IEEE P802.11
Wireless LANs

|  |
| --- |
| Minutes of the January 2024 meetings of the IEEE 802.11 Coexistence Standing Committee |
| Date: 2024-02-01 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Guido R. Hiertz | Ericsson GmbH | Ericsson Allee 152134 HerzogenrathGermany |  | hiertz@ieee.org |

Abstract

This document contains the minutes of the January 2024 meetings of the IEEE 802.11 Coexistence Standing Committee

# Tuesday, 2024-01-16, PM 1 session

1. At 2024-01-16T13:33-05:00 the chair calls the meeting of the IEEE 802.11 Coexistence Standing Committee (SC) to order. Mark Emmelmann acts as chair of the SC. Guido R. Hiertz acts as recording secretary of the SC.
2. The chair presents 11-23/2132r0 and reviews the proposed agenda as contained in 11-23/2130r1.
3. At 2024-01-16T13:38-05:00 the chair asks for approval of the proposed consent agenda as contained in 11-23/2130r1.
	1. Motion: “Move to approve Coex SC agenda as contained in 11-23/2130r1.”
		1. Mover: Al Petrick
		2. Seconded: Stuart Kerry
			1. Approved by unanimous consent
		3. The approval of this consent agenda also approves the previous meeting’s minutes (11-23/2112r0).
4. At 2024-01-16T13:39-05:00 the chair reviews slides four to twelve in 11-23/448r1 and reminds all attendees of their obligations when attending this meeting.
5. At 2024-01-16T13:44-05:00 the chair continues to present from page 12 of 11-23/2132r0.
6. At 2024-01-16T13:50-05:00 Guido presents 11-24/127r0. At 2024-01-16T14:00-05:00, he concludes his presentation.
	1. Comment: I have a question regarding the narrowband test signal. Can it be replaced?
	2. Comment: Yes, ETSI TC BRAN is contribution-driven. Please, bring a proposal and find consensus for it.
7. At 2024-01-16T14:01-05:00 Rich Kennedy presents 11-24/6r0. He concludes his presentation at 2024-01-16T14:06-05:00.
8. At 2024-01-16T14:08-05:00 Wenzo Wentink presents 11-24/148r0. He concludes his presentation at 2024-01-16T14:24-05:00.
	1. Comment: You are assuming a non-realistic high duty cycle on page 7. A realistic duty cycle is much lower, in general. This doesn’t represent Bluetooth Low Energy. Your results on page 9 are w/o any hopping.
	2. Comment: The duty cycle might be lower but there also might be more links.
	3. Comment: This is a corner usecase.
	4. Comment: For a limited amount of spectrum this might still apply. However, it might be even much worse. See this hotel as an example. The meeting room, that we are in, is an example.
	5. Comment: I wanted to point out that your conclusions are not universal.
	6. Comment: I fully support the proposed straw poll. I do believe it is important to have a mandatory coexistence protocol. We need to agree on a set of assumptions that we can all generate comparable simulation results. Otherwise, everyone makes their own assumptions and scenarios. We all need to look at the same thing. Then, we can get to an agreement.
	7. Comment: Actually, I like that we have different scenarios and different assumptions. Nevertheless, we have the same results and we draw the same conclusions. The fact that we are not using the same assumptions and scenarios makes the conclusion even stronger.
	8. Comment: Not everyone is reaching the same conclusions. It’s going to help that we have different tools. However, there are certain individuals, for example, that come to other conclusions.
	9. Comment: We also don’t want to overdo things. What is the next step if this straw poll finds support? We could make this recommendation, tonight, during the joint meeting.
	10. Comment: The Bluetooth SIG works on higher bands for Bluetooth Low Energy. We are not looking at other things. We can use Bluetooth Low Energy as a guide.
	11. Comment: Does this group have the authority to make such recommendations? We did not really agree on a simulation setup. Nobody really asked if the simulation setups are agreed by the members.
	12. Comment: This is a contribution-driven group. I am happy to have more discussion on baselines for simulation results. The straw poll is just asking for an opinion in the room. There is no mandating action. It’s just the view of the room. Everyone here can participate.
	13. Comment: The simulation results from previous meetings were not aligned. The straw poll should not be understood to represent the whole group.
	14. Comment: I agree with this straw poll. For this to work, it has to be a common agreement. If we make a recommendation to IEEE 802.15, it is like throwing the action at IEEE 802.15. However, it is both groups that need to work together. We will need to be doing it together. I would like to see that a “joint” viewpoint to be developed. We’ll never get this done, otherwise.
	15. Comment: It’s the burden of the group developing a new standard to develop a coexistence assessment.
	16. Comment: Having seen the history of the last years it is important that we talk to each other. We need to bring members together. We need to create an environment where we can talk. As chair, it’s my responsibility to create an environment to talk.
	17. Comment: I am speaking in favor of the straw poll. However, this should be soften. We are just providing a recommendation.
9. At 2024-01-16T14:48-05:00 the following straw poll is asked:
	1. “802.11 Coex SC recommends that 802.15.4ab considers adopting a mandatory coexistence mechanism to enable shared use of the spectrum and adequate performance between 802.11 and 802.15.4ab. This mandatory coex mechanism should consist of one or more of LBT or other techniques”
		* 1. Result: Yes: 44, No: 13, Abstain: 0
		1. At this time, 67 attendees participate in the Webex session.
10. At 2024-01-16T14:51-05:00 the chair presents 11-24/146r1. He concludes his presentation at 2024-01-16T14:54-05:00.
11. At 2024-01-16T14:55-05:00 Menzo presents 11-24/122r0. He concludes his presentation at 2024-01-16T15:14-05:00.
	1. Comment: Please provide more details regarding your assumptions on the connection events.
	2. Comment: I assume that it is possible to hope during a connection event. However, Bluetooth also allows to stay on the same channel during a connection event.
	3. Comment: What are you using in your simulation?
	4. Comment: I assume that the device stays on same channel. I took the assumption that there is no hopping.
	5. Comment: Bluetooth would use hopping to get frequency diversity. It would be good for Wi-Fi if the hopping occurs in just 20 MHz because Wi-Fi could puncture this resp. detect Bluetooth.
	6. Comment: I see your point.
	7. Comment: I will bring further simulation results that show how bad it is for Wi-Fi to defer a full 160 MHz transmission instead of performing channel puncturing. This happens because I used multiple BT links. They randomly jump in and Wi-Fi seldomly finds the full 160 MHz channel to be idle.
	8. Comment: In reality, these transmissions would be on different frequencies because of diversity. So, this is not completely realistic. Currently, BT hops at least 20 MHz away. The glitch in the CDFs that you have shown, is this a function of Wi-Fi traffic? Any plot like the one on page 10 will be impacted by how much Wi-Fi traffic there is.
	9. Comment: Yes, the Wi-Fi packet size impacts this. If the Wi-Fi packets were 8 ms you’d see glitches.
	10. Comment: In general, the connection event has some idle period. The fourth try ends before the end of the connection event.
	11. Comment: What is sliding audio?
	12. Comment: Normally, BT would schedule its transmissions. With sliding audio packets, I am assuming that the BT device could receive the packets any time. That means after a ceratin backoff. I am not suggesting that BT should do it because it is a bigger deviation from what BT implements. If you have the capability to transmit whenever your backoff expires, it makes coexistence much easier.
	13. Comment: What is the duration of your short interframe space?
	14. Comment: It is 16 µs.
12. At 2024-01-16T15:26-05:00, the chair declares the meeting to be in recess.

# Tuesday, 2024-01-16, Eve session

1. At 2024-01-16T19:36-05:00 the chair calls the meeting of the IEEE 802.11 Coexistence Standing Committee (SC) to order. Mark Emmelmann acts as chair of the SC. Guido R. Hiertz acts as recording secretary of the SC.
	1. The SC invited IEEE 802.15 to participate in this session. Therefore, this session is held jointly by the SC and IEEE 802.15.
2. The chair presents 11-23/2132r1. The chair reminds all attendees of their obligations when participating in this meeting. The chair reviews 11-23/2130r2 that contains the agenda for this session.
3. At 2024-01-16T19:39-05:00 the chair presents 11-24/146r1. At 2024-01-16T19:42-05:00 attendees discuss page 4.
	1. Comment: There are several different coexistence mechanisms in the 802.15 standard. Few know that the use of CSMA is mandatory, already. We need to further investigate what can be done to develop good practices that improve coexistence. We have to improve both standards. In the wireless world, that we are heading towards, there is no more exclusive spectrum.
4. At 2024-01-16T19:45-05:00 Ben Rolfe presents 15-23/452r0. At 2024-01-16T19:55-05:00 Ben presents 15-23/452r2. Ben concludes his presentation at 2024-01-16T20:01-05:00.
	1. Comment: The demo you mentiond had just UWB devices.
	2. Comment: Yes, they did not have a narrowband radio. However, the specification ist not limited to a specific radio technology. The LBT description in the IEEE 802.15 standard works with different PHYs.
	3. Comment: CSMA is not mandated in the IEEE 802.15.4ab standard.
	4. Comment: Yes, but the use of CSMA is mandated in the IEEE 802.15 standard that IEEE 802.15.4ab relies upon. In IEEE 802.15.4, LBT is mandatory. We don’t need to repeat this requirement in an amendment.
	5. Comment: But there is no Energy Detection threshold defined?
	6. Comment: Take a look at the next revision. It is specified there.
	7. Comment: At IEEE 802.11, we put CCA requirements in every PHY description. Our experience is that it is advisable to have something mandatory in the standard. At IEEE 802.11, we have a gatekeeper and that is Wi-Fi Alliance.
	8. Comment: Coexistence methods should be mandatory. Because if they are optional, some will not implement them. You seem to imply that IEEE 802.15.4 mandates the use of many LBT schemes already.
	9. Comment: The standard requires CSMA for all PHYs. There are PHYs where LBT does not bring any good. We have very diverse markets.
	10. Comment: Let’s make one coexistence scheme mandatory for IEEE 802.15.4ab.
	11. Comment: Are the LBT requirements listed in IEEE 802.15.4-2020 or in the upcoming revision?
	12. Comment: It’s there since the 2006 version. It’s not new.
	13. Comment: There is an issue with the new NB transmission that is proposed to also carry data transmissions. All of that happens without LBT.
	14. Comment: LBT is in the specific IEEE 802.15.4 clause. CCA applies in regulatory domains that require it.
	15. Comment: For coexistence, LBT should be always mandatory.
	16. Comment: The IEEE SA ballot pool on IEEE 802.15.4 is open until tomorrow. How does the group want to follow-up?
	17. Comment: What is the timeline for 15-23/452?
	18. Comment: We want to open the ballot in March. That includes the coexistence assessment document.
5. At 2024-01-16T20:43-05:00 Brian Hart presents 15-23/573r1. He concludes his presentation at 2024-01-16T20:59-05:00.
	1. Comment: In-device coordination is important. What we have been mostly discussing is meeting regulatory requirements. We need to be quick because requirements in standards are written at this time.
	2. Comment: In-device coexistence is a challenging discussion. Solving in-device coexistence gives tail wind to solve the sharing problem.
	3. Comment: The slides are about accessing the wireless medium, all related requirements etc. But what’s lacking is the status about how long to transmit. The duration is so important. Transmitting for a duration of 100 ms prevents any coexistence.
	4. Comment: I completely agree with you. It’s baked into stuff that I work with. But then again, it’s not baked in for everyone. I completely agree that this needs to be part of the solution.
	5. Comment: There are several clocks ticking. We need to focus on getting the ETSI standard done. FCC will develop will a Further Notice of Proposed Rulemaking. In-device coordination is not on the same timeline as with regulatory requirements.
	6. Comment: We have an issue that dissimilar systems cannot exchange information with each other and communicate. However, inside a device, different systems can talk to each other.
6. At 2024-01-16T21:10-05:00 Rich Kennedy presents 11-24/19r0. He concludes his presentation at 2024-01-15T21:19-05:00.
	1. Comment: Why is there a new Work Item needed at ETSI? If the outcome is that LBT is not needed anymore, will your recommendation be to still use LBT?
	2. Comment: We are not at the stage to make that determination.
	3. Comment: If the outcome is that there are alternatives, will you still recommend LBT as solution?
	4. Comment: Sharing is required. A sharing mechanism is what we need.
	5. Comment: What is your intent in this committee?
	6. Comment: It’s general. Let’s do things a little differently. A lot of good work is done on simulations. We need to share. The work needs to become more focused.
	7. Comment: Where are we going? What is the next step?
	8. Comment: We should have these joint sessions at every future meetings.
	9. Comment: There should be conference calls, too.
	10. Comment: We’ll make proposals for teleconferences. The chairs facilitate the environment but we are contribution driven.
7. At 2024-01-16T21:30-05:00, the chair declares the meeting to be in recess.
	1. At 2024-01-16T19:55-05:00 approximately 60 attendees were present in the meeting room and ca. 117 attendees were logged on to the Webex session.

# Wednesday, 2024-01-17, AM 2 session

1. At 2024-01-17T10:31-05:00 Marc Emmelmann calls the meeting of the IEEE 802.11 Coexistence Standing Committee (SC) to order. Mark Emmelmann acts as chair of the SC. Guido R. Hiertz acts as recording secretary of the SC.
	1. Marc presents 11-23/2132r1 and reminds all attendees of their obligations during this meeting.
2. At 2024-01-17T10:33-05:00 Sebastian Max presents 11-24/55r0. At 2024-01-17T11:04-05:00, he concludes his presentation.
	1. Comment: I have a question on page 5. Does this mean that the backoff fails?
	2. Comment: Yes, the 25 µs check for secondary CCA fails. In example one, I assume that a new backoff occurs and the device falls back to transmitting on the primary 20 MHz channel.
	3. Comment: There are two options in the current standard definition. So, you are not falling back from a 160 MHz to a 40 MHz transmission, for example.
	4. Comment: Yes, it is difficult to say which is better. Having a static backoff or a dynamic backoff that adjusts bandwidth use.
	5. Comment: Yes, for latency reeuction it’s much better to use a dynamic backoff.
	6. Comment: I intentionally did not analyze complex scenarios. I just wanted to see what is possible with today’s hardware, already.
	7. Comment: Going from 160 MHz to 40 MHz is not simple but it is used by products out in the field.
	8. Comment: Is this assuming that hopping is limited to within 20 MHz only?
	9. Comment: I am assuming that just no hopping happens here. In my simulation, I assume that a connection event remains on the same channel. If the hopping remains within 20 MHz, then it would be the same situation for Wi-Fi.
	10. Comment: There would be issues if BT was limited to just hopping in 20 MHz. Skipping the Wi-Fi primary channels has benefits.
	11. Comment: The blue curve represents a scenario where Wi-Fi needs the full 160 MHz to be idle. Hence, there is no benefit to avoid the primary channels.
	12. Comment: If you keep increasing the number of BT links, Wi-Fi will be limited to its primary channels.
	13. Comment: Under my assumption, BT is doing LBT and hence, it shares with Wi-Fi. I would need to make further simulations.
	14. Comment: When there is no coexistence, the latency shoots up. Where can I see this?
	15. Comment: You can’t see it when the latency becomes infinite. The queues fill up.
	16. Comment: You assume 60 ms per second. In the next page, you show the minimum latency.
	17. Comment: I am looking at the worst case round-trip delays.
	18. Comment: If you can, I kindly ask that you a add a pure Wi-Fi latency graph in the future.
	19. Comment: Do you believe that doing things with AFH instead of no-LBT makes the no-LBT simulation scenario more realistic?
	20. Comment: So far I see that AFH takes some 500 ms.
	21. Comment: About six to severn years ago, at Wi-Fi Alliance members meeting I asked various employees of companies that manufacture IEEE 802.11 chips about their products’ ability to dynamically switch the channel size before the backoff expires. Back then, they unanimously indicated that their products could not do it, and that the products repeat their medium access attempts with another backoff.
	22. Comment: I believe today, everyone probably implements dynamic bandwidth switching.
3. At 2024-01-17T11:26-05:00 Ratnesh Kumbhkar presents 11-24/7r0. At 2024-01-17T11:50-05:00, he concludes his presentation.
	1. Comment: Please note the difference between spectrum regulation and market requirements. In Europe, spectrum regulation is defined by ECC. Harmonised Standards do not define regulatory requirements. Harmonised Standards define requirements that products need to comply with if they are intended to be placed on the market of the EU.
	2. Comment: I did not understand what active scanning is. Can you explain please?
	3. Comment: Active scanning occurs when transmissions are happening already.
	4. Comment: So, active scanning occurs shortly before a medium assessment happens whe a device tries to transmit?
	5. Comment: Yes, could be. But It’s not necessarily an LBT.
	6. Comment: If I do LBT, I could of course use the results of LBT to adapt my channel usage. We are approaching the same solution from different angles.
	7. Comment: The 20 ms on page 6 seems high. The values are not consistent with 6 GHz requirements in EN 303 687.
	8. Comment: The power part would be determined by whatever the regulatory requirement is. The 20 ms, we can further study. The detection threshold could scale according to the Wi-Fi sensing threshold.
	9. Comment: How accurate are the scans?
	10. Comment: Have you looked at the power consumption of r-DAA vs. LBT?
	11. Comment: I believe LBT is more respectful to Wi-Fi. Why do you start with rDAA on page 5?
	12. Comment: There are many scenarios where you hop over 500 MHz and only 160 MHz are occupied. Then, LBT leads to unnecessary delays for BT. The use of rDAA depends on how much of the spectrum is occupied. If there is frequency division, no LBT is needed. BT would still suffer if LBT was used everywhere. Low latency is important for BT.
	13. Comment: I liked when the LTE-U/LAA LTE crowd worked with Wi-Fi. When you introduce a new system to license-exempt spectrum, the rule should be that a new system would impact Wi-Fi at most as adding another Wi-Fi system would cause. Do you believe rDAA would pass this coexistence value metric?
	14. Comment: In case of LAA LTE, it made sense to use this metric. But BT has so low bandwidth and it is hopping, it’s not a straight comparison.
4. At 2024-01-17T12:07-05:00 Carlos Aldana presents 11-24/130r0. He concludes his presentation at 2024-01-17T12:20-05:00.
	1. Comment: On page 4, in your simulations, do you assume when there is a NB transmission that the whole Wi-Fi packet is lost?
	2. Comment: No, only when the preamble is hit, everything is lost. Otherwise, the part that is hit will be retransmitted.
	3. Comment: In your assumptions AFH does not help because everything is occupied.
	4. Comment: Yes
5. At 2024-01-17T12:22-05:00 chair presents from page 16 of 11-23/2132r1.
6. At 2024-01-17T12:29-05:00 the chair declares the meeting of the SC adjourned.