**UAV_submitted**

**Variant of 98e-23-R18-UAV Version 0.0.4**

**RAN**

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3GPP TSG-RAN Meeting #98e

Electronic Meeting, December 12-16, 2022

RP-223463

Title: Moderator's summary of email discussion [98-23-R18-UAV]

Source: Moderator (Nokia)

# 1 Introduction

This is the summary document from the dicussion on UAV work item updates & LS response, covering the following documents:

RP-222713, RP-222961, RP-222987, RP223014 and RP-223253.

The two topics to be address are:

- How to reflect the TSG SA WG2 conclusions on the UAV ID broadcast in the UAV WID (moving to normative phase after SA2 studies) (Objective 3)
- What potentially to answer for the LS received from TC-LI

# 2 UAV ID broadcast - Round 1

The proposed Objective 3 by the raporteur is:

3. Specify sidelink support/capability for Rel-18 UAV UE to enable remote ID broadcasting using Sidelink Mode 2. Specification of a new PC5 message is not expected in the WI scope [RAN2, SA2].

Feedback is invited if this is acceptable was capturing the SA2 outcome.

**Feedback Form 1: Is the proposed objective 3 acceptable as proposed by the raporteur in RP-222961?**

**1 – TELECOM ITALIA S.p.A.**

The proposal as provided is not acceptable. The band where to support this signalling (licensed / unlicensed) should be clarified. In particular, we object to use this signalling in licensed spectrum, since it will cause major operation disruption (interference to remote base stations - gNBs could in line of sight with the devices even at tens of kilometers), and in any case interference management solutions need to be evaluated by RAN4.

**2 – Qualcomm Incorporated**

While it is not clear whether that is the intent, the current wording seems to only focus on specifying UE capability for Sidelink. However, the existing objective placeholder is not limited to UE capability reporting. Additionally, based on SA2 conclusions we do not see a need to limit to Mode 2 only.

In our view, SA2 conclusions from section 8 in TR 23.700-58 clearly propose to progress to normative phase PC5-based solutions for the Broadcast Remote ID (BRID) and Detect And Avoid (DAA) in accordance with solution #5 (in the SA2 TR), and for that, SA2 expects RAN to define necessary enhancements for NR.

Based on these SA2 conclusions, we proposed the following in RP-223014: Update RAN WID objective #3 to specify enhancements for PC5-based UAV identification broadcast and detect and avoid, for both LTE and NR.

Suggested text changes to the existing objective#3 is shown below:

3. ~~Study and specify, if needed,~~Specify enhancements for PC5 broadcast based UAV identification broadcast (BRID) and PC5 broadcast and PC5 unicast based detect and avoid (DAA) [RAN2, RAN1, SA2].

Applicable to both LTE and NR

~~Note: This study should consider existing techniques based on Uu or non 3GPP technologies, or unlicensed band as the baseline.~~

~~Note: This description is a placeholder for a more detailed objective to be drafted once SA2 will have concluded their study on the architectural aspects.~~

**3 – Kyocera Corporation**

We share Qualcomm's view that RAN should modify objective #3 to specify enhancements for PC5-based UAV identification broadcast and detect and avoid since SA2 has already concluded their study to support Broadcast Remote ID (BRID) and Detect And Avoid (DAA) and to move to the normative phase.

**4 – Samsung Electronics Co.**

We also think that the scope does not have to be limited to Mode 2 here. In addition, from our understanding, SA2 concluded that both LTE PC5 and NR PC5 can be considered for support of broadcast remote ID. However, given the limited TU, we are fine to focus on NR in Rel-18. If so, the objective can be simplified to e.g. 'Specify sidelink support/capability for Rel-18 UAV UE to enable remote ID broadcasting using NR sidelink'?

Regarding the comments from Telecom Italia, we are not sure we understand the concern correctly. Sidelink operation on same spectrum as the one used for Uu is allowed, and network takes care of resource split between Uu and SL.

**5 – Intel**

We agree with the intention but given that RAN2 need more discussion on what is needed in AS layer, we could keep the current objective and let RAN2 have more technical discussion.

**6 – vivo Mobile Communication Co.**

We think it would be good to align with SA2 conclusions from section 8 in TR 23.700-58 which clearly propose to progress to normative phase PC5-based solutions for the Broadcast Remote ID (BRID) and Detect And Avoid (DAA) . We are fine with Qualcomm WID revision proposal.

**7 – LG Electronics UK**

Firstly, we think it is important to clarify the RAT and frequency bands this update is targeting. Though the update proposed in RP-222961 mentions "Sidelink Mode 2", as the note "Applicable to both LTE and NR" is kept in RP-222961, we wonder if this objective is targeting both LTE sidelink Mode 2 and NR sidelink Mode 2 or it covers NR sidelink Mode 2 only. Moreover, we wonder if this objective avoids introducing of a new sidelink frequency band. So far NR sidelink is defined in n38 and n47 and we note that n47 is dedicated to ITS in many regions and thus not likely to be used for the UAV use cases unless there is an update to the regulation. Rel-18 sidelink evolution WI will define some unlicensed spectrum and, if this objective assumes to use the same unlicensed spectrum, we should make it clear that no new sidelink frequency bands will be introduced with this objective.

Secondly, we think the word "specify sidelink support" is somewhat ambiguous and might allow various new features in RAN WGs to optimize the UAV operation scenarios, which is not desirable under the current workload. We think RAN spec impact should be limited to supporting SA-defined solutions in RAN side, but on the other hand, we are not clear yet about what specific changes are required from the current SA conclusion. Thus we think meaningful RAN work can start with more input from SA side (e.g. normative work for UAS_Ph2 in SA2) and propose to make it clear that this objective scope is limited to supporting the input from SA.

On the involved WGs, currently we don't see the need of having RAN1 for this objective and the work needs to be limited to RAN2.

**8 – Ericsson LM**

While we agree with the intention of the proposal, we believe some amendments to the wording are needed:

- It is not clear what needs to be specify, hence it is better to keep "Study and specify if needed" at this stage.

- It is unclear what is meant by "new PC5 message". Hence either we remove it or clarify it.

Besides, we are not supportive of adding detect-and-avoid, not to up-scope the WI at this stage (conform to the RAN chairman's guidance).

In summary, we propose the following:

- Study and specify, if needed, enhancements to NR PC5 and LTE PC5 to support UAV identification broadcast. [RAN2]

We have been proposing to clarify the measurement related objective to include the prohibit timer for which there are simulation results to back up the relevance. However, it has been discussed already in RAN2 and hence it is enough if common understanding is that it is within current scope.

**9 – ZTE Corporation**

We are fine to update the scope based on SA2's progress. Regarding the detailed objective, it seems that the study phase is needed to identify the required changes, which is mainly RAN2's work on how to deliver the message (the content is defined already in SA2's TR). We are also open to supporting both NR and LTE PC5 if the scope is compact.

**10 – Beijing Xiaomi Mobile Software**

We agree with many of the comments above that the WID objective was a holding bullet on the understanding that SA2 study on use of sidelink for BRID as well as for use in DAA was ongoing and RAN would update this following the conclusion in SA2.

Essentially we support the Qualcomm proposed wording.

We believe the inclusion of DAA functionality will be required by regulators before any service may be permitted so this is required. We however acknowledge that the scope of the DAA aspects may need further refinement in order to ensure the scope of work in RAN2 in REL18 is manageable but delivers a practical and reliable solution. As such we suggest accepting this proposed Qualcomm wording for this meeting and allowing it to be refined in RP#99 following further discussion in RAN2.

**11 – HUAWEI TECHNOLOGIES Co. Ltd.**

We share the concern from Telecom Italia and LG on the spectrum to be used for remote ID broadcast. As discussed in RAN WG2, it is assumed that there can be more LOS paths between UAV and remote gNBs. Therefore, if the PC5 spectrum to be used for UAV is shared with Uu, some serious interference can be foreseen. On the other aspects, it is not clear what the RAN impact is expected to support such remote ID broadcasting and DAA as concluded by SA2. Normally, the upper layer content is transparent to AS. As proposed in RP-222961, no new PC5 message is expected, then we would like to understand whether upper layer contents can simply be treated as a user data (our initial assumption). Then the question is what's the difference comparing with the existing specified NR V2X and ProSe over the NR PC5? In conclusion, we agree with Intel and LG that more clarification is needed and it is better to start RAN work based on SA2 input.

**12 – TELECOM ITALIA S.p.A.**

To Samsung: I try to clarify my comment, and I am very worried nobody is following up on the issue I raised. PC5 transmission is practically a broadcast from a UE located at high altitude (likely even higher than the base station antennas). Therefore, if there is no directivity in the transmitted signal, this will be received by multiple base stations even at a distance of several kilometers. In practice, the signal transmitted by a UAV could interfere even with tens of gNBs (especially in urban environment). It is not acceptable to progress with the work without considering this aspect.

Therefore, **we object to this proposal as is**.

**13 – Nokia Corporation**

As proponent, we support the objective 3 proposal from the rapporteur. While inclusion of DAA to the objective could be desirable as proposed by some companies, we are not sure that RAN2 is able to complete all the need work timely with the available TUs. Therefore, we would like to keep the updated objectives

focuses on BRID at least for now. If the work progresses well in RAN2, DAA could be included to the WID objectives in a later phase.

**14 – Sony Europe B.V.**

We are ok with the proposed wording from Qualcomm for this objective

# 3 Feedback for the ETSI TC-LI - Round 1

ETSI TC-LI is asking in their LS at least the following

- TC LI currently does not think the positioning for option 3 (IP access for the UAV) will not be meet currently and seeks guidance on how to close that gap.
- TC LI kindly requests information on what RAN is doing in area of sensing, and how that might apply to detection and tracking of UAV

From the RP-222987:

- 3GPP TSG RAN is working further on positioning in Release 18, though has not specific scenario's under consideration for UAVs. There is work on-going for UAVa in Release 18, but addressing related reporting, ID broadcast and studying reducing interference with antenna directivity in a UAV.
- Reply to ETSI TC LI that 3GPP does not think that access via IP is mandated by FAA. Connectivity options 1 & 2 can provide additional benefits
- Reply to ETSI TC LI that there is no ongoing work on sensing in 3GPP RAN, but a study item is carried out in SA1 (22.837).
- Reply to ETSI TC LI that 3GPP thinks that the 3GPP specifications allow for an implementation and deployment wherein requirements can be met

**Feedback Form 2: Feedback for the proposed answer for ETSI TC-LI**

**1 – VODAFONE Group Plc**

Could also indicate which release the SA1 sensing study is for (I think it is a Rel 19 study)

**2 – TELECOM ITALIA S.p.A.**

As it is likely the SA1 study is for Rel 19, how can 3GPP state that the requirement from SA3-LI is already met?

We also suggest to state in the answer that the requirements could be met by using Uu communications

**3 – Samsung Electronics Co.**

We support all the proposals in RP-222987.

**4 – vivo Mobile Communication Co.**

We are fine with the proposals in RP-222987.

**5 – ZTE Corporation**

Regarding the feedback to ETSI, we can simply share the state of sensing in 3GPP. For other aspects, it seems that no further action is required from this LS.

**6 – Ericsson LM**

Proponent of RP-222987

**7 – Nokia Corporation**

We support the proposed LS responses in RP-222987 with some additional information as shown below (underlined part) since RAN#98e is planning to extend the Rel-18 UAV WID to include BRID:

Proposal 1 Reply to ETSI TC LI that 3GPP does not think that access via IP is mandated by FAA. Connectivity options 1 & 2 can provide additional benefits. RAN#98 is planning to extend the Rel-18 UAV work item by including BRID support for UAVs

Proposal 2 Reply to ETSI TC LI that there is no ongoing work on sensing in 3GPP RAN, but a study item is carried out in SA1 (22.837).

Proposal 3 Reply to ETSI TC LI that 3GPP thinks that the 3GPP specifications allow for an implementation and deployment wherein requirements can be met

**8 – HUAWEI TECHNOLOGIES Co. Ltd.**

We are fine with the initial Ericsson proposal and open to the Nokia addition. Perhaps for the next phase of this discussion we could directly work on the LS draft text (in .doc format, to be shared on ftp server).

# 4 Questions to be answered in Intermidiate round / Intermidate summary

For the LS response towards ETSI TC-LI it's proposed to continue drafting based on RP-222987, taking the comments into account from round 1. Draft is to be done in Word in drafts folder.

For the modified objective 3 discussion continues for the next round in NWM

# 5 UAV ID broadcast - Intermediate round

Based on the comments there seems to be still need to allow initial RAN2 discussions (as the objective was on hold until RAN#98e) and clarifications possible from SA2 side what are the actual RAN impacts for the methods desired by SA2.

The concern raised from the operator side on the spectrum band (due interference created by UAVs for the network) could be address by limiting the operation to unlicensed and existing sidelink bands

The proposed wording for the Objective 3 would be as follows:

- Study and specify, if needed, enhancements to NR PC5 and LTE PC5 to support UAV identification broadcast [RAN2]. Check at RAN#99 for further elaboration of this objective based RAN2 discussions and SA2 development. The possible UAV sidelink communications would be limited to existing sidelink bands in addition to the expected unlicensed band from Release 18.

**Feedback Form 3: Feedback for the proposed new objective 3.**

**1 – CableLabs**

CableLabs: unlike V2X operating in unlicensed bands, UAVs could trigger coexistence issues in unlicensed bands on a much larger scale than SideLink. We support UAV operation in ITS spectrum. If UAV is about to use 5/6 spectra, then this would require a coexistence study, given the large scale potential disruption of existent incumbent ground access technologies in unlicensed spectra.

**2 – Qualcomm Incorporated**

We are ok to keep "study" part as suggested by multiple companies.

We also do not intend on introducing new bands (sidelink or otherwise) for UAV-only use cases in this objective of this WI. However, the suggested wording has some issues.

First, it says "sidelink band", but we think the proper phrase to refer to such bands is "bands with support for the PC5 interface". Further, the suggested text says "the UAV sidelink communication would be limited to *existing* sidelink bands…". This does not go well with how 3GPP introduces enhancements in the specifications. In general, bands are introduced in a release independent manner, and we should not preclude the use of bands defined in the future. So, we agree with the intent but think the better way to capture is as follows "Note: This objective is not intended to introduce new band(s) with support for the PC5 interface".

Regarding some companies' comments in previous round on what enhancements might be needed, our initial assessment is also that the upper layer content should be transparent to AS and could be treated as user data. In that sense there may or may not be differences between supporting BRID only or DAA also. The study phase can look into whether current specification can satisfy the upper layer expectations e.g. periodicity, data rate of the BRID and DAA messages. Therefore, as also explained by multiple comments from other companies, we do not see a need to exclude DAA.

So we suggest changes to Rapporteur's proposed wording as follows:

"Study and specify, if needed, enhancements to NR PC5 and LTE PC5 to support UAV identification broadcast and detect and avoid [RAN2]. Check at RAN#99 for further elaboration of this objective, if needed, based on RAN2 discussions and SA2 development. ~~The possible UAV sidelink communications would be limited to existing sidelink bands in addition to the expected unlicensed band from Release 18.~~

Note: This objective is not intended to introduce new band(s) with support for the PC5 interface."

**3 – Intel Corporation (UK) Ltd**

We are ok with the moderator's proposal with Qualcomm's suggestion to add "DAA". Although we are not sure what RAN2 enhancement is needed, RAN2 can study both cases given that solution #5 from TR23.77-58 covers both broadcast ID and DAA.

**4 – OPPO**

We are fine to study first as RAN has not organized any discussion for this objective, more evaluation time is valuable to clarify the potential RAN spec impact and QC's objective revision is also acceptable and anyway we can revisit this objective in RAN#99 as suggested.

**5 – Samsung Electronics Co.**

We support the proposal from the moderator as it is, and do not see the need to add DAA part at the moment, even though this work would not have any impact to AS at the end. From our understanding, DAA part was not even 100% completed from the SA conclusion.

**6 – vivo Mobile Communication Co.**

Fine with moderator proposal.

**7 – NTT DOCOMO INC.**

we are fine with moderator's proposal.

**8 – Kyocera Corporation**

We are fine with the rapporteur's suggestion to include a study phase first. We prefer Qualcomm's modification to Objective 3 with the inclusion of DAA.

**9 – ZTE Corporation**

We are fine with the moderator's proposal to let RAN2 conduct the study on how to deliver the message only.

**10 – Apple R&D**

We think this is a good approach to include a study phase though our view is likely there would be no RAN impact in the end.

**11 – TELECOM ITALIA S.p.A.**

Many thanks to the moderator for taking into account our concern. We are generally ok with the proposal, but:

- it should be clear that UEs are allowed to broadcast PC5 signals only if authorized. Therefore, RAN2 should specify a procedure to solve this issue

- We think that RAN4 should be involved for a coexistence analysis
- the addition of new bands should not treated as a routine activity in RAN4

**12 – LG Electronics UK**

We are fine with the moderator's proposal. On the addition of DAA, we are not sure if it can be done without defining a new SL frequency band because UAV may not be allowed to use ITS or unlicensed spectrum for this purpose. If the group reaches a consensus of no additional bands for sidelink, we think DAA can be removed in this release.

**13 – LG Electronics UK**

We are fine with the moderator's proposal. On the addition of DAA, we are not sure if it can be done without defining a new SL frequency band because UAV may not be allowed to use ITS or unlicensed spectrum for this purpose. If the group reaches a consensus of no additional bands for sidelink, we think DAA can be removed in this release.

**14 – Sony Europe B.V.**

We are ok with the modified proposal from Qualcomm

**15 – Beijing Xiaomi Mobile Software**

We support the modified objective from Qualcomm, including the evaluation of the DAA and BRID parts.

**16 – Ericsson LM**

We are OK with the objective proposed by the moderator, aside from the wording on unlicensed: Sidelink on unlicensed is pending ongoing discussions so we can wait with this to RAN#99. There is anyway enough things for the WGs to discuss in Q1.

DAA is something we also prefer to wait with. If, as the proponent suggest, there is no(/little?) additional work that needs to be done, it can easily be added later when it is clearer what the exact impact would be. Again, there is enough things for the WGs to discuss in Q1.

**17 – Nokia Corporation**

We support the Moderator's proposal. Qualcomm's proposal to include a note of not defining new frequency bands would also be beneficial addition. We also don't see that DAA needs to be included now especially considering limited TUs that are available for this work.

**18 – HUAWEI TECHNOLOGIES Co. Ltd.**

Hi all. How about this compromise wording: "Study and specify, if needed, enhancements to NR PC5 and LTE PC5 to support UAV identification broadcast [RAN2]. Check at RAN#99 for further elaboration of this objective,

based on RAN2 discussions and SA2 development.

Note: This objective is not intended to introduce new band(s) with support for the PC5 interface."

This wording should be a compromise, taking into account some of the comments above.

On DAA, on one side we could wait until we have more information from SA2 about formats etc. In this case the wording about should be fine for now.

On the other hand, it could be useful to discuss BR ID and DAA at the same time, if all are just data traffic for the AS layer, as it has been confirmed. In this other case we could change the word “identification” with ”information”, to cover both BR ID and DAA? No strong opinion ...

# 6 Final round

Following the feedback, it seems there is not possible to agree on adding Detect and Avoid (DAA) at this point in time, on that foresee possible discuss more in RAN#99.

So as no discussion yet took place in RAN2 and following comments to the earlier proposal, then proposed to stay with the ”study and specify” formulation. As the unlicensed sidelink operation technically does not exist yet and is being handled by other work item, here we should stay with the suggested note ”This objective is not intended to introduce new band(s) with support for the PC5 interface”, which should address the operator concern and on the other hand does not make any new conclusions on the possible unlicensed or any other new sidelink band. As pointed out one need to pay attention if new sidelink bands are added in the future (not from this WI) of their impact to possible co-existence, which is naturally work relevant for new band introduction if relevant for the UAV use of sidelink.

Thus the proposed objective 3 for the revised WID would be as:

Study and specify, if needed, enhancements to NR PC5 and LTE PC5 to support UAV identification broadcast [RAN2]. Check at RAN#99 for further elaboration of this objective,based on RAN2 discussions and SA2 development. Note: This objective is not intended to introduce new band(s) with support for the PC5 interface.

**Feedback Form 4: Can we agree the above text for objective 3, and continue discussions in RAN#99**

**1 – AT&T**

AT&T supports studying enhancements to NR PC5 and LTE PC5 for BRID in RAN2. We also support returning to the issue at RAN#99 to review the reply from RAN2 and possible additional input from SA2.

**2 – Intel Corporation (UK) Ltd**

We are ok with the moderator’s proposal.

**3 – LG Electronics UK**

We are fine with the moderator’s proposal.

**4 – vivo Mobile Communication Co.**

We are fine with the moderator's proposal.

**5 – Kyocera Corporation**

We are ok with the moderator's proposal.

**6 – ZTE Corporation**

We are fine with the moderator's proposal.

**7 – Samsung Electronics Co.**

We support the moderator's proposal.

**8 – TELECOM ITALIA S.p.A.**

We still have strong concerns with the possible interference caused by this solution. We require to ensure by the necessary specification work that UEs are allowed to broadcast PC5 signals only if authorized.

**9 – Ericsson LM**

We support.

**10 – OPPO**

Support

**11 – Nokia Corporation**

We support the moderator's proposal.

**12 – Beijing Xiaomi Mobile Software**

as written it seems any revisit of this objective will only relate to discussion of RAN2/SA2 discussion relating to UAV identification broadcast, but I believe it is also intended to consider DAA at that time, although RAN2 should not be discussing anything on this at their next meeting.

Study and specify, if needed, enhancements to NR PC5 and LTE PC5 to support UAV identification broadcast [RAN2]. Check at RAN#99 for further elaboration of this objective, based on RAN2 discussions and SA2 development for UAV identification broadcast or Detect And Avoid. Note: This objective is not intended to introduce new band(s) with support for the PC5 interface.

# 7 Final conclusions

The Revised WID in RP-223545 (revised still to indicate not being usable for operator licensed bands based on email comments) with this formulation for objective 3 as is proposed for approval:

- Study and specify, if needed, enhancements to NR PC5 and LTE PC5 to support UAV identification broadcast [RAN2]. Check at RAN#99 for further elaboration of this objective,based on RAN2

discussions and SA2 development. Note: This objective is not intended to introduce new band(s) with support for the PC5 interface.

There was raised if DAA (Detect and Avoid) can be also discussed, and naturally inputs on that can be raised in RAN#99 as well, now there was not sufficient support to add DAA explicitly for the objective 3. The work in this WI is not aiming either to introduce any non-authorised transmission on operator spectrum, thus this concern should be covered now as well.