98e-17-R18-SLEvo - Version 0.0.6

RAN

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3GPP TSG RAN meeting #98-e RP-223495

Electronic Meeting, December 12 – 16, 2022

Title: Moderator's summary of discussion [98e-17-R18-SLEvo]

Source: Moderator (OPPO)

Agenda Item: 9.3.1.5

Document for: Discussion and Decision

1 Introduction / background

In the last RAN#97-e meeting, it was decided the carrier aggregation (CA) objective will continue to be hold-on until RAN#98-e and the FR2 beam management objective will start to work on evaluation methodology only for sidelink beam management until RAN#98-e. The WID was revised accordingly in RP-221938 [1] for these two objectives as followed. In this meeting, RAN should make a decision on how to handle these two objectives after RAN#98-e (e.g., start, put on hold, drop, etc).

Table 1: Objective #1 and #3 of the NR sidelink evolution WID in RP-221938 [1].

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1. Specify mechanism to support NR sidelink CA operation based on LTE sidelink CA operation [RAN2, RAN1, RAN4] **(This part of the work is put on hold until further checking in RAN#98-e)**

- Support only LTE sidelink CA features for NR (i.e., SL carrier (re-)selection, synchronization of aggregated carriers, handling the limited capability, power control for simultaneous sidelink TX, packet duplication)
- The work is limited to FR1 licensed spectrum and ITS band in FR1.
- No specific enhancements of Rel-17 sidelink features with sidelink CA support.
- This feature is backwards compatible in the following regards
    - A Rel-16/Rel-17 UE can receive Rel-18 sidelink broadcast/groupcast transmissions with CA for the carrier on which it receives PSCCH/PSSCH and transmits the corresponding sidelink HARQ feedback (when SL-HARQ is enabled in SCI)

2. ...
3. Study and specify enhanced sidelink operation on FR2 licensed spectrum [RAN1, RAN2, RAN4] **(Determine in RAN#98-e whether to continue the study or study + specification work for FR2 until the end of R18)**

- Focus only on updating the evaluation methodology for commercial deployment scenario in 4Q 2022. [RAN1]
- Work is limited to the support of sidelink beam management (including initial beam-pairing, beam maintenance, and beam failure recovery, etc) by reusing existing sidelink CSI framework and reusing Uu beam management concepts wherever possible.
    - Beam management in FR2 licensed spectrum considers sidelink unicast communication only.

Based on reviewing contribution submitted in this meeting (a review summary is provided in the Appendix section 5), a set of questions are formulated in Section 2 to help in deciding how to handle these two objectives and other topics brought up in the submitted contributions.

It should be noted that according to the new RAN planning from RAN and RAN WG Chairs in RP-222730 [2], the following is recommended.

1. No change to the original RAN Rel-18 timeline, i.e.:
    a) Target Sept'2023 for RAN1 functional freeze
    b) Target Dec'2023 for RAN2/3/4 functional freeze
    c) Target Mar'2024 for ASN.1 freeze

In this document, we will provide a summary for the email discussion [98e-17-R18-SLEvo] at RAN#98-e.

2 Initial round

Assuming no additional TU will be allocated to this WI for the remaining WG meetings in R18 and no change to the original RAN R18 timeline (as proposed in RP-222730 [2]), please provide views to the following questions.

2.1 Handling of carrier aggregation (objective #1)

Topic 1: Please indicate your views on how to handle the CA objective for the remaining WG meetings in Rel-18 (including reasons if possible).

- Option 1: Drop / remove the CA objective from the WID in Rel-18
- Option 2: Start the CA objective after RAN#98-e in the WGs
- Option 3: Continue to put on-hold until RAN#99-e
- Option 4: Others

Feedback Form 1:

1 – NTT DOCOMO INC. Option 1. Based on discussion situation in each WG so far, obviously there is no room to start CA. This would not be changed till end of R18. Dropping CA is only what we can select unless more TUs are allocated.
2 – CATT Option 1: Drop / remove the CA objective from the WID in Rel-18
3 – National Spectrum Consortium Option 2. The WID checkpoints have been met and the combination of CA + SL-U is really the only way to have a compelling Rel-18 SL solution. Therefore, we strongly advocate for starting the normative work on CA.
4 – Nokia Denmark Option 1. Mainly due to the work load and also due to the current scope of the SL-CA objective not considering unlicensed and FR2 bands.
5 – Huawei Tech.(UK) Co.. Ltd The question we asked in Monday's GTW was related to regulation of spectrum in (for example, but not exclusively) Europe. Is it the case that proposed work in ETSI then CEPT on a 20 MHz channelization would complete in the 2026-2027 timeframe, and similarly for an additional 10 MHz allocation to NR V2X adopted/proposed by 5GAA, and hence commercialization would be later than that? If so, would Rel-19 be suitable for specification of SL CA in 3GPP, considering that it is still well before 2026-27?

6 – Volkswagen AG

Option 2: The need for CA has been repeated by many automotive companies during the past meetings and scoping discussions. Some companies already asked for CA in Rel-17. Further 5GAA has listed CA on their Rel-18 priority list. CA is understood to be the technical tool to allow NR-V2X operation with larger channels than 10Mhz without the availability of consecutive frequency spectrum. The worldwide frequency regulation landscape for ITS currently doesn't include a consecutive spectrum to allow NR-V2X operation with more than 10Mhz.

A down scoping has been already accepted by including only LTE sidelink CA features support. Further down scoping could be done by focusing only on mode 2 operation in FR1 ITS bands.

7 – MediaTek Inc.

Option 1. There simply isn't time to specify the additional objectives.

8 – Classon Consulting

[for FUTUREWEI] Opt 1

9 – Ericsson LM

Option 1. Reasoning: Based on the current progress, on-going work on the objectives and expected remaining work we think it is best to down-scope to avoid too much workload during R18 for the RAN WGs.

10 – InterDigital

We think it should be discussed together with FR2. Our preference is not to include both CA and FR2 due to the current progress of SL-U and CoEx and workload, there is no room to increase the load especially for RAN1. However, if RAN decides to include one objective between FR2 and CA, we think CA should be the one included as the workload for RAN1 is much less than FR2. CA is RAN2 led item and RAN2 seems to have a better situation to cover additional workload.

11 – Qualcomm CDMA Technologies

While our first preference was to postpone SL CA work to Rel-19 as indicated in our contribution. Given the input from the automotive industry, we would be ok with starting CA work in Rel-18. However, workload needs to be carefully managed and as such and we would like to discuss approaches to limit the scope of the objective. We propose to discuss such proposals in the subsequent rounds of NWM discussion.

12 – ETRI

Even though we prefer option 2, we can follow the majority view (seems option 1) considering current work progress.

13 – Apple GmbH

We think the existing workload in RAN2 NR sidelink evolution is not heavy and the specification work on sidelink CA is doable in Rel-18 NR sidelink evolution on RAN2 side. However, the bottleneck for sidelink CA in Rel-18 is RAN1 workload, considering that SL-HARQ feedback in sidelink CA is mainly RAN1 work which cannot be reused from LTE sidelink CA.

Overall, Option 2 works only if RAN1 workload allows. (A possible way of reducing RAN1 workload is to further restrict the scope of co-channel coexistence.) As a way-forward, we are fine with Option 3 and re-visit it in RAN#99-e, and make decision based on the progress of other objectives (especially, the co-channel coexistence objective).

14 – Spreadtrum Communications

Considering the workload of other objectives, there is no time to start CA objective. We support option 1.

15 – Beijing Xiaomi Mobile Software

Considering the workload in RAN1, we can accept either CA or FR2 but not the both.

16 – Meta Ireland

Prefer option 2 when RAN choose either CA or FR2 to reduce workload.

17 – SHARP Corporation

Option 2 (with proper scoping). Unlike the FR2 objective with most work in RAN1, the work of SL CA is mainly in RAN2 where the Rel-18 SL Evo workload seems reasonable so far. We fail to understand the concern on TU/workload from companies that on the other hand propose to continue the FR2 objective.

18 – ZTE Corporation

Similar view as IDC and Volksvagen on the feasibility of starting CA from RAN 98-e from the perspective of commercial outlook and work load impact. The restriction on the CA topic suggestion from Qualcomm seems reasonable and we propose some considerations in the aspect of HARQ feedback (either is acceptable to us as restriction):

- Rel 18 CA work can assume the slots for PSFCH are aligned among the carriers for SL CA
- no PSFCH enhancement compared to R16

19 – ZTE Corporation

Option 2 preferred

20 – Samsung Electronics Romania

Option 1. It is impossible to accommodate both objectives (i.e., CA and FR2) in the limited TU.

21 – NEC Corporation

Option 3 is preferred.

22 – vivo Communication Technology

Option 2. If the LTE SL CA framework is reused, considering that RAN2 is the leading WG, the current RAN2 TU and workload would not be a problem to start the SL CA work. If the RAN1's load is the concern, one possible way is to drop some controversial topic of co-channel coexistence (e.g., mix SCS of NR and LTE SL).

23 – LG Electronics UK

Firstly, we think the key issue is the workload which requires RAN to look the overall objectives. Thus we agree with InterDigital that the option needs to be discussed together with how to deal with FR2.

Regarding the options for SL CA, we think Option 1 is practical considering the current situation but if there is a way to make the SL CA workload manageable, it should be discussed in this thread.

We think Option 3 cannot be a reasonable choice due to the lack of time after RAN#99.

24 – China Mobile Com. Corporation

Option 1 is preferred, at least there is no room for starting CA in RAN1 from our perspective.

25 – Panasonic Holdings Corporation

We support CA as it is requested by 5GAA. On the other hand, considering time availability with the progress, option 1 seems the direction. Not to have PSFCH related enhancement can be one way to realize CA in Rel.18 but it could have co-existence issue in future if the handling level of PSFCH are different among UEs of different releases.

26 – Mitsubishi Electric RCE

We should not start what we cannot reasonably finish. Having half-done CA (also applies to FR2) and bothching coexistence/SL-U in the same time in order to achieve this doesn't really bring us forward. From a global workload perspective I agree that FR2/CA should be discussed together. Our preference is Option 1 (can also live with Option 3)

27 – Guangdong OPPO Mobile Telecom.

As stated in our Tdoc, there are new features (SL-HARQ feedback, PSFCH operation, RSRP for power control and CSI feedback) supported in NR but not in LTE. We have strong concern that the discussion of these features in the context of CA will become complicated and time consuming in RAN1, not as straight forward as it seems right now. For example, for a UE that is capable of multiple Rx and a single Tx receiving CA from another UE, a new SL-HARQ feedback procedure and PSFCH format would be needed to handle a such case (i.e., transmitting multiple HARQ on a single carrier). So, at least some enhancements on this would be needed. Observing from the last RAN1 meeting (F2F), where we handled all 3 objectives at the same time (SL-U, Co-Ex, FR2), there was even no offline time can be allocated to FR2. There is no more time to start CA from this meeting. Our preference is Option 1.

28 – Lenovo (Beijing) Ltd

Support Option 2: Start the CA objective after RAN#98-e in the WGs. This objective is led by RAN2 and requires less standard effort in RAN1. It does make sense to start Objective 1 from Q1 2023.

29 – ROBERT BOSCH GmbH

We support Option 2. We also suggest having proper scoping for SL CA to limit the contribution of RAN1, while consider RAN2 as objective lead (aligned with the opinion of some companies above). We also believe that Option 3 is not a suitable choice at this time. Therefore, we would like to confirm Option 2.

30 – Sony Group Corporation

Option 1. We think it would be difficult to additionally start the CA objective considering the current workload in Rel-18 SL. It would be postponed to Rel-19.

31 – ROBERT BOSCH GmbH

Option 2: We also support Apple GmbH, some work capacity can be shifted from the LTE/NR coexistence to SL CA, considering limiting the scope of the dynamic co-channel coexistence.

32 – Deutsche Telekom AG

Option 4: Drop everything beyond what is currently active in the WI !

(for Rel-18 load reasons we should take serious after the decision to not agree the necessary 6 months extensions claimed in 915)

33 – Intel Korea

Option 2, i.e., we would like to explore possibilities to start work on CA objective, including potentially restricting the scope further e.g., no SL HARQ optimization. It addresses spectrum fragmentation and makes NR SL supported features on par with the LTE SL ones.

Dropping CA (Option 1) would be unfortunate since this topic was one of the high priority ones from 5GAA.

Option 3 is effectively equal to dropping the objective since there will be no time to complete the work if RAN postpones it further.

34 – Fraunhofer HHI

We support Option 2 as listed by 5GAA on their priority list. As also commented by others, we believe that most efforts are in RAN2 keeping the load in RAN1 acceptable.

2.2 Handling of SL beam management in FR2 licensed spectrum (objective #3)

Topic 2: Please indicate your views on how to handle the FR2 objective for the remaining WG meetings in Rel-18 (including reasons if possible).

- Option A: Stop / remove the FR2 objective from the WID in Rel-18
- Option B: Revise the objective to “study” only until the end of Rel-18.

- If yes,
  - Should the study be limited to RAN1 only or should RAN2 be also involved in studying beam failure recovery solutions?
  - Should this work be considered as low priority compared to other objectives?

- Option C: No change, continue the objective to study + specification work
- Option D: Others

Feedback Form 2:

1 – NTT DOCOMO INC.

Option A or Option B. As we experienced at the last RAN1 meeting, available time for SL-FR2 will be quite limited due to hard work on SL-U/coex. Option C is impossible. If Option B is taken, SL-FR2 should be lower priority than other objectives since they needs to be specified in R18. But anyhow, we can have some study for SL-FR2 during R18 so that R19 specifies SL-FR2.

2 – National Spectrum Consortium

Option C or Option B. No real technical issues have been surfaced for FR2 SL operation to date.

3 – TOYOTA Info Technology Center

Option B. This seems more realistic given the overall workload for the Rel-18. We would prefer to finish properly what has been already started (e.g. SL-coex and SL-U).

4 – Nokia Denmark

We prefer Option B, as the introduction of beam management in SL will impact more than just introducing signaling for the beam alignment. For example, the use of beamforming is expected to impact the SL Mode 2 sensing procedure.

- RAN1 and RAN2 should be involved in the study.

5 – Huawei Tech.(UK) Co.. Ltd

We suggest keeping to a study (Option B), so that Rel-19 is well booted-up for valuable normative work, rather than a rather short and possibly truncated Rel-18 specification effort which might not open the door to FR2 in the same way. If going for Option B, it seems useful to add RAN2, where workload is OK, and there are technically useful things to study for FR2.

We note that ”study only” does not mean low priority. It only sets the end-point goal of the effort, and time management is left to the chairs to achieve all the (active) objectives.

6 – Volkswagen AG

Option A or at least option B with low priority: First get full feature set for FR1 before moving to FR2.

7 – MediaTek Inc.

Option A or B, considering the time constraints. If option B is taken, we are OK to include RAN2, but time should be allocated so that the study does not starve normative work on SL-U.

8 – Classon Consulting

[For FUTUREWEI] Opt A or Opt B

9 – Ericsson LM

Option B. Both RAN1 and RAN2 should be involved in the SL FR2 study.

Reasoning: Since SL FR2 is a new feature, we think that having a proper study phase with enough time until the end of Rel-18 is the most reasonable way to prepare for a feasible solution for beam management.

10 – CATT

Option A or Option B.

11 – AT&T GNS Belgium SPRL

We are fine with option A or Option B.

12 – TELECOM ITALIA S.p.A.

option A. Option B and C are not acceptable. Option B is not really solving the workload issue, since it will in any case require dedicated TUs. Option C is non sense, since it practically requires to design a new radio interface

13 – InterDigital

Option A. FR2 is RAN1 heavy topic which will increase workload significantly for RAN1 which is overloaded already.

14 – Qualcomm CDMA Technologies

Our first preference is Option C (Study + specify). Given the overall workload with the discussions on SL CA, we would be ok with Option B. We think it would be beneficial for RAN2 to study beam-failure recovery solutions and we support that proposal.

15 – Apple GmbH

We support either Option B or Option C.

Option B is already a balance between progress and workload, and we do not think further scope restriction or lower priority treatment is necessary.

Option C is also good to us, and we are open to some scope restriction (e.g., on beam failure recovery) within this option.

16 – Spreadtrum Communications

Fine with Option A or Option B.

17 – Beijing Xiaomi Mobile Software

If FR2 is continue to study in R18, option B is preferred. The workload is too high if both study and specification work is included in R18. RAN2 should also be involved in the scope.

18 – Meta Ireland

Fine with option A or option B.

19 – SHARP Corporation

We are fine with Option B.

20 – ZTE Corporation

We are fine with either option A or option B.

21 – Verizon UK Ltd

Though our first preference is option C, we can accept option B.

22 – Samsung Electronics Romania

Option B. The study is limited to RAN1 only because beam management is more like RAN1 scope and for some RAN2 specification impact (e.g. beam recovery) may normally need mature RAN1 progress for RAN2 to make a decision. The meaning of "low priority" is not clear. As long as study is finished at the end of Rel-18, the outcome will be considered in Rel-19 normative work.

23 – NEC Corporation

Option B with low priority.

24 – vivo Communication Technology

Our first preference is option C, but we are also OK with option B if the workload is the concern.

25 – Continental Automotive

Option B. The natural way-forward given the workload. RAN1 only study would help in faster progress, but if this would not imply slower pace, then definitely add RAN2.

26 – LG Electronics UK

Option A or B.

If Option B is taken, it should be marked as a low priority topic because WGs may face a situation where completing the normative work of the other objectives becomes challenging. In this regards, we think having RAN2 for this objective is not desirable because 1) this is a RAN1-led objective and RAN2 work can start only after some meaningful progress in RAN2, 2) typically RAN2 becomes busy at the end of a release in order to manage the impact RAN1 made. We think it would not be so late to involve RAN2 from the next release based on the RAN1 study outcome.

We think Option C cannot be a reasonable selection due to the workload issue. Especially we think it is very challenging to complete the normative work in RAN4 which has had no discussion on FR2 SL so far.

27 – China Mobile Com. Corporation

We are fine with Option A or Option B.

28 – Panasonic Holdings Corporation

We are fine either option A or option B.

29 – Mitsubishi Electric RCE

Option A (preferred) or B with low priority.

30 – Lenovo (Beijing) Ltd

Support Option A: Stop / remove the FR2 objective from the WID in Rel-18. Continuing FR2 sidelink after RAN#98 is not reasonable based on current progress in Rel-18 SL. It is better not to continue FR2 sidelink until end of Rel-18.

Study only objective within Rel18 is not worthwhile as the corresponding specification work needs to be done in Rel19, and hence the topic can be studied and specified in Rel19 – there is no difference in timeline between study only in Rel18 and study and specify in Rel19.

Additionally, we want to clarify does the study only objective in Rel18 aiming to prioritize FR2 with-in the Rel19 topic selection? If so, then it should be avoided

31 – Guangdong OPPO Mobile Telecom.

Option B with RAN2 involvement for the study on beam failure recovery.

32 – Sony Group Corporation

We are fine with Option B.

33 – ROBERT BOSCH GmbH

We prefer Option A or Option B (as a compromise)

34 – Deutsche Telekom AG

Drop everything beyond what is currently active in the WI !

(for Rel-18 load reasons we should take serious after the decision to not agree the necessary 6 months extensions claimed in 915)

35 – Intel Korea

Option Cis preferred, we can also accept B, while at the same time the scope of the feature has been restricted already by the objectives thus the required effort is not that extensive to complete the normative work.

For Option A, we don't think removing the objective is justified given the time spent already on it in RAN1.

36 – Fraunhofer HHI

Option C is preferred but we also fine with Option B as a compromise.

2.3 Others

Topic 3: Any further restriction needed on the scope for the LTE/NR V2X co-channel coexistence objective (e.g., focus only on 15kHz SCS for NR V2X; Not work on IUC solutions for the co-channel coexistence between LTE and NR V2X)?

Feedback Form 3:

1 – NTT DOCOMO INC.

We do not see any necessity of down-scoping. If the raised examples above are dropped, big part of advantage of NR-V2X - better latency and reliability - would disappear/degrade. Such a direction is really what we want to achieve in this coex topic? Our understanding is NO.

2 – TOYOTA Info Technology Center

We don't want to downscope SL-coex. We think that restricting SL-NR SCS to 15kHz for the SL-coex would result in a noticeable restriction for this objective, with systems impacts. Higher SCSs reduce the impact of high doppler effect and reduce latency. Higher SCSs exist in NR and not LTE, making it one of the advantages of NR versus LTE.

3 – Nokia Denmark

No further restriction is needed. For example, 30 kHz SCS should be in scope since it provides better NR performance

4 – Huawei Tech.(UK) Co.. Ltd

These points could all be left to contribution-driven handling in WGs at this stage. RAN has tried a few times to manage the timeline, deadline, and scope, without substantially influencing the RAN1 discussions

more than could be achieved by FL's prioritization.

5 – Volkswagen AG

No further restrictions recommended.

6 – MediaTek Inc.

We would be open to restricting IUC solutions.

7 – Classon Consulting

[for FUTUREWEI] no strong need

8 – VODAFONE Group Plc

Agree with DOCOMO

9 – Ericsson LM

We do not think down-scoping here is needed and discussion on these points should in any case be left for the WGs.

10 – CATT

No need for further restriction

11 – InterDigital

No need for further restriction

12 – Qualcomm CDMA Technologies

These two issues have been consuming a significant amount of RAN1 time at the expense of basic functionality.

We are ok with the proposal to help RAN1 focus and finish the work. Even if the proposal as-is is not agreed, we think guidance from RAN would be helpful for RAN1 to focus on finishing essential functionality using 15 kHz and without extending the IUC framework first, then consider these issues later.

13 – ETRI

We do not want to down-scope SL coex further.

14 – Apple GmbH

We are open to further restrict the scope for co-channel coexistence objective. This could save TU for new objectives.

15 – Spreadtrum Communications

We are open with further restrictions.

16 – Beijing Xiaomi Mobile Software

We are supportive to have further RAN guidance to limit the scope for coexistence.

17 – SHARP Corporation

We see no need for further restriction.

18 – Meta Ireland

Key use cases are considered for the co-channel coexistence. This is up to contribution based in RAN WGs. RAN can help if the diverse contributions and use case are proposed in RAN WGs.

19 – ZTE Corporation

Similar view as Docomo, no restriction is needed considering additionally RAN1 has spent quite some time on these topics and convergence is gradually being built. It would be a pity that downscope is done now. In the meantime, to address companies' concern on progress, maybe we can set a check point to trigger RAN intervention on co-ex topic, e.g. RAN#99

20 – Samsung Electronics Romania

It is preferable to focus on 15kHz first and then the design can be supported for 30kHz and PSFCH without further optimization. This way is able to reduce workload.

21 – NEC Corporation

The study of LTE/NR V2X co-channel coexistence should first focus on 15kHz SCS for NR V2X.

22 – vivo Communication Technology

If the workload is the concern, we support to down scope the co-channel coexistence, especially the controversial topic (i.e., mix SCS of NR and LTE SL). One possible way is to prioritize the work of 15kHz SCS.

23 – Continental Automotive

We think multiple numerologies is definitely a must-have, particuarly for several automotive use cases. consequently, we do not support down-scope Co-channel Coex, this feature is important, significant work has been done so far (which needs to be continued), and a useful and functional solution (indclusing dynamic ones) is a necessary outcomo of Rel. 18.

24 – LG Electronics UK

We don't think focusing on 15 kHz SCS is desirable for the co-channel coexistence. 30 kHz SCS is the basic numerology in Rel-16/17 sidelink and having such a restriction may result in complicated and undesirable NR V2X deployment issues: A UE may eventually be required to support both SCS or to operate two different SCS over two carriers in the same frequency band.

We think IUC based solution can be excluded for this release, but this can be up to WG decision.

25 – China Mobile Com. Corporation

We think the restrictions are needed, both higher SCS and IUC solution can be considered to be excluded from Rel-18.

26 – Panasonic Holdings Corporation

We are ok to discuss other than 15 kHz SCS but the design of 15 kHz SCS should be completed first as the priority.

27 – Mitsubishi Electric RCE

No need for downscoping in plenary. RAN1 should be let to finish the job at least on matters such as higher SCS or PSFCH handling, which are very important from performance perspective. RAN1 made good offline progress and is close to convergence on these matters, downscoping now would be throwing away all those efforts. Although this is less true for IUC and that we could probably live without, I think this can be left to RAN1 at this point.

28 – Lenovo (Beijing) Ltd

no need further restrictions in Rel-18 on the scope for the LTE/NR V2X co-channel coexistence objective.

29 – Sony Group Corporation

No further restriction is necessary.

30 – Deutsche Telekom AG

Drop everything beyond what is currently active in the WI !

(for Rel-18 load reasons we should take serious after the decision to not agree the necessary 6 months extensions claimed in 915)

31 – ROBERT BOSCH GmbH

We are supportive of restricting the work scope of the co-channel coexistence objective. We prefer to focus on finalizing 15 kHz first. Additionally, we should revisit the discussions during development of DSS (coexistence between Uu LTE and NR) and the multiple numerology coexistence issues before spending long time discussing in SL Evo in RAN1. Regarding the concern about the 30 kHz and the advantages it brings, we want to remind the group that we may be considering the LTE/NR co-channel coexistence solutions for mixed regimes with LTE vehicles driving side-by-side to NR vehicles . Even if heterogeneous deployment of basic and advanced use cases could be envisioned, the performance of LTE vehicles may limit the whole system.

32 – Guangdong OPPO Mobile Telecom.

Our preference is to not work on IUC solutions, but we are fine to leave the discussion / down-scoping based on FL prioritization in the WG.

33 – Intel Korea

Support excluding IUC related discussions from R17 co-ex. IUC is a complex feature and it may not be widely implemented, thus relying on it in the co-ex framework is unreasonable.

34 – Fraunhofer HHI

We do not see a need for downscoping and think this can be handled on WG level.

Topic 4: Is it necessary to declare the study is completed for the SL-U objective (due to the following bullet in the objective)?

- The study should focus on FR1 unlicensed bands (n46 and n96/n102) and is to be completed by RAN#98.

Feedback Form 4:

1 – NTT DOCOMO INC.

The necessity is unclear. Anyhow WGs continue discussion on details of SL-U to specify this objective regardless of this declaration. Removing this bullet would be OK, but at the same time, 'FR1 unlicensed bands (n46 and n96/n102)' should be kept in e.g., main bullet, in order to clarify this objective focuses on FR1.

2 – National Spectrum Consortium

The SL-U topic is ready to move to normative work, so the study can be declared complete if needed.

3 – Nokia Denmark

The study can be declared as completed and we can proceed for specification phase.

4 – Huawei Tech.(UK) Co.. Ltd

A declaration is not particularly necessary, since the feasibility and progress are both clear from the Status Reports. RAN can let work continue without intervention, but it's also fine to take DOCOMO's change, i.e. "~~**The study should** focus on FR1 unlicensed bands (n46 and n96/n102) **and is to be completed by RAN#98**~~:.

5 – MediaTek Inc.

One way or another, it should be clear that normative work can start. We don't have a strong view on whether to do this with a formal declaration, but it seems needed to update the bullet as suggested by DOCOMO and Huawei.

6 – Classon Consulting

[for FUTUREWEI] we are already making normative phase type decisions, but can accept Huawei/DOCOMO clarification

7 – Ericsson LM

No need to declare the study complete. RAN WGs can continue the work as usual.

8 – CATT

No need to declare or change the wid

9 – Qualcomm CDMA Technologies

We do not think that a declaration is strictly necessary since the objective is progressing well in RAN1. On the other hand, we would be ok with declaring the study phase complete and removing the bullet.

10 – Apple GmbH

Yes. We think it can be declared completed, since the main principles of SL-U have been studied and agreed. We only need to go ahead on the detailed design of SL-U.

11 – Spreadtrum Communications

We support to declare the study is completed, and the clarification of DOCOMO/Huawei is necessary.

12 – Beijing Xiaomi Mobile Software

We do not think the declaration is necessary, but we are fine with the clarification of DCM and HW.

13 – SHARP Corporation

Fine to declare completion of the study.

14 – Meta Ireland

We think that the bullet means to meet the time-line for study phase. Just need to continually discussion and specify in RAN WGs.

15 – ZTE Corporation

Given companies' divergent views on whether to claim the study phase is complete, we propose the following clarification to the WID.

- The study**, if any,** should focus on FR1 unlicensed bands (n46 and n96/n102)~~ and is to be completed by RAN#98~~.

16 – vivo Communication Technology

We support to declare the completion and start the normative work of SLU.

17 – Lenovo (Beijing) Ltd

It seems not necessary to declare the study on SL-U is completed or not. The progress of Rel-18 SL-U is a bit slow due to only high level agreements achieved on channel access and physical layer design. It is reasonable to consider further down-selection in future meetings.

The study does not include any agreements on Resource allocation mechanism (mode 1 and mode 2) for SL_U and multi slot transmission for SL-U.

Rel-18 sidelink should continuously focus on the sidelink over unlicensed spectrum in Q1/Q2 2023.

18 – Deutsche Telekom AG

Drop everything beyond what is currently active in the WI !

(for Rel-18 load reasons we should take serious after the decision to not agree the necessary 6 months extensions claimed in 915)

19 – ROBERT BOSCH GmbH

We also prefer ZTE proposal.

20 – Guangdong OPPO Mobile Telecom.

We don't think it is necessary to declare completion of the study phase in RAN, as it is clear from the progress and agreements in RAN1/RAN2 we are well into the normative phase already. Various simulation results in RAN1 have already shown good performance of SL can be achieved in the unlicensed band using existing resource allocation scheme. Having said this, we are fine with DCM/Huawei's suggested text.

21 – Intel Korea

It is not necessary, but we are supportive declaring study phase completion for SL-U.

Topic 5: Any other issues?

Feedback Form 5:

1 – Deutsche Telekom AG

Drop everything beyond what is currently active in the WI !

(for Rel-18 load reasons we should take serious after the decision to not agree the necessary 6 months extensions claimed in 915)

2.4 Summary of initial round and recommendation

Topic 1: Handling of carrier aggregation (objective #1)

- Option 1: Drop / remove CA objective from the WID in Rel-18 **(18)**
  - DCM (no TU), CATT, Nokia (workload, no unlicensed and FR2), MediaTek (no TU), Futurewei,

[HW (no urgency until 2026-27)], Ericsson (workload), [IDC] (workload and slow progress in SL-U and Co-Ex), ETRI (workload), Spreadtrum (workload), xiaomi (if FR2 continues), Samsung (no TU), LGE (workload), CMCC (no TU), Mitsubishi (no TU), OPPO (HARQ enhancement, no TU), Sony, DT

- Option 2: Start the CA objective after RAN#98-e in the WGs **(15)**
  - NSC (CA+SL-U), VW (5GAA), QC (further down-scoping), ETRI (if majority), Apple (down-scope Co-Ex), xiaomi (if FR2 stops), Meta, Sharp (RAN2-led), ZTE (5GAA), vivo (down-scope Co-Ex), [Panasonic (5GAA)], Lenovo, BOSCH, Intel, Fraunhofer
  - Further down-scoping areas:
    - Only Mode 2 operation in FR1 ITS bands
    - Slots for PSFCH are aligned among the carriers for CA
    - No PSFCH enhancement compared to R16
    - In Co-Ex: same SCS between LTE/NR V2X
- Option 3: Continue to put on-hold until RAN#99 **(3)**
  - Apple, NEC, Mitsubishi

Topic 2: Handling of SL beam management in FR2 licensed spectrum (objective #3)

- Option A: Stop / remove the FR2 objective from the WID in Rel-18 **(18)**
  - DCM, VW, MediaTek, Futurewei, CATT, AT&T, TIM, IDC, Spreadtrum, Meta, ZTE, LGE, CMCC, Panasonic, Mitsubishi, Lenovo, BOSCH, DT
- Option B: Revise the objective to “study” only until the end of Rel-18 **(32)**
  - DCM (low priority), NSC, Toyota, Nokia (RAN1/RAN2), Huawei (RAN1/RAN2, no low priority), VW (low priority), MediaTek (RAN1/RAN2), Futurewei, Ericsson (RAN1/RAN2), CATT, AT&T, Qualcomm (RAN1/RAN2), Apple, Spreadtrum, xiaomi (RAN1/RAN2), Meta, Sharp, ZTE, Verizon, Samsung (RAN1 only), NEC (low priority), vivo, continental (RAN1/RAN2), LGE (low priority, RAN1 only), CMCC, Panasonic, Mitsubishi (low priority), OPPO (RAN1/RAN2), Sony, BOSCH, Intel, Fraunhofer
- Option C: No change, continue the objective to study + specification work **(6)**
  - NSC, Apple, Verizon, vivo, Intel, Fraunhofer

Topic 3: Any further restriction on the scope for the LTE/NR V2X co-channel coexistence objective

- No down-scoping **(20)**

- DCM, Toyota, Nokia, Huawei (not in RAN), VW, Futurewei, Vodafone, Ericsson, CATT, IDC, ETRI, Sharp, ZTE (checkpoint in RAN#99), Continental, LGE, Mitsubishi, Lenovo, Sony, OPPO, Fraunhofer

- Focus only on 15kHz SCS for NR V2X **(10)**
  - Qualcomm (RAN guidance), Apple, Spreadtrum, xiaomi (RAN guidance), Samsung/NEC/vivo/Panasonic/BOSCH (prioritize 15kHz first), CMCC

- Not work on IUC solutions **(9)**
  - MediaTek, Qualcomm (RAN guidance), Apple, Spreadtrum, xiaomi (RAN guidance), LGE (WG decision), CMCC, Mitsubishi, OPPO, Intel

Topic 4: Is it necessary to declare the study is completed for the SL-U objective

- Yes **(6)**: NSC, Nokia, Apple, Spreadtrum, Sharp, vivo
- No **(12)**: DCM, Huawei, MediaTek, Futurewei, Ericsson, CATT, Qualcomm, xiaomi, Meta, Lenovo, OPPO, Intel
- A common suggestion:
  - ~~**The study should**~~ focus on FR1 unlicensed bands (n46 and n96/n102)~~ **and is to be completed by RAN#98**~~.

- ZTE/BOSCH suggestion:
  - The study**, if any,** should focus on FR1 unlicensed bands (n46 and n96/n102) and is to be completed by RAN#98.

2.5 Moderator's observations and comments from the initial round

Topic 1 (CA objective): It is observed there is a very significant concern on the workload and no more room/TU is available in RAN1 (although RAN2 is not overloaded at the moment). Not to forget, the CA work will also increase RAN4 workload to define RF/RRM/demod requirements for CA band combinations. One company also question the urgency of this work and we can possibly do this work in Rel-19 instead. Moderator feels that if there is any chance of doing some SL CA work in the remaining time of R18, since there are still some demands from the automotive companies, the moderator proposes to really compress the scope based on some of the suggestions. But the proposal should be jointly considered with the FR2 objective as a package.

Topic 2 (FR2 objective): There are a lot of interests to continue this topic as a "study-only" objective until the end of R18. And some think this can be of a lower priority compared to other objectives, which involves normative work. The continuation of this objective should jointly consider the handling of the CA objective as a package, as said above. Therefore, by taking into different preferences and workload into account, the moderator suggests two alternative packages below for down-selection.

Topic 3 (Co-Ex objective): Based on the inputs, the majority does not think a hard down-scoping of this objective is needed, especially from the car makers (auto industry). In addition, they have also voiced that

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30kHz SCS is an important and relevant deployment scenario for NR sidelink in the ITS spectrum. In this sense, we could try provide some RAN guidance on the IUC scheme.

Topic 4 (SL-U objective): While the majority of company has a view that it is not necessary to formally declare the study phase in SL-U is completed, many also suggested that a text update to the bullet in question could be done. In moderator's view, this also can be a way to express that the study is no longer needed. The most suggested version of the wording is from DCM/Huawei, hence, it is moderator's proposal to update the WID accordingly.

Proposals for the above are listed in the intermediate round section.

3 Intermediate round

3.1 Moderator's proposals

Proposal 1 (I): For handling of both CA and FR2 objectives as a package, please indicate which one of the following alternatives is your preference. In Alt. 1, is there any further restriction can be included for either the CA or the FR2 objective.

- Alt. 1:
  - Start the CA objective from RAN#98-e with the following restrictions.
    - Only Mode 2 operation in FR1 ITS band (intra-band CA only)
    - For a CA capable UE, the same number of Tx and Rx chains/carriers is supported by the UE (e.g., if UE supports SL reception on 2 carriers, it should support SL transmission on 2 carriers, vice-versa).
    - No enhancement related to SL-HARQ feedback, PSFCH transmission, RSRP feedback, and CSI feedback compared to Rel-16.
  - Continue the FR2 topic as a "study"only objective from RAN#98-e with the following restrictions.
    - The study is limited to RAN1 only.
    - To be handled as low priority in RAN1.
- Alt. 2:
  - Continue the FR2 topic as a "study"only objective from RAN#98-e and it has both RAN1 and RAN2 involvement.

Feedback Form 6:

1 – Ericsson LM Our preference is Alt. 2
2 – Classon Consulting [for FUTUREWEI] Alt 2

3 – MediaTek Inc.

Alt. 2

4 – National Spectrum Consortium

Alt. 1 without the intra-band restriction. If the intention was to agree on CA and FR2 as a package, then Alt. 2 needs to say something about CA, otherwise the RAN#98-e checkpoint is left unaddressed.

5 – InterDigital

Our preference is Alt.1 with removing one of the objectives (either CA or FR2). From workload perspective, CA only has the least impact for RAN1 but we can compromise to select one of the objectives in Alt.1.

6 – SHARP Corporation

Alt. 1

7 – Qualcomm CDMA Technologies

Modified Alt 1.

We propose to remove the following from the SL CA objective since such a discussion would be part of the UE features discussed at the end of the release:

o "For a CA capable UE, the same number of Tx and Rx chains/carriers is supported by the UE (e.g., if UE supports SL reception on 2 carriers, it should support SL transmission on 2 carriers, vice-versa)."

We also propose to remove "To be handled as low priority in RAN1" from the FR objective. The scope is already limited by being a study only.

8 – Sony Group Corporation

Alt. 2

9 – Apple GmbH

We support Alt. 2.

In Alt. 1, restricting the scope of sidelink CA (e.g., not handling mode 1, no enhancement related to SL-HARQ feedback, etc) in Rel-18 does not make the sidelink CA working properly in Rel-18. Instead of partially supporting sidelink CA in Rel-18, we prefer delaying the starting of sidelink CA so that we could do the necessary work altogether in Rel-19. In Alt. 1, we also disagree that sidelink FR2 is to be handled as low priority in RAN1. We think FR2 is an important feature and should be at least taken as the same priority as other objectives. Finally, the sidelink FR2 without RAN2 participation is not preferred.

We also note that Alt . 2 has many RAN2 work on sidelink FR2, which could fulfill the workload of RAN2.

10 – Meta Ireland

We support QC's update within Alt.1. Prefer not to restriction of RF architecture in RAN. The restriction will be studied and decided in RAN WGs.

11 – Verizon UK Ltd

Support Alt2. QC revised Alt1, if it is a clear majority, we can accept too.

12 – vivo Communication Technology

If one of them is to be selected, our preference is Alt 2 - making FR2 as low priority (as in Alt 1) is not acceptable to us.

13 – CATT

Alt 2

14 – NTT DOCOMO INC.

Alt 2

15 – Panasonic Holdings Corporation

If we compare alt 1 and alt 2, our preference is alt 2 because the functionality of CA in Alt.1 is only partially realized, and it can be the issue for the compatibility among different releases.

16 – Spreadtrum Communications

Alt 2.

17 – Samsung Electronics Romania

Alt. 2. For RAN2 involvement, it needs RAN1 progress first.

18 – Nokia Denmark

Nokia supports Alt. 2!

19 – Transsion Holdings

Support Alt 2.

20 – Huawei Tech.(UK) Co.. Ltd

We support Alt 2.

If Alt 1 were to become a general direction, we would not agree that studying FR2 should be low priority.

21 – LG Electronics UK

We are fine with Alt 1.

We would also be fine with Alt 2 if it is clarified that FR2 is a low priority topic. We don't see a reason to treat a study-only objective with the same priority as other normative objectives.

22 – Intel Korea

Alt.1 direction is preferred, accepting FR2 as a study-only and limiting CA work scope.

We don't agree to have FR2 as a low priority item. With the limited scope already, treating it with low priority would further complicate achieving any progress there.

o *Continue the FR2 topic as a "study" only objective from RAN#98-e with the following restrictions.*

§ *The study is limited to RAN1 only.*

§ ~~*To be handled as low priority in RAN1.*~~

23 – Continental Automotive

We support Alt. 2.

24 – Continental Automotive

We support Alt. 2.

25 – TELECOM ITALIA S.p.A.

Neither 1 or 2 - Having a study on FR2 in Rel 18 is enlarging the scope of Rel 18 and does not solve the issue of workload.

We request to remove FR2 from the scope of the work Item

26 – ROBERT BOSCH GmbH

We support Alt.1; We agree with Qualcomm proposal to remove: ~~to be handled as low priority in RAN1~~.

27 – ROBERT BOSCH GmbH

We support Alt.1; We agree with Qualcomm proposal to remove: ~~to be handled as low priority in RAN1~~.

28 – ROBERT BOSCH GmbH

We support Alt.1; We agree with Qualcomm proposal to remove: ~~to be handled as low priority in RAN1~~.

29 – ROBERT BOSCH GmbH

We support Alt.1; We agree with Qualcomm proposal to remove: ~~to be handled as low priority in RAN1~~.

30 – ROBERT BOSCH GmbH

We support Alt.1; We agree with Qualcomm proposal to remove: ~~to be handled as low priority in RAN1~~.

31 – ROBERT BOSCH GmbH

We support Alt.1; We agree with Qualcomm proposal to remove: ~~to be handled as low priority in RAN1~~.

32 – ROBERT BOSCH GmbH

We support Alt.1; We agree with Qualcomm proposal to remove: ~~to be handled as low priority in RAN1~~.

33 – Beijing Xiaomi Mobile Software

We prefer Alt 2

34 – Fraunhofer HHI

We support Alt 1. with removal of „to be handled as low priority in RAN1“.

35 – Volkswagen AG

None of both. Grouping SL CA and FR2 support into one package seems not to be useful as there are only few commonalities if at all. If a packaging was envisioned, then Alt. 2 also needs to include proposals for SL CA.

The 2nd and 3rd scope reductions of Alt. 1 for SL CA are too restrictive and bear the risk of incompatibilities.

36 – Guangdong OPPO Mobile Telecom.

Alt. 2

37 – Lenovo (Beijing) Ltd

Alt1. But the restriction can be considered in future RAN plenary meeting, e.g., the enhancement on HARQ feedback and handling mode 1.

Proposal 2 (I): For the LTE/NR V2X co-channel coexistence objective, inter-UE coordination related scheme is de-prioritized. It can be re-visited if consensus.

Feedback Form 7:

1 – TOYOTA Info Technology Center

Inter-UE coordination should not be deprioritized by the Plenary and should be left to the WG decision as part of the technical discussions of the pros/cons.

2 – Ericsson LM

We don’t think RAN plenary should down-prioritize this objective now. Like Toyota, we think such discussion with proper technical input is for WGs to handle, if needed.

3 – Classon Consulting

[for FUTUREWEI] RAN guidance does not seem necessary here

4 – MediaTek Inc.

We tend to agree with the moderator’s proposal; this objective has shown a tendency to expand, and some scope control seems beneficial.

5 – InterDigital

RAN guidance is not needed for this issue at this point.

6 – Qualcomm CDMA Technologies

We prefer to also list mixed-SCS support as a deprioritized topic since it has been taking significant amount of RAN1 time at the expense of discussing essential functionality.

7 – Apple GmbH

We think this kind of decision could be left for RAN1 discussion, especially in the case that decision on sidelink CA and sidelink FR2 has been made.

8 – Meta Ireland

We also similar view with other companies. These is no necessity of RAN guidance at this stage.

9 – vivo Communication Technology

From the summary there are 10 companies prefer to deprioritize the mixed-SCS while 9 companies prefer to deprioritize the IUC. Then it is more reasonable to at least deprioritize the support of mixed-SCS.

10 – CATT

we support the proposal

11 – NTT DOCOMO INC.

Same view with other companies; no guidance in this plenary meeting is necessary.

12 – Panasonic Holdings Corporation

We support the proposal.

13 – Samsung Electronics Romania

In our understanding, RAN guidance is not needed on IUC for co-existence at this time.

This is not what is blocking progress in RAN1. But it might be better for RAN plenary to direct the scope of work in RAN1 in Q1.

Based on the initial round, 20 companies saw no need for down scoping and 10 wanted down scoping. So having an intermediate milestone for RAN1 in Q1 seems to be a good compromise, then we can re-assess based on progress. For example, the RAN guidance can be “work on co-existences for 15 kHz in Q1 and then objective is revisited in RAN#99 based on progress”. This would be productive as it focuses effort of RAN1 in Q1, otherwise it will risk one more quarter with little progress on this topic.

14 – Nokia Denmark

We support Apple’s view and leave the discussion to RAN1

15 – Huawei Tech.(UK) Co.. Ltd

We doubt this will make a crucial difference to RAN1, although we could live with it.

16 – Transsion Holdings We support the proposal
17 – LG Electronics UK We support this proposal. It can help WGs handle the outcome from Proposal 1.
18 – Intel Korea Support P2, as was explained in the first round IUC is a complex feature which may not be widely implemented thus relying on it in the co-ex framework is unreasonable.
19 – Continental Automotive We consider the Co-channel Coex discussion should continue without need for deprioritizing anything. Whether or not IUC becomes part of the solution, that should be a natural outcome of discussions in RAN1.
20 – ROBERT BOSCH GmbH We believe the proposal written above is not correctly reflecting the discussion happened online and in the initial round of the discussion! We think the de-prioritization should be done only for mixing numerology, i.e., in addition to what was guided by RAN before, namely dynamic co-channel coexistence.
21 – Beijing Xiaomi Mobile Software We support the proposal. We also support to deprioritize mixing numerology for dynamic resource sharing.
22 – VODAFONE Group Plc Tend to support Continental.
23 – Fraunhofer HHI We do not think RAN guidance is needed and that this can be handled by the WG. In our understanding, the discussions in RAN1 does not involve any modifications to IUC but rather uses the tools introduced in Rel-17.
24 – Guangdong OPPO Mobile Telecom. Similar to the majority, this perhaps can be left to WG decision.
25 – Volkswagen AG IUC should not be down prioritized. A potential topic for down-priortization could be the support of mixed-SCS.
26 – Lenovo (Beijing) Ltd RAN guidance is not necessary at this stage.

Proposal 3 (I): In the SL-U objective, update the following bullet as:

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- ~~**The study should**~~ Focus on FR1 unlicensed bands (n46 and n96/n102) ~~**and is to be completed by RAN#98**~~.

Feedback Form 8:

1 – Ericsson LM We are fine with this proposal.
2 – Classon Consulting [for FUTUREWEI] OK
3 – MediaTek Inc. OK with this proposal.
4 – MediaTek Inc. OK with this proposal.
5 – MediaTek Inc. OK with this proposal.
6 – SHARP Corporation OK
7 – Qualcomm CDMA Technologies We are ok with the proposal.
8 – Sony Group Corporation OK with this proposal.
9 – Apple GmbH OK with this proposal.
10 – Meta Ireland Fine with the revision.
11 – vivo Communication Technology OK
12 – CATT ok

https://nwm-trial.etsi.org/#/documents/8382

13 – NTT DOCOMO INC. OK
14 – Panasonic Holdings Corporation We support the proposal.
15 – Spreadtrum Communications Fine with the proposal.
16 – Samsung Electronics Romania Okay with the proposal.
17 – Samsung Electronics Romania Okay with the proposal.
18 – Nokia Denmark OK with this proposal
19 – Huawei Tech.(UK) Co.. Ltd OK
20 – Huawei Tech.(UK) Co.. Ltd OK
21 – Transsion Holdings OK
22 – LG Electronics UK Okay with the proposal
23 – Intel Korea Support
24 – ROBERT BOSCH GmbH Support
25 – Beijing Xiaomi Mobile Software OK
26 – Fraunhofer HHI OK

https://nwm-trial.etsi.org/#/documents/8382

27 – Guangdong OPPO Mobile Telecom. OK
28 – Lenovo (Beijing) Ltd OK with this proposal

3.2 Summary of intermediate round

Proposal 1 (I): For handling of both CA and FR2 objectives as a package.

- Alt. 1: Start both CA objective and FR2 ”study only” objective, with reduced scope
  - CA work: only mode 2 in ITS band; support same number of Tx/Rx carriers; no enhancement to HARQ, PSFCH, RSRP and CSI feedbacks
  - FR2 study: only RAN1; low priority
  - Support (9): NSC (remove intra-band CA), Sharp, Qualcomm/Meta (remove Tx/Rx restriction and low priority for FR2 in RAN1), LGE, Intel, Lenovo (no HARQ restriction, add mode 1), BOSCH/Fraunhofer (remove low priority for FR2 in RAN1)
- Alt. 2: Start only FR2 as a ”study one” objective (both RAN1 and RAN2 involvement)
  - Support (18): Ericsson, Futurewei, MediaTek, Sony, Apple, Verizon, vivo, CATT, DCM, Panasonic, Spreadtrum, Samsung, Nokia, Transsion, Huawei, LGE (low priority), Continental, OPPO
- Start only CA or FR2: IDC
- Neither: TIM, VW

Proposal 2 (I): For the LTE/NR V2X co-channel coexistence objective, inter-UE coordination related scheme is de-prioritized. It can be re-visited if consensus.

- Support (7): MediaTek, Qualcomm/xiaomi (include mixed-SCS support), CATT, Panasonic, Transsion, LGE, Intel
- Not necessary (15): Toyota, Ericsson, Futurewei, IDC, Apple, Meta, DCM, Samsung (prioritize 15kHz in Q1), Nokia, Huawei, Continental, Vodafone, Fraunhofer, OPPO, Lenovo
- De-prioritize only the mixed SCS (3): vivo, BOSCH, VW

Proposal 3 (I): For the SL-U objective, update the following bullet as:

- ~~**The study should**~~ focus on FR1 unlicensed bands (n46 and n96/n102) ~~**and is to be completed by RAN#98**~~.
- Support: All

3.3 Moderator's observations and comments based on intermediate round inputs

- Proposal 1 (I) – CA and FR2 package alternatives:
  - It is observed many are having problems with limiting the CA work as proposed in Alt. 1 due to the down-scoping will seriously limit the use of CA and create a forward compatibility issue (i.e., intra-band CA, same number of Tx/Rx and no enhancement in HARQ feedback). At the same time, some do not want to treat the FR2 objective as low priority.
  - At the same time, the majority does not prefer to further down-scope the Co-Ex objective.
  - For FR2, some RAN1 progress is needed before the study in RAN2 can begin.
  - Considering the inputs from the initial round as well, it is not possible to start both CA and FR2 objectives without any scope reduction. In this case, the moderator proposes to go with the direction of Alt. 2.
- Proposal 2 (I) – deprioritizing IUC in Co-Ex objective:
  - As mentioned in the initial round observation and comment, automotive companies have serious concerns on not supporting the mixed SCS deployment. In the intermediate round of discussion, they still think decisions should be made based on WG discussion, not in RAN.
  - At the same time, the majority of other companies also have the same preference of leaving the decision to the WG. The moderator will not pursue this proposal / topic anymore in RAN#98-e.
- Proposal 3 (I) – SL-U bullet update:
  - All supported. The same proposal 3 (I) will be kept for the Wednesday GTW.

3.4 Way forward proposals for Wednesday GTW

Proposal 1 (II):

- Continue the FR2 topic as a "study" only objective from RAN#98-e with both RAN1 and RAN2 involvement.
  - The priority handling of this objective is up to the session chairs in RAN1 and RAN2.
  - The timing to start the RAN2 study is up to RAN2 session chair (e.g., after RAN1 has made some progress).
- The SL CA objective (#1) is dropped from Rel-18. It should be re-considered in Rel-19.

https://nwm-trial.etsi.org/#/documents/8382

Proposal 3 (I): In the SL-U objective, update the following bullet as:

- ~~**The study should**~~ Focus on FR1 unlicensed bands (n46 and n96/n102) ~~**and is to be completed by RAN#98**~~.

3.5 Way forward proposals endorsed during Wednesday GTW

Proposal 1 (III):

- Continue the FR2 topic as a "study" only objective from RAN#98-e with both RAN1 and RAN2 involvement
  - The priority handling of this objective is up to the session chairs in RAN1 and RAN2
  - The timing to start the RAN2 study is up to RAN2 session chair (e.g., after RAN1 has made some progress)
- Revisit the CA objective in March, including the possibility of including it in Rel-18 with minimal WG efforts, or dropping it from Rel-18 but re-consider it in Rel-19

Proposal 3 (I): In the SL-U objective, update the following bullet as:

- ~~The study should~~ Focus on FR1 unlicensed bands (n46 and n96/n102) ~~and is to be completed by RAN#98~~.

4 Final round

4.1 WID update according to endorsed way forward proposals

With the way forward proposals endorsed during Wednesday GTW (captured in Conclusions section), the next step is to update the WID. An updated version can be found in the following link. Please indicate if any mistake or missing parts.

https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_98e/Inbox/Drafts/%5B98e-17-R18-SLEvo%5D/draft%20WID%20update%20RP-222806%20rm%20v001.doc

Feedback Form 9:

1 – Qualcomm CDMA Technologies

We are ok with the updated WID.

2 – Huawei Tech.(UK) Co.. Ltd

Thanks, looks good.

3 – Apple GmbH

The updated WID looks good to us.

4 – NTT DOCOMO INC.

OK

5 – LG Electronics UK

We are fine with the WID update.

6 – China Mobile Com. Corporation

We are OK with the updated WID.

7 – vivo Communication Technology

Fine with the updates

8 – Panasonic Holdings Corporation

OK with the update.

9 – ZTE Corporation

OK with the update

10 – MediaTek Inc.

OK with the updated WID.

11 – Intel Korea

The update looks correct.

We assume FR2 study outcome is planned to be captured in the TR, mentioned in section 5 of the WID. Could moderator confirm this?

12 – Transsion Holdings

Fine with the updated WID

13 – Spreadtrum Communications

OK with the updated WID.

14 – Nokia Denmark

We are fine with the updated WID

15 – Ericsson LM The updated WID looks OK to us
16 – Fraunhofer HHI We are fine with the updated WID.
17 – Lenovo (Beijing) Ltd OK with the updated WID.
18 – Beijing Xiaomi Mobile Software We are fine with the updated WID.

4.2 Candidate areas / topics for down-scoping in CA for March 2023

During the Wednesday GTW, the Chair suggested that we could continue discussing potential areas / topics for down-scoping the CA objective for March 2023. This continuing discussion is only to identify a potential / candidate list of topics, but not intended for any endorsement or agreement in RAN#98-e. The idea is to save some discussion time for the March plenary. This is just an initial collection of the list, then companies can further consider them until March 2023. More down-scoping ideas / topics for CA can be further included during the March plenary and jointly discussed.

Please indicate further ideas / topics other than those ones already listed in Section 3.1 and below.

- Only Mode 2 operation in FR1 ITS band (intra-band CA only).
- For a CA capable UE, the same number of Tx and Rx chains/carriers is supported by the UE (e.g., if UE supports SL reception on 2 carriers, it should support SL transmission on 2 carriers, vice-versa). To avoid situation where a UE support multiple Tx and a single Rx, then all the SL-HARQ feedbacks would need to be on the same Rx carrier. Also to avoid situation where a UE support multiple Rx and a single Tx, then the SL-HARQ feedbacks may all need to be transmitted on the same Tx carrier.
- No enhancement related to SL-HARQ feedback, PSFCH transmission, RSRP feedback, and CSI feedback compared to Rel-16.

Feedback Form 10:

1 – Qualcomm CDMA Technologies Thanks to the moderator for explaining the motivation behind the second bullet “same number of Tx and Rx chains/carriers is supported by the UE”. It is clearer to us now. From our view, the number of chains is heavily related to the implementation architecture. We propose directly capturing the desired outcome in the bullet instead of using the number of chains and carriers as intermediaries. For a CA capable UE, the UE supports transmitting SL HARQ feedback on the same carrier on which it receives the associated PSSCH. ~~the same number of Tx and Rx chains/carriers is supported by the UE (e.g.,~~

~~if UE supports SL reception on 2 carriers, it should support SL transmission on 2 carriers, vice-versa). To avoid situation where a UE support multiple Tx and a single Rx, then all the SL-HARQ feedbacks would need to be on the same Rx carrier. Also to avoid situation where a UE support multiple Rx and a single Tx, then the SL-HARQ feedbacks may all need to be transmitted on the same Tx carrier.~~

2 – NTT DOCOMO INC.

We are not sure no enhancement/impact especially related to SL HARQ feedback is really possible...

For example, in LTE, there is the following text in 36.213 for PSSCH TX in multiple carriers:

—

if the UE does not support transmission in the candidate single-subframe resource in the carrier under the assumption that transmissions take place in other carrier(s) using the already selected resources due to its limitation in the number of simultaneous transmission carriers, its limitation in the supported carrier combinations, or interruption for RF retuning time [10].

—

This means, special handling for simultaneous PSFCH TXs on multiple carriers would be necessary over R16 simultaneous PSFCH TXs on a single carrier. UE behavior perspective, and/or UE capability perspective, etc. In our understanding, careful spec check is required to support PSFCH in CA case, which is also time consuming.

Regarding the second bullet, 'all the SL-HARQ feedbacks would need to be on the same Rx carrier' 'the SL-HARQ feedbacks may all need to be transmitted on the same Tx carrier' are a bit unclear. The intention is the same TX/RX carrier **with the corresponding PSSCH RX/TX**? If YES, this should be clarified.

3 – LG Electronics UK

We think the list the moderator provided can be a good starting point. If mode 1 is to be considered for SL CA, we think no enhancement to DCI and PUCCH can be a potential means to manage the work scope.

4 – ZTE Corporation

We are fine with Moderator's list. Regarding DCM's concern on the PSFCH feedback for the case when PSSCH transmission does not take place over all the carriers, we don't think there is need for any enhancement other than assuming the PSFCH shall cater to all the transmissions actually performed. This case is similar to the Rel16 PSSCH prioritization situation where some PSSCH shall be dropped whose corresponding PSFCH will not be transmitted.

5 – Intel Korea

Agree with focus on Mode 2. Mode 1 support can be added later w/o compatibility issues.

Regarding second and third bullets, it seems the second bullet is a solution to the issue with SL HARQ feedbacks, and the third bullet again mentions SL HARQ / PSFCH optimizations. Either the second bullet can be removed assuming the third covers it, or the third bullet may be limited to RSRP & CSI.

6 – Nokia Denmark

We believe that sidelink CA should be postponed till Rel. 19 to enable a proper study. We should not rush a solution in Rel. 18 for SL-CA.

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Further inputs from BOSCH:

”We would like to thank the moderator for giving us the chance to consolidate the possible limited scope to enable activating CA in Rel.-18. We are generally fine with all proposed limitation presented by the moderator. Regarding the number of the TX and RX chains, we prefer the clarification of Qualcomm. However, we are inline with the moderator view in this case. Regarding PSFCH feedback enhancements, we agree it is not needed for CA (as proposed by moderator and ZTE). Additionally, it seems that the second bullet has also a solution for PSFCH in case we consider multiple TX/RX chains. Finally, we support the direction of limiting the CA to Mode 2 and consider it for Rel-18. That is why we believe Rel.18 is the right timeline to limit further compatibility issues if delayed to future releases. However, for mode 1, this is the feature that can safely considered in Rel.19 (i.e., without compatibility issues).”

4.3 Moderator’s summary and responses

Regarding Intel’s clarification question on the WID update, it should be clarified that the TR in Section 5 of the WID is a RAN4-led TR, which is meant to RAN4’s analysis on RF requirements for SL transmission and reception. Study outcomes for the FR2 objective, my thinking/preference is to leave all agreed candidate beam management solutions (including any observation and conclusion that we may have) in the Chair’s notes in both RAN1 and RAN2 to minimize the overhead of compiling and reviewing texts for the TR (which can be very considerable). Given that the allocated TUs for R18 SL is already lacking and potentially starting the CA objective from March 2023, I think it is reasonable to take this approach.

On candidate areas/topics for down-scoping the CA objective, based on the inputs so far, the following technical areas have been identified in the final round as candidates that could be considered in March plenary (RAN#99).

- Only Mode 2 operation in FR1 ITS band (intra-band CA only)
- For a CA capable UE, the UE supports transmitting SL HARQ feedback on the same carrier on which it receives the associated PSSCH
- No enhancement related to RSRP feedback and CSI feedback compared to Rel-16
- In Mode 1, no enhancement to DCI and PUCCH

Further topic areas for down-scoping of course could be also consider in the March plenary if there is a consensus to start the CA objective for the remainder of R18 timeframe (i.e., to be done within 3 WGs meetings).

Regarding DCM’s question/concern on the 2nd bullet, we can further discuss if any enhancement necessary on the PSFCH transmission handling in the case of CA in March plenary. Currently, my understanding of Rel-16 behavior is that if number of PSFCH transmissions in a slot is more than UE’s supported capability, then the UE transmit PSFCHs according to its capability and the corresponding PSSCH priority (from high to low).

5 Conclusions

The following proposals are endorsed during Wednesday GTW.

Proposal 1 (III):

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- Continue the FR2 topic as a "study" only objective from RAN#98-e with both RAN1 and RAN2 involvement
    - The priority handling of this objective is up to the session chairs in RAN1 and RAN2
    - The timing to start the RAN2 study is up to RAN2 session chair (e.g., after RAN1 has made some progress)
- Revisit the CA objective in March, including the possibility of including it in Rel-18 with minimal WG efforts, or dropping it from Rel-18 but re-consider it in Rel-19

Proposal 3 (I): In the SL-U objective, update the following bullet as:

- ~~The study should~~ Focus on FR1 unlicensed bands (n46 and n96/n102)~~ and is to be completed by RAN#98~~.

The revised WID is approved in RP-222806.

6 References

[1] RP-221938 "WID revision: NR sidelink revolution", OPPO, RAN#97-e

[2] RP-222730 "RAN Planning", RAN Chair, RAN1 Chair, RAN2 Chair, RAN3, Chair, RAN4 Chair, RAN5 Chair, RAN#98-e

[3] RP-222805 "Status report for WI NR sidelink evolution; rapporteur: OPPO", RAN1, RAN#98-e

[4] RP-222838 "Discussion on the scope of Rel-18 sidelink evolution", LG Electronics, RAN#98-e

[5] RP-222913 "Discussion on the scope of Rel-18 Sidelink Evolution", National Spectrum Consortium, RAN#98-e

[6] RP-222937 "Discussion on the scope of NR sidelink evolution", xiaomi, RAN#98-e

[7] RP-222975 "Discussion on WI scope for Rel-18 Sidelink", Intel, RAN#98-e

[8] RP-222986 "Discussion on WID update for SL evolution", Ericsson, RAN#98-e

[9] RP-223018 "On the scope of NR sidelink evolution WI", OPPO, RAN#98-e

[10] RP-223082 "Views on Rel-18 NR sidelink evolution", Sharp, RAN#98-e

[11] RP-223087 "On work scope of Rel-18 NR sidelink evolution", Samsung, RAN#98-e

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[12] RP-223101 ”Discussion on NR sidelink evolution WI”, vivo, RAN#98-e

[13] RP-223125 ”Views on objectives for NR sidelink evolution”, Qualcomm, RAN#98-e

[14] RP-223133 ”On the Scope of Rel-18 Sidelink Evolution”, CATT, GOHIGH, RAN#98-e

[15] RP-223167 ”Discussion on Rel-18 NR sidelink evolution”, NTT DOCOMO, RAN#98-e

[16] RP-223199 ”On objectives of Rel-18 Sidelink Evolution”, Lenovo, RAN#98-e

[17] RP-223202 ”On Rel-18 NR Sidelink Evolution”, Apple, RAN#98-e

[18] RP-223226 ”On Rel-18 NR sidelink evolution”, Nokia, Nokia Shanghai Bell, RAN#98-e

[19] RP-223252 ”Views on NR sidelink evolution WI scope for Rel-18”, ROBERT BOSCH, RAN#98-e

[20] RP-223256 ”Views on scope of NR sidelink evolution”, ZTE, Sanechips, RAN#98-e

7 Appendix (Contribution review summary)

Handling of carrier aggregation (Objective #1)

- Drop / postpone CA after R18 (11): *LGE, OPPO, Ericsson, Samsung, Qualcomm, Nokia/NSB, DCM, CATT/GOHIGH, xiaomi (if dropping FR2)*
    - ETSI TC ERM has started work on support for channel bandwidths larger than 10 MHz, this reduces the urgency of support for NR sidelink CA operation, high RAN4 workload, SL TU in RAN1 is already exhausted, there are hidden features in NR SL that requires further consideration in RAN1;
- Start CA (10): *Intel, ZTE/Sanechips, Apple, vivo, xiaomi (not together with FR2 study), Sharp, Lenovo, NSC, BOSCH*
    - RAN2-led item and there is sufficient TU/capacity to start CA, one of the requests from 5GAA, supported in LTE Rel-15, scope to be further quantified in the WG, no additional work in RAN1, Co-Ex work in RAN1 is almost completed;

Handling of FR2 beam management objective (Objective #3)

- Study only (14): *LGE, OPPO, Ericsson, Samsung, Nokia/NSB, DCM (fine to drop), ZTE/Sanechips, Apple, CATT/GOHIGH (until RAN#99), xiaomi, BOSCH*
    - Limited remaining R18 WG meetings, a proper study is needed for a completely new feature in SL;
- Study + specification work (6): *Qualcomm, Intel, Apple, vivo, Sharp, NSC*
    - Operator demand (if there), important feature, SL-Evo item is progressing well in all existing objectives;

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- Suspend FR2 objective until end of R18: *Lenovo*
    - Heavy remaining work, progress on R18 SL work is slow
- WG involvement (in the case of study only):
    - RAN1 to study and identify candidate beam management solutions: *OPPO*
    - RAN2 to study beam failure reporting and recovery: *OPPO*
- Work priority:
    - Low priority in R18: *LGE*

Others

- Xiaomi (2937), BOSCH (3252): Handling of Co-Ex objective – special handling for higher SCS (i.e., different from 15kHz) and/or the support IUC for dynamic resource pool sharing in co-channel coexistence are not considered or down-prioritized in R18.