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| IEEE 802.18 Radio Regulatory Technical Advisory Group, RR-TAG, Minutes | | | | |
| Date: 12 - 14 March 2019 | | | | |
| Name | Affiliation | Address | Phone | Email |
|  | | | | |
| Author(s): | | | | |
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|  |  |  |  |  |
|  | | | | |
| Author and Officer presiding: | | | | |
| Jay Holcomb,  Chair, RR-TAG | Itron | Liberty Lake, (Spokane) WA | +1(509) 891-3281 | jholcomb@ieee.org |

Abstract

IEEE 802 RR-TAG f2f Minutes

These are IEEE 802 RR-TAG f2f Minutes for 12 - 14 March 2019; Plenary in Vancouver, BC, Canada

Chair calls the meeting to order at 10:33pt (local). See attendees below.

1. Chair presents slides 2, 3, and 4 of 802.18-19/00031r01, the call to order and administrative items
   1. Voters: 44 (9 on EC); Nearly Voters: 0; Aspirant members: 14
   2. Includes IEEE 802 meeting and participant’s guidelines and requirements.
2. Chair presents slides 5, of 802.18-19/0030r01, the agenda:
   1. Call to Order
   2. Administrative items
      1. Need a recording secretary; Peter Ecclesine
   3. Approve agenda & last minutes
   4. Discussion items
      1. EU Items
      2. Ofcom consultation
      3. General Discussion Items
         1. FCC Open meeting, 15 March, this Friday.
            1. R&O - Spectrum Horizons, > 95 GHz including 300GHz
            2. NPRM Expanding Broadband to the 896 / 935 MHz PLMR Band
         2. FCC NPRM 18-295, 6 GHz Reply Comments due Monday the 18th.
         3. USDoT Next phases on DSRC Analysis.
         4. Topics covered in Teleconferences since Jan.
   5. Teleconferences moving forward
   6. Actions required
      1. Anything new from this week
   7. AOB and Adjourn
3. Chair presents slides 6 – 8, Administrative – Motions and more
   1. Motion: To approve the agenda as presented on previous slide

Moved by: Mike Lynch (MJLync Assoc)

Seconded by: Tim Jeffries (Huawei)

Discussion? None

Vote: Unanimous consent

* 1. Motion: To approve the minutes from the IEEE 802.18 Interim meeting 15-17 January 2019 in document: <https://mentor.ieee.org/802.18/dcn/19/18-19-0009-00-0000-minutes-stl-interim-15-17-jan-2019-rr-tag.docx> Posted: 18-Jan-2019 10:20:19 ET

Moved by: Stuart Kerry (Ruckus)

Seconded by: Hassan Yaghoobi (Intel)

Discussion? None

Vote: Unanimous consent

* 1. Is anyone able to help as the 802.18 Vice-Chair?
     1. Needs to be a member of the IEEE and also the SA, needs a declaration of term commitment and affiliation letters to the EC. No response.
  2. Is anyone able to help as the 802.18 Secretary?
     1. Secretary must be IEEE SA member, though letters are not needed. No response.

1. Chair presents slide 9-10, EU Items review,
   1. ETSI – [<BRAN>](https://portal.etsi.org/tb.aspx?tbid=287&SubTB=287) next meeting #102, 17-20 June, Sophia Antipolis,
      1. Rcvr performance being added to EN 301 893, to be closed by December.
      2. EC staff officer rejected EN 302 567.
      3. Adaptivity discussions are continuing.
      4. Technical report TN 03 31 on 6725 – 7125 MHz has been approved.
      5. Broadband DA2GC Direct air-to-ground, maybe withdrawn.
   2. ETSI [<ERM>](https://portal.etsi.org/tb.aspx?tbid=286&SubTB=286)
      1. 66-71 GHz SRDoc is out for publication.
      2. There is an ECC doc on SRD for 66-71 GHz requirements, but the EU will adopt that about 18 months away. At ECC plenary if the consultation resolves all comments, at July meeting will approve the report bypassing the update cycle and ahead of the WRC-19.
   3. ETSI – ERM [<TG-37>](https://portal.etsi.org/tb.aspx?tbid=620&SubTB=620)
      1. Access layers ITS group has approved two work items for solutions for co-channel and adjacent channel operation . Timelines for solutions is July.
      2. [DTR/ERM-TG37-273 (TR 103 666)](https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=56944)
         1. Intelligent Transport Systems (ITS); Pre-Standardization Study on Co-Channel Co-Existence between IEEE- and 3GPP-based ITS technologies in the 5 855 MHz-5 925 MHz band TR on co-channel co-existence between ITS-G5 and LTE-V2X
      3. [DTR/ERM-TG37-274 (TR 103 667)](https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=57437)
         1. Intelligent Transport Systems (ITS); Study on Spectrum Sharing between ITS-G5 and LTE-V2X technologies in the 5 855 MHz-5 925 MHz band TR on feasibility and performance of solutions for shared use of 5.9 GHz spectrum by ITS-G5 and LTE-V2X
   4. CEPT – ECC [<SE24>](https://cept.org/ecc/groups/ecc/wg-se/se-24/client/introduction/)
      1. WI 63 – UWB indoor power increase and fixed outdoor.
   5. CEPT – ECC [<SE45>](https://cept.org/ecc/groups/ecc/wg-se/se-45/client/introduction/) next meeting #7, 24-25 Apr, Copenhagen
      1. Public consultation ECC Report 302 is in process, its due date confirmed to be 01 April
   6. CEPT – ECC [<FM57>](https://cept.org/ecc/groups/ecc/wg-fm/fm-57/client/introduction/) next meeting #5, 12-13 March, Maisons-Alfort (This week)
      1. RLAN/satellite and outdoor discussions this week, will hear more Thursday.
      2. The next meeting will include mitigations.
2. Chair presents slide 11, Ofcom\_Enabling-opportunities-for-innovatoin\_2.4GHz
   1. <https://www.ofcom.org.uk/consultations-and-statements/category-1/enabling-opportunities-for-innovation>
      1. <https://mentor.ieee.org/802.18/dcn/19/18-19-0034-00-0000-ofcom-enabling-opportunities-for-innovation-2-4ghz.pdf>
   2. Response due by March 12th, completed using  [consultation responses form (RTF, 1.5 MB)](https://urldefense.proofpoint.com/v2/url?u=https-3A__www.ofcom.org.uk_-5F-5Fdata_assets_rtf-5Ffile_0026_130688_enabling-2Dinnovation-2Dconsultation-2Dform.rtf&d=DwMDaQ&c=pqcuzKEN_84c78MOSc5_fw&r=z8R-nWJ8GIxwjOjNKhEFByb-tZ6XE3GZXWSggNdVo-w&m=3FBZmV-USi1IAJCcWLc_TKEa1D1P2ap2wmW9rVIDII0&s=Xr3ivvSquLAhW7zYeHsx70dkYfyIx3oz9mAK7LT-jww&e=).
      1. <https://mentor.ieee.org/802.18/dcn/19/18-19-0035-00-0000-ofcom-enabling-opportunities-consultation-form-2-4ghz.rtf>
   3. The 2390-2400 MHz discussion starts around page 35
      1. Handsets 23 dBm, base stations to 42 dBm, some other IOT considerations
   4. Annex 6. Interference risk assessment in 2300 MHz shared spectrum, starts on page 103.
   5. Does IEEE 802 consider sending in comments late? Yes, even after the deadline
   6. We can focus on two points for question 19: Do you have any other comments on our proposal?
      1. We are adjacent channel and we question analysis in Annex 6.
      2. The receive performance that Ofcom went another direction is going to be a problem.
3. Chair presents slides 12-15 General Discussion Items
   1. FCC Open meeting, 15 March, This Friday
   2. Spectrum Horizons
      1. The Commission will consider a [First Report and Order](https://www.fcc.gov/document/promoting-innovation-spectrum-horizons-airwaves) that would adopt rules to make available 21.2 GHz of spectrum above 95 GHz for unlicensed operations and create a new class of experimental licenses in 0.95-3 THz. (ET Docket No. 18-21; RM-11795)
      2. <https://mentor.ieee.org/802.18/dcn/19/18-19-0027-00-0000-draft-first-r-o-18-21-spectrum-horizons-95-ghz.pdf>
   3. Expanding Broadband to the 900 MHz Band
      1. The Commission will consider a [Notice of Proposed Rulemaking](https://www.fcc.gov/document/expanding-broadband-900-mhz-band) that would propose to reconfigure the 900 MHz band to create a broadband segment to facilitate technologies and services for a wide variety of businesses, including critical infrastructure, as well as seek comment on various transition mechanisms to achieve this goal. (WT Docket No. 17-200)
      2. <https://mentor.ieee.org/802.18/dcn/19/18-19-0028-00-0000-draft-nprm-17-200-expanding-broadband-to-896-935-mhz.pdf>
      3. This is for the 896-901/935-940MHz land mobile licenses band today.
      4. PBB wireless wants the FCC to reorganize spectrum so they can have 3 MHz paired for private LTE, moving existing LMR users elsewhere.
      5. 802.11 and 802.15 both have standards in between this pair, as well as all the road tolling is also in between.
      6. Not much discussion and we should look at how this could affect unlicensed in the middle of this pair. We will look further and maybe do comments.
   4. FCC NPRM 18-295, 6 GHz
      1. Comments in: <https://www.fcc.gov/ecfs/search/filings?proceedings_name=18-295&sort=date_disseminated,DESC>
      2. Reply comments due 18 March, Monday after our Plenary. IEEE 802 not commenting.
      3. Anything to share this week: Nothing specific.
   5. US DoT Next phases for DSRC Analysis / testing. Will Discuss Thursday.
   6. With different audience from teleconference reviewed what has transpired since the last f2f.
      1. U.S. DoT Releases RFC on V2X Communications
         1. Comments: <https://www.regulations.gov/document?D=DOT-OST-2018-0210-0001>
      2. ACMA - Proposed updates to class licensing arrangements supporting 5G and other technology innovations
         1. For more details see [IFC 45/2018 Class licensing updates: Supporting 5G and other technology innovations](https://www.acma.gov.au/theACMA/class-licensing-updates-supporting-5g-and-other-technology-innovations)
         2. Note: Monday (11th) we received formal word from ACMA thanking us for our submission.
      3. 5GAA claims their test report is incorrect.
         1. They announced their devices did not utilize receive antenna diversity...
         2. (no mention though the test report was for 10 MHz and they asked for 20 MHz.)
         3. But *they* say *their* conclusions are still valid... … …
         4. The Ex Parte: [https://ecfsapi.fcc.gov/file/102221524815309/5GAA%20Ex%20Parte%202.22.19.pdf](https://urldefense.proofpoint.com/v2/url?u=https-3A__ecfsapi.fcc.gov_file_102221524815309_5GAA-2520Ex-2520Parte-25202.22.19.pdf&d=DwMFAg&c=pqcuzKEN_84c78MOSc5_fw&r=z8R-nWJ8GIxwjOjNKhEFByb-tZ6XE3GZXWSggNdVo-w&m=uE5fLeeKR16pj2yTWnWhe6OKluuLeeV_joZNpdXHRcs&s=UdQb3ou1a7K7wGQXlQc6Qx80y1Fq5OmrFPt9m2AvBy0&e=)
4. Chair presents slide 16, Actions/AOB/Recess
5. Actions required:
   1. Ofcom comments on the 2 points discussed, adjacent band interference analysis and receiver performance that Ofcom wanted and how it affects us.
   2. Review the NPRM on the 895/935 MHz pair for private LTE like operations and effect on unlicensed in the middle.
6. AOB before Recess to Thursday AM1. None.
7. We recessed until Thursday AM1, at 11:27 local
8. Chair reconvenes the meeting to order at 08:12pt (local)(bad projector cable), See attendees below.
9. Chair presents slide 17 of 802.18-19/00031r02, the call to order and administrative items
   1. Reminder of IEEE policies we are under.
      1. Attendance server is open.
      2. Remember to state your name, affiliation, employer and/or clients first time you speak.
   2. Call for a recording secretary: Peter Ecclesine
   3. Items from Tuesday or new.
      1. CEPT – ECC [<FM57>](https://cept.org/ecc/groups/ecc/wg-fm/fm-57/client/introduction/) meeting #5, 12-13 March, Maisons-Alfort (This week)
      2. US DoT Next phases for DSRC Analysis / testing
      3. Ofcom\_Enabling-opportunities-for-innovation\_2.4GHz
      4. FCC NPRM Expanding Broadband to the 896/935 MHz pair
   4. Teleconferences moving forward
   5. Actions Required
   6. AOB
   7. Adjourn
10. Chair presents slide 18, EU items to share
    1. CEPT – ECC [<FM57>](https://cept.org/ecc/groups/ecc/wg-fm/fm-57/client/introduction/) next meeting #5, 12-13 March, Maisons-Alfort (This week)
    2. Work was generally positive and kept fact based.
    3. Much of the meeting was focused on merging 4 contributions from Germany, France, WFA and SES/Intelsat keeping in mind guidance from WGFM.
    4. There was some agreement on the technical feasibility for Very Low Power, Low Power Indoor and High Power Outdoor and is detailed in the updated Executive Summary however further work needed on Report A and later in Report B.
    5. The section on Communication Based Train Control (CBTC) still needs further work at later meetings when more information will be available from CEPT Report 71 and consultation feedback on draft ECC Report 302.
    6. Link to a snapshot of ECC report 302 that results of consultation will be reviewed at the FM57 meeting 26 April.
    7. <https://www.cept.org/Documents/wg-se/49152/se-19-044a18_draft-ecc-302-report-rlan-6ghz_final-pc> Watch for updates on the CEPT website.
    8. There are sections on RLAN, e.g. w/duty cycle items …, all should look at these.
    9. Document TEMP 006 will be on server soon with details and results of the meeting.
11. Chair presents slide 19, US DoT Next phases for DSRC Analysis / testing
    1. <https://www.its.dot.gov/research_archives/connected_vehicle/pdf/DSRC_Analysis_Planv4Dec2017.pdf>
    2. Or in Mentor: <https://mentor.ieee.org/802.18/dcn/19/18-19-0037-00-0000-dsrc-analysis-planv4dec2017.pdf>
    3. Other links: <https://www.fcc.gov/oet/unii-4banddevice>
       1. <https://www.its.dot.gov/research_archives/connected_vehicle/dsrc_testplan.htm>
    4. FCC now asking how to proceed considering all that has transpired in recent years with technology; e,g. antennas, .11bd, .11ax, etc.
    5. Many contributors are now working with the DOT directly on this.
    6. Schedule is running behind and with the changes that may occur, schedule seems open.
    7. IEEE 1609 - can it be more technically neutral? a question.
    8. C-V2X – remember there are 2 versions, LTE and NR
    9. There is a theme floating around - let the industry figure out where to go.
    10. The operative phrase for IEEE 802 is ‘stay tuned’.
        1. There are lots of discussions and activities by many different organizations on V2X, and where it will go is not as clear as a few years ago.
12. Chair presents slide 20, Ofcom\_Enabling-opportunities-for-innovation\_2.4 GHz
    1. OFCOM asked the industry to respond to:
       1. <https://www.ofcom.org.uk/consultations-and-statements/category-1/enabling-opportunities-for-innovation>
       2. <https://mentor.ieee.org/802.18/dcn/19/18-19-0034-00-0000-ofcom-enabling-opportunities-for-innovation-2-4ghz.pdf>
       3. Response due by March 12th, completed using  [consultation responses form (RTF, 1.5 MB)](https://urldefense.proofpoint.com/v2/url?u=https-3A__www.ofcom.org.uk_-5F-5Fdata_assets_rtf-5Ffile_0026_130688_enabling-2Dinnovation-2Dconsultation-2Dform.rtf&d=DwMDaQ&c=pqcuzKEN_84c78MOSc5_fw&r=z8R-nWJ8GIxwjOjNKhEFByb-tZ6XE3GZXWSggNdVo-w&m=3FBZmV-USi1IAJCcWLc_TKEa1D1P2ap2wmW9rVIDII0&s=Xr3ivvSquLAhW7zYeHsx70dkYfyIx3oz9mAK7LT-jww&e=).
       4. <https://mentor.ieee.org/802.18/dcn/19/18-19-0035-00-0000-ofcom-enabling-opportunities-consultation-form-2-4ghz.rtf>
       5. The 2390-2400 MHz discussion starts around page 35
       6. Handsets 23 dBm, base stations to 42 dBm, some other IOT considerations
       7. Annex 6. Interference risk assessment in 2300 MHz shared spectrum, page 103.
       8. Question 19: (Section 8) Do you have any other comments on our proposal?

1) We are on an adjacent channel and we question analysis in Annex 6.

2) e.g. need to consider .11ax is coming

3) The receive performance that Ofcom pushed for is going to be a problem.

4) Should speak to Zigbee and 802.15.4g ….

5) Need to consider economic value of bottom of 2.4 GHz band / channel 1.

6) BT is there also.

* + 1. Will review draft comments on the 21 March (next week) .18 teleconference.

1. Chair presents slide 21, FCC NPRM Expanding Broadband to the 896/935 MHz pair
   1. The Commission will consider a [Notice of Proposed Rulemaking](https://www.fcc.gov/document/expanding-broadband-900-mhz-band) that would propose to reconfigure the 900 MHz band to create a broadband segment to facilitate technologies and services for a wide variety of businesses, including critical infrastructure, as well as seek comment on various transition mechanisms to achieve this goal. (WT Docket No. 17-200)
   2. <https://mentor.ieee.org/802.18/dcn/19/18-19-0028-00-0000-draft-nprm-17-200-expanding-broadband-to-896-935-mhz.pdf> (rev01 is the highlighted version)
   3. This is for the 896-901/935-940MHz land mobile licenses band today.
      1. Some want the FCC to reorganize spectrum so they can have 3 MHz paired for private LTE, moving existing LMR users elsewhere.
   4. 802.11 and 802.15 both have standards in between this pair, as well as all the road tolling is also in between.
   5. We will look further and maybe do comments and review in upcoming teleconferences. No deadlines are set just yet.
   6. A key is to review what is on the record that has already been filed. There are >100 filings. <https://www.fcc.gov/ecfs/search/filings?proceedings_name=17-200&sort=date_disseminated,DESC>
2. Chair presents slide 22, Teleconferences
   1. Motion: The 802.18 Chair or Vice Chair is directed to conduct, as necessary, teleconferences on Thursdays at 15:00 ET through 05 Sept 2019
      1. Moved by: Vijay Auluck (Sef)
      2. Seconded by: Stuart Kerry (Ruckus)
      3. Discussion? None
      4. Passed by Unanimous Consent
3. Chair presents slide 23, Actions Required
   1. Review Ofcomm Consultation and inputs by next Wednesday 20 March so they can be discussed on the Thursday 21 March teleconference.
   2. Start to review FCC NPRM for possible IEEE 802 comments and look at what is in the 17-200 filing and on the record.
4. Chair presents slide 24, Any Other Business
   1. It was noted the EU EC has just issued a dedicated act on the legal framework for communications profiles. There will be a two-month period where the European Parliament can act to intervene and reject or change it.
   2. Straw Poll
   3. How many people would like to come back to this St. Louis venue?

Yes - 27

No - 0

Like the Social – 21

Disliked the Social – 0

Did not go to Social –4

#2 – is it worth exploring Australia for a meeting in the future? (meeting costs and all.)

Yes – 22 Melbourne - 23 y / 0 n Cairns - 6 y / 8 n / rest - abstain

No -- 1

1. Chair presents slide 25, Adjourn
   1. Next teleconference: 21 Mar 2019 – *15:00 – <15:55* ET
      1. Call in info: <https://mentor.ieee.org/802.18/dcn/16/18-16-0038-11-0000-teleconference-call-in-info.pptx> (*or latest) (note: new call in for 2019)*
      2. Note: If the call-in link doesn’t work send the Chair an email right away.
      3. All changes/cancellations will be sent out to the 802.18 list server.
   2. Adjourn:
      1. Agenda complete, any objection to Adjourn.
      2. None heard, we are Adjourned at 9:25 ET
   3. The next face to face meeting of the 802.18 RR-TAG will be at the IEEE 802, 14 – 16 Wireless Interim in Atlanta, GA, USA at the Grand Hyatt in Buckhead
      1. Time slots, Tuesday AM2 and Thursday AM1

Meeting attendance for RR-TAG (Tuesday, 12-Mar-2019, AM2 10:20 - 12:30)

|  |  |  |
| --- | --- | --- |
| voter | Name | Affiliation |
|  | ALMASHAKBEH, ALANSARI | Telecommunications Regulatory Commission of Jordan |
| v | Auluck, Vijay | Self |
|  | Baer, Bernd | Marquardt |
| v | Berens, Friedbert | FBConsulting Sarl |
| v | Boldy, David | Broadcom Corporation |
| v | de Vegt, Rolf | Qualcomm Incorporated |
| v | Ecclesine, Peter | Cisco Systems, Inc. |
|  | Fang, Yonggang | ZTE TX Inc |
|  | Fathy, Ramy | NTRA |
| v | Furuichi, Sho | Sony Corporation |
| v | Godfrey, Tim | Electric Power Research Institute, Inc. (EPRI) |
| v | Harrington, Timothy | Pro-ID Consulting |
| v | Hiertz, Guido | Ericsson AB |
| v | Holcomb, Jay | Itron Inc. |
| v | Inoue, Yasuhiko | Nippon Telegraph and Telephone Corporation (NTT) |
| v | Jeffries, Timothy | Huawei Technologies Co. Ltd |
|  | Jones, Vincent Knowles IV | Qualcomm Incorporated |
| v | Kain, Carl | Noblis, Inc. |
|  | Kenney, John | TOYOTA InfoTechnology Center U.S.A. |
| v | Kerry, Stuart | OK-Brit |
| v | Kuerner, Thomas | TU Braunschweig |
| v | Lepp, James | BlackBerry |
|  | Levy, Joseph | InterDigital, Inc. |
| v | Lynch, Michael | MJ Lynch & Associates, LLC. |
|  | Massawe, Erick | Tanzania Bureau of Standards |
|  | Max, Sebastian | Ericsson AB |
|  | McInnis, Michael | The Boeing Company |
|  | Rolfe, Benjamin | Blind Creek Associates |
|  | Sadeghi, Bahareh | Intel Corporation |
|  | Sand, Stephan | German Aerospace Center (DLR) |
|  | Sarris, Ioannis | u-blox |
| v | Sato, Naotaka | Sony Corporation |
| v | Scott, Andy | NCTA |
|  | Sherlock, Ian | Texas instruments |
| v | Verso, Billy | DecaWave |
| v | Wang, Lei | Huawei R&D USA |
|  | Ward, Lisa | Rohde & Schwarz |
|  | Weise, Constance | IEEE/SELF |
| v | YAGHOOBI, HASSAN | Intel Corporation |

Meeting attendance for RR-TAG (Thursday, 14-Mar-2019, AM1 07:40 - 10:00)

|  |  |  |
| --- | --- | --- |
| voter | Name | Affiliation |
|  | ALMASHAKBEH, ALANSARI | Telecommunications Regulatory Commission of Jordan |
| v | Auluck, Vijay | Self |
| v | Berens, Friedbert | FBConsulting Sarl |
| v | Boldy, David | Broadcom Corporation |
|  | Byun, Woo-Jin | Electronics and Telecommunications Research Institute (ETRI) |
| v | de Vegt, Rolf | Qualcomm Incorporated |
| v | Ecclesine, Peter | Cisco Systems, Inc. |
|  | Fang, Yonggang | ZTE TX Inc |
| v | Furuichi, Sho | Sony Corporation |
| v | Godfrey, Tim | Electric Power Research Institute, Inc. (EPRI) |
| v | Hiertz, Guido | Ericsson AB |
| v | Holcomb, Jay | Itron Inc. |
|  | Ikegami, Tetsushi | Meiji University |
|  | Jones, Vincent Knowles IV | Qualcomm Incorporated |
| v | Kain, Carl | Noblis, Inc. |
|  | Kenney, John | TOYOTA InfoTechnology Center U.S.A. |
| v | Kerry, Stuart | OK-Brit |
| v | Kuerner, Thomas | TU Braunschweig |
| v | Lepp, James | BlackBerry |
|  | Li, Huan-Bang | National Institute of Information and Communications Technology (NICT) |
| v | Lynch, Michael | MJ Lynch & Associates, LLC. |
|  | Massawe, Erick | Tanzania Bureau of Standards |
|  | Max, Sebastian | Ericsson AB |
| v | Petranovich, James | ViaSat, Inc. |
|  | Sadeghi, Bahareh | Intel Corporation |
| v | Salazar Cardozo, Ruben E | Landis Gyr Group Worldwide |
|  | Sand, Stephan | German Aerospace Center (DLR) |
|  | Sarris, Ioannis | u-blox |
| v | Sato, Naotaka | Sony Corporation |
| v | Scott, Andy | NCTA |
|  | Sherlock, Ian | Texas instruments |
| v | Wang, Lei | Huawei R&D USA |
|  | Ward, Lisa | Rohde & Schwarz |