IEEE P802.11  
Wireless LANs

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| IEEE 802.11bf – Teleconference Minutes May-July 2021 | | | | |
| Date: 2021-04-27 | | | | |
| Author(s): | | | | |
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Abstract

This document contains minutes for the TG 802.11bf teleconferences in May-July 2021.

Rev 0: Minutes for TG 802.11bf teleconference on the 25th of May.

Rev 1: Minutes for TG 802.11bf teleconference on the 1st of June added.

Rev 2: Minutes for TG 802.11bf teleconferences on the 15th and 22nd of June added.

**Tuesday, May 25, 2021, 10:00-12:00 am (ET)**

**Meeting Agenda:**

The meeting agenda is shown below, and published in the agenda document:

<https://mentor.ieee.org/802.11/dcn/21/11-21-0875-01-00bf-tgbf-meeting-agenda-2021-05-06.pptx>

1. Call the meeting to order
2. Patent policy and logistics
3. TGbf Timeline
4. Call for contribution
5. Teleconference Times
6. Presentation of submissions
7. Any other business
8. Adjourn
9. The chair, Tony Xiao Han, calls the meeting to order at 10:00am (about 50 persons are on the call after a few minutes of the meeting).
10. The chair goes through “Meeting Protocol, Attendance, Voting & Documentation Status” (slide 4), “Participants have a duty to inform the IEEE” (slide 6), and “Ways to inform IEEE” (slide 7).

The chair makes a Call for Potentially Essential Patents. No potentially essential patents reported, and no questions asked.

The chair goes through “Other Guideline for IEEE WG meetings” (slide 8), “Patent-related information” (slide 9), “ IEEE SA Copyright Policy” (slides 10 and 11), “Participant behavior in IEEE-SA activities is guided by the IEEE Codes of Ethics & Conduct” (slide 12), “Participants in the IEEE-SA “individual process” shall act independently of others, including employers”(slide 13), and “IEEE-SA standards activities shall allow the fair & equitable consideration of all viewpoints” (slide 14), and “Required notices” (slide 15).

The chair goes through the agenda (slide 21) and asks if there are any questions or comments on the agenda. Solomon Trainin explains that his contribution is related to Motion 16 and askes to run Motion 16 after his presentation. Chair askes the mover for Motion 16 if this is OK. The mover agrees to this.

The chair asks if there is any objection to approve the agenda. No objection from the group so the agenda is approved.

1. The Chair presents the TGbf timeline (slide 17).
2. The Chair presents slide 18, Call for contributions.
3. The Chair presents the teleconference times (slide 19).
4. Presentations:

**11-21/0770r0, “Trellis Coded Quantization for CSI Feedback Part 1: Quantization for the Phase of CSI”, Junghoon Suh (Huawei):** The contribution was presented in the last teleconference, but there was no time for Q&A.

Question/Comment (Q): I don’t understand how you get 1 bit saving from 1 dB improvement in SNR.

**11-21/0771r0, “Trellis Coded Quantization for CSI Feedback Part 2: Quantization for the Magnitude of CSI”, Junghoon Suh (Huawei):** This contribution is similar to the previous one, but considering the magnitude instead of the phase.

Q: I don’t think it is worth the extra complexity to get this relatively small gain.

Q: Do we need to make changes to the PHY?

Answer(A): No, not to the PHY.

Q: I also don’t think 1 dB gives1 bit gain.

Q: Do you expect this to be mandatory or optional?

A: Mandatory.

Q: We have already agreed on sending raw data as one option

A: In that case it has to be optional.

**Straw Poll 1:** Do you support to convert the CSI (CFR) in complex number to the CSI (CFR) in phase & magnitude for the Quantization of CSI?

-Note: CFR FB is one CSI FB type

**Y/N/A: 9/17/9**

**11-21/0854r0 “A Proposed Sensing Procedure for 802.11bf”, Osama Aboul-Magd (Huawei):** This submission presents a sensing procedure modelled after the sounding procedure in 802.11ac and 802.11ax.

Q: Do we need an announcement for each reference sequence sent?

A: No.

Q: Basically, the sensing feedback request is a Trigger Frame?

A: Yes.

**The SP is deferred.**

**11-21/0644r3, “Sensing session and measurement exchange identification”, Solomon Trainin (Qualcomm):** The contribution has been presented before, but with a relatively large number of persons voting NO on the SPs. The purpose with this presentation is to trigger discussion and to understand what the concern is in order to make progress.

After some discussions, we run out of time. The Chair suggests continuing the discussion off-line.

1. The Chair asks if there is any other business. No response from the group.
2. The meeting is adjourned without objection at 12:01 pm (ET).

**List of Attendees:**

|  |  |  |  |
| --- | --- | --- | --- |
| Breakout | Timestamp | Name | Affiliation |
| TGbf | 5/25 | Aboulmagd, Osama | Huawei Technologies Co., Ltd |
| TGbf | 5/25 | Au, Kwok Shum | Huawei Technologies Co., Ltd |
| TGbf | 5/25 | Aygul, Mehmet | VESTEL; IMU |
| TGbf | 5/25 | Beg, Chris | Cognitive Systems Corp. |
| TGbf | 5/25 | Bredewoud, Albert | Broadcom Corporation |
| TGbf | 5/25 | Dong, Xiandong | Xiaomi Inc. |
| TGbf | 5/25 | Du, Rui | Huawei Technologies Co., Ltd |
| TGbf | 5/25 | feng, Shuling | MediaTek Inc. |
| TGbf | 5/25 | Kadampot, Ishaque Ashar | Qualcomm Incorporated |
| TGbf | 5/25 | Kamel, Mahmoud | InterDigital, Inc. |
| TGbf | 5/25 | Kim, Jeongki | LG ELECTRONICS |
| TGbf | 5/25 | Lu, Liuming | Guangdong OPPO Mobile Telecommunications Corp.,Ltd |
| TGbf | 5/25 | Luo, Chaoming | Beijing OPPO telecommunications corp., ltd. |
| TGbf | 5/25 | Mirfakhraei, Khashayar | IEEE member / Self Employed |
| TGbf | 5/25 | Ozbakis, Basak | Vestel Electronics Corp. |
| TGbf | 5/25 | Pushkarna, Rajat | Panasonic Asia Pacific Pte Ltd. |
| TGbf | 5/25 | Raissinia, Alireza | Qualcomm Incorporated |
| TGbf | 5/25 | Shellhammer, Stephen | Qualcomm Incorporated |
| TGbf | 5/25 | Stephens, Adrian | Self |
| TGbf | 5/25 | SUH, JUNG HOON | Huawei Technologies Co., Ltd |
| TGbf | 5/25 | Trainin, Solomon | Qualcomm Incorporated |
| TGbf | 5/25 | Tsai, Tsung-Han | MediaTek Inc. |
| TGbf | 5/25 | Wang, Chao Chun | MediaTek Inc. |
| TGbf | 5/25 | Wang, Lei | Futurewei Technologies |
| TGbf | 5/25 | Wilhelmsson, Leif | Ericsson AB |
| TGbf | 5/25 | Yano, Kazuto | Advanced Telecommunications Research Institute International (ATR) |
| TGbf | 5/25 | Zeng, Ruochen | NXP Semiconductors |

**Tuesday, June 1, 2021, 10:00-12:00 am (ET)**

**Meeting Agenda:**

The meeting agenda is shown below, and published in the agenda document:

<https://mentor.ieee.org/802.11/dcn/21/11-21-0875-02-00bf-tgbf-meeting-agenda-2021-05-06.pptx>

1. Call the meeting to order
2. Patent policy and logistics
3. TGbf Timeline
4. Call for contribution
5. Teleconference Times
6. Motions (19-20)
7. Presentation of submissions
8. Any other business
9. Adjourn
10. The chair, Tony Xiao Han, calls the meeting to order at 10:00am (about 40 persons are on the call after a few minutes of the meeting, close to 70 persons are on the call after one hour).
11. The chair goes through “Meeting Protocol, Attendance, Voting & Documentation Status” (slide 4), “Participants have a duty to inform the IEEE” (slide 6), and “Ways to inform IEEE” (slide 7).

The chair makes a Call for Potentially Essential Patents. No potentially essential patents reported, and no questions asked.

The chair goes through “Other Guideline for IEEE WG meetings” (slide 8), “Patent-related information” (slide 9), “ IEEE SA Copyright Policy” (slides 10 and 11), “Participant behavior in IEEE-SA activities is guided by the IEEE Codes of Ethics & Conduct” (slide 12), “Participants in the IEEE-SA “individual process” shall act independently of others, including employers”(slide 13), and “IEEE-SA standards activities shall allow the fair & equitable consideration of all viewpoints” (slide 14), and “Required notices” (slide 15).

The chair goes through the agenda (slide 20) and asks if there are any questions or comments on the agenda. The Chair explains he plans to run the motions during the second hour, so possibly interleaved with the presentations.

The chair asks if there is any objection to approve the agenda. No objection from the group so the agenda is approved.

1. The Chair presents the TGbf timeline (slide 21).
2. The Chair presents slide 22, Call for contributions.
3. The Chair presents the teleconference times (slide 23).
4. Presentations:

Solomon explains that he would like to delay his presentation to the next session

**11-21/0908r0, “Sensing Measurements: Interfaces and Reporting” (Claudio da Silva):**

Claudio explains that he does not have any SP at this point, instead the purpose is to collect feedback from the group.

Q: Just a friendly note on slide 5. Using category Public may cause limitation, so I believe we should consider defining a new category.

A: Thanks. The slide is updated to reflect this comment.

Q: The parameter Ng used in 11ax depends on the frequency correlation, I don’t know if you have some results showing this is appropriate also for sensing?

A: No, I don’t have any data, but the overhead is a concern and a large Ng would reduce the amount of data needed to be fed back.

Q: It may be possible to process the data and not just feed back raw data.

A: I agree, but we need to specify the formats that can be used.

The Chair asks Claudio about the next plans. Claudio explains that he intends to collect comments from the group and then prepare SPs for future teleconferences.

1. Motions:

**Motion 19:** Move to adopt the document (21-0782r2) as the initial official Channel Models document for IEEE 802.11bf.

**Move**: Meihong Zhang

**Second:** Rui Du

**Preliminary Result:** Y/N/A: 26/1/17, Motion passes

**Motion 20:** Move to add the following to 11bf SFD:

The following parameters may be determined (or specified) in the setup phase of a sensing session

* Periodicity (the rate of transmission of sensing transmissions)
* Bandwidth
* Number of receive antennas
* Number of spatial streams
* Transmit output power

**Move:** Halise TÜRKMEN

**Second:** Mehment Ali Aygul

After some discussion the Mover decides to withdraw the Motion.

1. The Chair asks if there is any other business. No response from the group.
2. The meeting is adjourned without objection at 11:23 am (ET).

**List of Attendees:**



**Tuesday, June 15, 2021, 10:00-12:00 am (ET)**

**Meeting Agenda:**

The meeting agenda is shown below, and published in the agenda document:

<https://mentor.ieee.org/802.11/dcn/21/11-21-0875-04-00bf-tgbf-meeting-agenda-2021-05-06.pptx>

1. Call the meeting to order
2. Patent policy and logistics
3. TGbf Timeline
4. Call for contribution
5. Teleconference Times
6. Presentation of submissions
7. Any other business
8. Adjourn
9. The chair, Tony Xiao Han, calls the meeting to order at 10:00am (about 35 persons are on the call after a few minutes of the meeting, about 50 persons are on the call after one hour).
10. The chair goes through “Meeting Protocol, Attendance, Voting & Documentation Status” (slide 4), “Participants have a duty to inform the IEEE” (slide 6), and “Ways to inform IEEE” (slide 7).

The chair makes a Call for Potentially Essential Patents. No potentially essential patents reported, and no questions asked.

The chair goes through “Other Guideline for IEEE WG meetings” (slide 8), “Patent-related information” (slide 9), “ IEEE SA Copyright Policy” (slides 10 and 11), “Participant behavior in IEEE-SA activities is guided by the IEEE Codes of Ethics & Conduct” (slide 12), “Participants in the IEEE-SA “individual process” shall act independently of others, including employers”(slide 13), and “IEEE-SA standards activities shall allow the fair & equitable consideration of all viewpoints” (slide 14), and “Required notices” (slide 15).

The chair goes through the agenda (slide 27) with two presentations and asks if there are any questions or comments on the agenda. Solomon announces that he would like to prefer the SP to the next time.

The chair asks if there are any other business or if the agenda can be approved. No comment from the group so the agenda is approved.

1. The Chair presents the TGbf timeline (slide 28).
2. The Chair presents slide 29, Call for contributions.
3. The Chair presents the teleconference times (slide 30).
4. Presentations:

**11-21/0876r0, “TGbf Evaluation Methodology and Simulation Scenarios”, Rui Du (Huawei):**

The evaluation methodology defines PHY performance, one simulation scenario and comparison criteria for evaluating proposals.

Q: Do you want measure variations between different measurements or RMSE wrt to ground truth.

A: The latter.

Q: It must be the AP that transmits and the STA that receives?

A: I believe we can also do it the other way around.

Q: It should not be detection accuracy (detection is binary), but range accuracy.

Q: You specify that the the walls are concrete. Maybe it would make sense to also support other materials.

A: I agree, but I believe it is possible to just tune the model to account for this.

Q: In Section 1.3, exactly what do you compare? I think a better word is evaluation.

A: I agree.

Q: This is only for the 60 GHz band?

A: Yes

Q: I believe that some of the parameters you want to estimate are actually not estimated on the PHY, but on the application layer. I am not convinced this should be part of the standardization.

Q: If we want to add sub-7 GHz, would that be a new document or should we update this document?

A: At this point I don’t know. I believe we should discuss this in the group.

Q: In 1.3.1, what do you mean by “all MCS’s”?

A: The idea was to verify that if it is useful for all MCSs. But we can remove this if that is what the group believes.

Q: Do you really need to have “must” in the document? You can think about it to the next time.

Q: I believe you may want to state more clearly that the document is limited to the 60 GHz.

Q: I believe the comparisons we want to make are not on detailed PHY performance, but more along the lines “for how long must one measure” etc. I believe it is important to clarify a bit more what should be compared and evaluated.

A: I agree. It would make sense to use a common PHY part, but I am currently not sure what we can share in this respect.

Q: Do we only consider the radar scenario?

A: No.

The Chair asks about future plans.

Rui explains that there is a SP, but that he first will consider the feedback before running it.

1. The Chair asks is there is any other business. No response from the group.
2. The meeting is adjourned without objection at 11:03 am (ET).

**List of Attendees:**

|  |  |  |  |
| --- | --- | --- | --- |
| Breakout | Timestamp | Name | Affiliation |
| TGbf | 6/15 | Aboulmagd, Osama | Huawei Technologies Co., Ltd |
| TGbf | 6/15 | Beg, Chris | Cognitive Systems Corp. |
| TGbf | 6/15 | Bredewoud, Albert | Broadcom Corporation |
| TGbf | 6/15 | Chayat, Naftali | Vayyar Imaging |
| TGbf | 6/15 | da Silva, Claudio | Intel Corporation |
| TGbf | 6/15 | Dong, Xiandong | Xiaomi Inc. |
| TGbf | 6/15 | Du, Rui | Huawei Technologies Co., Ltd |
| TGbf | 6/15 | feng, Shuling | MediaTek Inc. |
| TGbf | 6/15 | Hu, Mengshi | Huawei Technologies Co., Ltd |
| TGbf | 6/15 | Kadampot, Ishaque Ashar | Qualcomm Incorporated |
| TGbf | 6/15 | Kain, Carl | USDOT; Noblis |
| TGbf | 6/15 | Kamel, Mahmoud | InterDigital, Inc. |
| TGbf | 6/15 | Kim, Jeongki | LG ELECTRONICS |
| TGbf | 6/15 | Kim, Sang Gook | LG ELECTRONICS |
| TGbf | 6/15 | Kim, Youn-Kwan | Sync Techno |
| TGbf | 6/15 | Kwon, Young Hoon | NXP Semiconductors |
| TGbf | 6/15 | Lim, Dong Guk | LG ELECTRONICS |
| TGbf | 6/15 | Luo, Chaoming | Beijing OPPO telecommunications corp., ltd. |
| TGbf | 6/15 | Memisoglu, Ebubekir | Istanbul Medipol University; Vestel |
| TGbf | 6/15 | Mirfakhraei, Khashayar | IEEE member / Self Employed |
| TGbf | 6/15 | NANDAGOPALAN, SAI SHANKAR | Infineon Technologies |
| TGbf | 6/15 | Ozbakis, Basak | Vestel Electronics Corp. |
| TGbf | 6/15 | Pushkarna, Rajat | Panasonic Asia Pacific Pte Ltd. |
| TGbf | 6/15 | Raissinia, Alireza | Qualcomm Incorporated |
| TGbf | 6/15 | Roy, Sayak | NXP Semiconductors |
| TGbf | 6/15 | Sarikaya, Behcet | IEEE Member / Self Employed |
| TGbf | 6/15 | Shellhammer, Stephen | Qualcomm Incorporated |
| TGbf | 6/15 | Sosack, Robert | Molex Incorporated |
| TGbf | 6/15 | SUH, JUNG HOON | Huawei Technologies Co., Ltd |
| TGbf | 6/15 | Trainin, Solomon | Qualcomm Incorporated |
| TGbf | 6/15 | Turkmen, Halise | IMU; Vestel |
| TGbf | 6/15 | Wei, Dong | NXP Semiconductors |
| TGbf | 6/15 | Wilhelmsson, Leif | Ericsson AB |
| TGbf | 6/15 | Yano, Kazuto | Advanced Telecommunications Research Institute International (ATR) |

**Tuesday, June 22, 2021, 10:00-12:00 am (ET)**

**Meeting Agenda:**

The meeting agenda is shown below, and published in the agenda document:

<https://mentor.ieee.org/802.11/dcn/21/11-21-0875-05-00bf-tgbf-meeting-agenda-2021-05-06.pptx>

1. Call the meeting to order
2. Patent policy and logistics
3. TGbf Timeline
4. Call for contribution
5. Teleconference Times
6. Presentation of submissions
7. Any other business
8. Adjourn
9. The chair, Tony Xiao Han, calls the meeting to order at 10:00am (about 35 persons are on the call after a few minutes of the meeting, close to 50 persons are on the call after one hour).
10. The chair goes through “Meeting Protocol, Attendance, Voting & Documentation Status” (slide 4), “Participants have a duty to inform the IEEE” (slide 6), and “Ways to inform IEEE” (slide 7).

The chair makes a Call for Potentially Essential Patents. No potentially essential patents reported, and no questions asked.

The chair goes through “Other Guideline for IEEE WG meetings” (slide 8), “Patent-related information” (slide 9), “ IEEE SA Copyright Policy” (slides 10 and 11), “Participant behavior in IEEE-SA activities is guided by the IEEE Codes of Ethics & Conduct” (slide 12), “Participants in the IEEE-SA “individual process” shall act independently of others, including employers”(slide 13), and “IEEE-SA standards activities shall allow the fair & equitable consideration of all viewpoints” (slide 14), and “Required notices” (slide 15).

The chair goes through the agenda (slide 31) with three presentations and asks if there are any questions or comments on the agenda.

The chair asks if there are any other business or if the agenda can be approved. No comment from the group so the agenda is approved.

1. The Chair presents the TGbf timeline (slide 32).
2. The Chair presents slide 33, Call for contributions.
3. The Chair presents the teleconference times (slide 34).
4. Presentations:

**11-21/0908r1, “Sensing Measurements: Interfaces and Reporting”, Claudio da Silva (Intel):**

The revision 0 has been presented, and now some SPs have been added.

Q: Related to SP 1, this PPDU can be any PPDU?

A: Yes.

Q: The CSI in SP1 may not be the same as the same in e.g. HT?

A: At this point, the format is not defined. I am looking for a high-level agreement. SP2 is modified to reflect to this.

**Straw Poll 1:** Do you agree to add the following statement to the SFD:

CSI (that is, the channel measured during the training symbols of a received PPDU) is a type of sensing measurement result for sub-7 GHz WLAN sensing.

**Result:** Y/N/A: 36/0/5

Q: Related to SP2, does it make sense to explicitly state that delayed reporting is acceptable?

A: I believe this has been the assumption all the time, but there has not been any specific contribution in this matter. For this reason, I did not include it at this time.

The SP is updated to reflect this.

**Straw Poll 2:**

Do you agree to add the following text to the SFD:

* To enable sub-7 GHz WLAN sensing, an RXVECTOR parameter CSI\_ESTIMATE is defined that contains the channel measured during the training symbols of the received PPDU.
* A Sensing Measurement Report frame, which allows a sensing receiver to report sensing measurements, is defined. This new frame contains at least the following two fields:
  + Measurement report control field: Contains information necessary to interpret the measurement report field.
  + Measurement report field: Carries CSI measurements obtained by a sensing receiver.
* The format of CSI\_ESTIMATE is the same one used in the measurement report field within the Sensing Measurement Report frame. The format of CSI\_ESTIMATE is TBD.
* Transmission of the Sensing Measurement Report frame is initiated by an MLME primitive. Both immediate and delayed reporting are acceptable.

**Result:** Y/N/A: 22/6/8

**11-21/0647r2, “WLAN Sensing Discovery”, Pei Zhou (OPPO):**

This contribution is concerned with how to indicate sensing capabilities for a STA.

**Straw Poll 1:**

Which option do you prefer when the 802.11bf amendment defines the container of sensing capabilities?

* + **Option 1:** use the reserved bits in Extended Capabilities element to indicate all the sensing capabilities of a STA.
  + **Option 2:** design a Sensing Capabilities element to carry all the sensing capabilities of a STA.
  + **Option 3:** use one reserved bit in Extended Capabilities element to indicate ‘Sensing Support’ and design a Sensing Capabilities element to carry the detailed sensing capabilities of a STA.

Note: The format of Sensing Capabilities element and the detailed sensing capabilities are TBD.

**Result:** Option 1/Option 2/Option 3/Abstain/None: 0/16/3/12/8

Straw Poll 2 is deferred.

**11-21/990r0, “Discussion on sensing measurement flows”, Cheng Chen (Intel):**

The focus is on the measurement flows, assuming that the setup phase is already done. Client to Client sensing is not considered in this contribution, so only the situation where an AP is involved. Finally, the sensing is assumed to be based on NDP in the sub-7 GHz bands.

We are out of time, but some time will be allocated in the next session for questions

1. The Chair asks if there is any other business? No response from the group.
2. The meeting is adjourned without objection at 12:02 pm (ET).

**List of Attendees:**

|  |  |  |  |
| --- | --- | --- | --- |
| Breakout | Timestamp | Name | Affiliation |
| TGbf | 6/22 | Aboulmagd, Osama | Huawei Technologies Co., Ltd |
| TGbf | 6/22 | Au, Kwok Shum | Huawei Technologies Co., Ltd |
| TGbf | 6/22 | Au, Oscar | Origin Wireless |
| TGbf | 6/22 | Aygul, Mehmet | VESTEL; IMU |
| TGbf | 6/22 | Beg, Chris | Cognitive Systems Corp. |
| TGbf | 6/22 | Chayat, Naftali | Vayyar Imaging |
| TGbf | 6/22 | da Silva, Claudio | Intel Corporation |
| TGbf | 6/22 | Dong, Xiandong | Xiaomi Inc. |
| TGbf | 6/22 | Du, Rui | Huawei Technologies Co., Ltd |
| TGbf | 6/22 | Grigat, Michael | Deutsche Telekom AG |
| TGbf | 6/22 | Kamel, Mahmoud | InterDigital, Inc. |
| TGbf | 6/22 | Kim, Sang Gook | LG ELECTRONICS |
| TGbf | 6/22 | Lu, Liuming | Guangdong OPPO Mobile Telecommunications Corp.,Ltd |
| TGbf | 6/22 | Luo, Chaoming | Beijing OPPO telecommunications corp., ltd. |
| TGbf | 6/22 | Ozbakis, Basak | Vestel Electronics Corp. |
| TGbf | 6/22 | Pushkarna, Rajat | Panasonic Asia Pacific Pte Ltd. |
| TGbf | 6/22 | Raissinia, Alireza | Qualcomm Incorporated |
| TGbf | 6/22 | Rolfe, Benjamin | Blind Creek Associates |
| TGbf | 6/22 | Sand, Stephan | German Aerospace Center (DLR) |
| TGbf | 6/22 | Sarikaya, Behcet | IEEE Member / Self Employed |
| TGbf | 6/22 | Shellhammer, Stephen | Qualcomm Incorporated |
| TGbf | 6/22 | Sosack, Robert | Molex Incorporated |
| TGbf | 6/22 | Trainin, Solomon | Qualcomm Incorporated |
| TGbf | 6/22 | Tsai, Tsung-Han | MediaTek Inc. |
| TGbf | 6/22 | Turkmen, Halise | IMU; Vestel |
| TGbf | 6/22 | Wang, Pu | Mitsubishi Electric Research Labs (MERL) |
| TGbf | 6/22 | Wei, Dong | NXP Semiconductors |
| TGbf | 6/22 | Wilhelmsson, Leif | Ericsson AB |
| TGbf | 6/22 | Xin, Yan | Huawei Technologies Co., Ltd |
| TGbf | 6/22 | Yano, Kazuto | Advanced Telecommunications Research Institute International (ATR) |
| TGbf | 6/22 | Zhang, Meihong | Huawei Technologies Co., Ltd |