Transfer” in the “Need for the project”
   * Change to “This amendment defines changes to the IEEE 802.11 MAC that are limited to the following:”
   * Change to “modifications to other clauses necessary to support these changes”
   * Remove “only” as is not important and limiting
   * Motion:

Approve the following text as the Scope of the 802.11 802.11 LC SG PAR:

… (take over from slides)

* + Moved by Li Quiang (Huawei), Seconded by Andrew Myles (Cisco)
  + Yes: 19 No: 0 Abstain: 3

1. The Chair continued with discussing the purpose
   * This amendment does not change the Purpose clause in 802.11.
2. The Chair continued to discuss the Need for the Project.
   * Fix the use case IoT (Mb/s) to mobile access (Gb/s). Some
   * Remove specific reference to market study and better refer to more comprehensive document listed in second sentence.
   * Specific use cases were deleted to have no limitation. But mention that the ones developing a significant market potential are now on the horizon.
   * Suggested to move the last sentence on security issues to 8.1
   * But should be part of the Need as this should be explicitly considered
   * The sentence is too much prominent and not the central need why the project is done
   * The sentence on security is important and a “Need in the project” and not belongs to the “Need for the project”
   * The Chair made a straw poll whether the sentence on security shall be removed from section 5.5.

… (copy)

Y: 5, N: 0, A: 10

* + The Need for the project has been accepted without further objections.
  + Stakeholders should not include “etc.”
  + 6.1.a/b are both Yes
  + Additional explanatory notes
  + Are referred to the section number they belong to
  + The security sentence was also added here ande referred to 5.2

1. The Chair made a motion to approve the PAR draft for the 802.11 amendment on Light Communications

Approve doc. 11-17/1604r6 as the draft PAR to be forwarded for approval by the 802.11 working group.

Moved by Li Qiuang (Huawei), Seconded by Volker Jungnickel (Fraunhofer HHI)

Y: 24 N: 0 A: 0

The meeting recessed at 5:57 p.m..

**Wednesday, January 18, 2018, PM2 Session**

Attendance: initially 25, increasing to 35 people over time

1. The IEEE 802.11 LC SG meeting was called to order at by the Chair, Nikola Serafimovski (pureLiFi).
2. The Chair reviewed the IEEE-SA patent policy, logistics, and reminders, including meeting guidelines and attendance recording procedures.
   * It is reminded all to record their attendance.
3. Chair introduced the schedule for the meeting

* Finalization of CSD
* Potentially finish work during this meeting

1. Chair started discussion of the CSD draft doc. 1603/r5
   * Numbers for Cisco VNI have been corrected
   * Reference numbers to be checked finally
   * Broad set of applicability, some changes suggested in the see revised document
   * The comparison of bandwidth useful in optical spectrum with RF is removed because intensity modulation cannot use this spectrum as efficiently as RF being based on coherent detection
   * Add a footnote referencing the consolidated KPIs for PAR/CSD doc. 11-17/1778r1 based on multiple use case presentations that were given
   * The sentence on the potential of LC was reformulated
   * The whole paragraph into which direction wireless technology should be developed was deleted
   * Multiple vendors text is replaced by text from PAR (Need for the Project) as much work has been spent on this
   * The interest from industry has been validated through the participation of individuals during LC TIG/SG phase.
   * Compatibility is clear
   * Distinct identity focus is the “definition of the PHY and minimal changes to the MAC layer necessary to enable the use of light spectrum…”
   * Difference is the use of the 802.11 MAC and the reuse of services.
   * 802.15.7m is focused on optical camera and low-rate photodiode communications
   * 802.15.13 focuses on industrial applications
   * Objective here is to significant widen the range of applications that can be addressed by LC through tight integration with 802.11
   * Difference to G.vlc is in addressing home and enterprise applications
   * Being with 802.11 is attractive because of the ecosystem (….see accepted text)
   * Minor changes of the wording in costs section
   * Same for other areas as appropriate

The meeting recessed at 10:03 until Thursday Jan. 19, AM1.

**Thursday, January 19, 2018, AM1 Session**

Attendance: around 25 people over time

1. The IEEE 802.11 LC SG meeting was called to order at by the Chair, Nikola Serafimovski (pureLiFi).
2. The Chair reviewed the IEEE-SA patent policy, logistics, and reminders, including meeting guidelines and attendance recording procedures.
   * It is reminded all to record their attendance.
3. Chair introduced the schedule for the meeting

* Review PAR and CSD and make a motion to submit them to WG
  + straw poll results on Wednesday
  + chair plans to make a motion in WG closing plenary on Friday.
* Presentation on updated usage models in doc. 11-17/1743r1

1. Chair looked though CSD again 11-17/1603r6
   * A motion for the Friday closing plenary meeting is suggested.
   * Some editorial suggestions on doc. 11-17/1603r6 are proposed.
   * 1603r7 is uploaded to mentor.

Motion on approve doc 11-17/1603r7 as the draft CSD to be forwarded for approval for the 802.11 working group

Yes: 13 No: 0 Abstain:1

1. Chair looked though PAR doc. 11-17/1604r6
   * Suggested to add a new reference (IEC 62471:2006) in section 8.1 regarding eye safety
   * 11-17/1604r7 is uploaded to Mentor
   * Is the proper word used for OBSS in the MAC paragraph
   * Chair explains the differences on LC and radio communication
   * Coexistence is used to replace mitigation on page 3 line 20.
   * Question about why two “minimum” throughputs
   * all modes should achieve 10 Mb/s, however only one mode should achieve 5 Gb/s
   * important to measure that at the MAC SAP data rate < PHY data rate (e.g., 70% efficiency)
   * discussed if to include retransmissions
   * simulation requirements in 802.11 n case
   * suggested to add scenario about the minimum throughput
   * why the throughput should be measured in MAC SAP
   * add “in reasonable scenarios” in line 15.
   * delete the “in reasonable scenarios” and decrease 10 Mb/s to a lower date rate
   * suggested to increase 10 Mb/s to a higher date rate
   * how to measure the throughput
   * Conclusion: change minimum 5G/s to at least 5G/s
   * Add minimum “single-link” throughput
   * Add “in typical environments”
   * suggested to add an explain what is a “single link” in section 8.1
   * 11-17/1604r8 is uploaded to Mentor.
2. Motion on approve doc 11-17/1604r8 as the draft PAR to be forwarded for approval for the 802.11 WG

Yes: 18 No: 0 Abstain: 1

1. 11-17/1743r1 is presented by Oliver Luo (Huawei)
   * added detailed information for usage model 1b, 3, and 4
   * EMI Sensitive Area
   * Industrial wireless scenario: Mobile robot with wireless connectivity, mainly control in the downlink, video and sensor data in uplink
   * Localized information scenario: Local information transmitted to an app, museum,
   * Internet/Intranet Access
   * it was commented that one might consider also other services in industrial environments like serving the worker with location information about tools that he needs to use shortly
2. The Chair explains future progress:

- PAR and CSD go to WG motion on Friday

- if successful will be passed to other 802 WGs

- reviews come in Tuesday during March meeting in Rosemont

- SG resolves all comments and makes a motion on Wednesday in the midweek plenary

- resolutions are passed to other WGs and if no new comment, PAR and CSD will be passed to SA

- if approved, new task group is ready to take off in May 2018 meeting in Warsaw

- first steps will be usage models, requirements document, before any technical work can start

- evaluation framework needs agreed-upon channel and transceiver models

- prepare call for proposals, hear proposals, compare performances of proposals

- make basic decisions, create first draft being iterated in several rounds

1. No teleconferences have been scheduled between Irvine and Rosemont meetings.

Meeting was recessed at 9:34 until March 2018 in Rosemont.