**3GPP TSG RAN WG1 #110 R1-2207703**

**Toulouse, France, August 22nd – 26th, 2022**

**Agenda item:** 8.16.3

**Source:** Moderator (NTT DOCOMO, INC.)

**Title:** Summary on UE features for NR sidelink enhancement

**Document for:** Discussion and Decision

# **Introduction**

This document summarizes contributions submitted to AI 8.16.3 regarding UE features for NR sidelink enhancement and captures company views based on the announcement in the following email thread.

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| [110-R17-UE\_features\_1] To be used for sharing updates on online/offline schedule, details on what is to be discussed in online/offline sessions, tdoc number of the moderator summary for online session, etc – Hiroki (DOCOMO)   * eIIoT & URLLC, RedCap, UE power saving, coverage enhancement, NB-IoT & eMTC, sidelink, MBS, 5G terrestrial broadcast, UL TX switching, SDT |

Based on the latest RAN1 UE features list in [1] and contributions in AI 8.16.3, the issues to be discussed are tagged and colour coded with High priority or Low priority based on potential RAN2 spec impact (including description update in TS38.306).

# **Discussion**

## **2.1 32-2a: PSFCH RX**

In [1], FG 32-2a is captured as below.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 32. NR\_SL\_enh | 32-2a | Receiving NR sidelink of PSFCH | 1) UE can receive PSFCH with HARQ-ACK information in NR sidelink.  2) UE can receive up to N PSFCH(s) resources in a slot | 32-2b, [at least one of 15-2 or 15-3 or 32-4 or 32-4a] | Yes | No | The UE cannot receive PSFCH with HARQ-ACK information from other UEs | Per FS | N.A. | N.A. | N.A. | Note: configuration by NR Uu is not required to be supported in a band indicated with only the PC5 interface in 38.101-1 Table 5.2E.1-1  Candidate values for N are {5, 15, 25, 32, 35, 45, 50, 64}  If UE reports more than one FGs of 15-11, FG32-2a and 32-5b-2, the reported value N in each FG is the total number and the same among those FGs | Optional with capability signalling. |

Following views are provided in contributions for the RAN1#110 meeting.

|  |  |  |
| --- | --- | --- |
| [2] | Huawei, HiSilicon | Since PSFCH reception is always corresponding to PSCCH/PSSCH reception, thus the blue pre-requisites are necessary.  ***Proposal 1: Remove the brackets of the blue pre-requisites in 32-2a.*** |
| [3] | LG Electronics |  |
| [4] | ZTE,Sanechips |  |
| [5] | OPPO |  |
| [6] | FUTUREWEI | 32-2a: Companies have split views, with some not wanting additional pre-requisites and some wanting to list the FG related to PSFCH as in the [ ] above. An argument to omit the pre-requisites would be if there were a use case that would receive PSFCH but *not* support any of these pre-requisites, but there does not appear to be such a use case in Rel-17. We support for completeness the list in [ ] as it does no harm and could help avoid uncertainty over the existence of such use cases in this release. |
| [7] | CATT, GOHIGH | For FG32-2a, if a UE is capable PSFCH reception, the motivation of PSFCH reception is to monitoring the corresponding sidelink HARQ-ACK feedback of its PSSCH transmission or potential resource conflict of its PSSCH transmission. Therefore, it is preferred that the PSSCH transmission should be the prerequisite of FG32-2a.  ***Proposal 1: Agree the proposal 2-1b provided by feature lead in RAN1#109e meeting***   * ***The prerequisite FGs of FG 32-2a is confirmed as "32-2b, at least one of 15-2 or 15-3 or 32-4 or 32-4a"*** |
| [8] | vivo | Regarding the prerequisite of FG 32-2a (i.e., the first bullet), we don’t think it is necessary. The motivation seems to restrict the UE supporting PSFCH should also support mode-1 or mode-2 sidelink PSCCH/PSSCH transmission. However, firstly, there is no problem if no prerequisite is defined for FG 32-2a. Secondly, although the support of PSFCH is currently corresponding to PSCCH/PSSCH, it does not mean one of 15-2, 15-3, 32-4 or 32-4a would be the only condition. If in the later release there is a new FG corresponds to PSFCH reception, we cannot change the prerequisite, and have to introduce a new copy of 32-2a. Obviously, this is not future-proof.  *Proposal 1:* *The prerequisite of FG 32-2a is confirmed as 32-2b. Addition of 15-2/15-3 or 32-4/32-4a is not necessary.* |
| [9] | Qualcomm Incorporated | In the Release 17 sidelink UE feature discussions, RAN1 expended significant time discussion how to handle and undo the Release 16 sidelink UE feature prerequisites. To avoid such discussions in the future, we propose to not introduce additional prerequisites beyond what has already been agreed.  Proposal 1: No additional prerequisites are introduced beyond the already agreed ones. |
| [10] | Apple | The pre-requisite for the feature 32-2a is open. In the previous RAN1 meeting, there are some discussions whether one of 15-2, 15-3, 32-4 and 32-4a could be a pre-requisite of feature 32-2a. In our view, a UE needs to make PSCCH/PSSCH transmissions before it receives PSFCH with HARQ-ACK information. In this sense, we are fine to add at least one of features 15-2, 15-3, 32-4 and 32-4a as pre-requisite feature of feature 32-2a.  ***Proposal 1:*** *In feature 32-2a, pre-requisite feature includes at least one of features 15-2, 15-3, 32-4 and 32-4a.* |
| [11] | NTT DOCOMO, INC. | * **Prerequisite**   For PSFCH RX, capability on PSCCH/PSSCH TX is necessary. For PSCCH/PSSCH TX, FG15-2 (mode 1) / FG15-3 (full sensing) / FG32-4 (partial sensing) / FG32-4a (random selection) are the candidates. At least one of them should be prerequisite of this FG.  **Proposal 1:**   * *For prerequisite of FG32-2a, remove the brackets from ‘[at least one of 15-2 or 15-3 or 32-4 or 32-4a]’.* |
| [12] | Ericsson | In our view, the pre-requisite needed apart from the synchronization aspects – which are included in 32-2b – are the feature groups related to the reception of SL transmissions. Therefore, we propose to include the feature groups related to SL transmission. The rationale behind is that a UE should be able to perform SL transmission in order to receive HARQ-ACK information about its transmission. We propose to define the pre-requisite feature groups indicating that the UE shall at least support one of the feature groups related to SL transmission.  Proposal 1 FG 32-2-1 has the following components:   * Prerequisites: at least one of 15-2 or 15-3 or 32-4 or 32-4a. |

Input summary:

Alt 1: Remove the brackets of the pre-requisite (i.e., support ‘at least one of 15-2 or 15-3 or 32-4 or 32-4a’)

* HW, (FW), CATT, Apple, DCM, Ericsson, ZTE, Intel
  + PSFCH RX is always corresponding to PSCCH/PSSCH TX.

Alt 2: Remove the yellow-highlighted part (i.e., not support ‘at least one of 15-2 or 15-3 or 32-4 or 32-4a’)

* vivo, QC
  + No problem if the yellow-highlighted part is removed.
  + To avoid long discussion in future release when such pre-requisite does not make sense.

Based on above, following proposal should be discussed at the RAN1#110 meeting.

### **High priority proposal 2-1:**

* **For the prerequisite FGs for FG 32-2a,**
  + **~~Alt 1:~~ Remove the brackets of the pre-requisite (i.e., support ‘at least one of 15-2 or 15-3 or 32-4 or 32-4a’)**
  + **~~Alt 2: Remove the yellow-highlighted part (i.e., not support ‘at least one of 15-2 or 15-3 or 32-4 or 32-4a’)~~**

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| --- | --- |
| Company | Comment |
| ZTE,Sanechips | Alt 1. |
| Intel | Alt. 1 |
| Qualcomm | Alt 2.  Whether those prerequisites are included or removed does not impact the system; hence, there is no gain from adding them. On the other hand, they could cause issues in future releases as we have seen happen in Rel-17 discussions. |
| Moderator (NTT DOCOMO) | Based on the inputs, the situation is updated as below.  Alt 1: Remove the brackets of the pre-requisite (i.e., support ‘at least one of 15-2 or 15-3 or 32-4 or 32-4a’)   * HW, (FW), CATT, Apple, DCM, Ericsson, ZTE, Intel   Alt 2: Remove the yellow-highlighted part (i.e., not support ‘at least one of 15-2 or 15-3 or 32-4 or 32-4a’)   * vivo, QC   We can check if the updated proposal below is agreeable.   * **For the prerequisite FGs for FG 32-2a,**   + **~~Alt 1:~~ Remove the brackets of the pre-requisite (i.e., support ‘at least one of 15-2 or 15-3 or 32-4 or 32-4a’)**   + **~~Alt 2: Remove the yellow-highlighted part (i.e., not support ‘at least one of 15-2 or 15-3 or 32-4 or 32-4a’)~~** |
| Qualcomm | We do not support the proposal |
| CATT, GOHIGH | We support this proposal. |

## **2.2 32-2b/32-4b: S-SSB RX, Sync source**

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| 32. NR\_SL\_enh | 32-2b | Receiving NR sidelink of S-SSB | 1) UE can receive S-SSB in NR sidelink.  [2) UE supports SyncRef UE as the synchronization reference] | [32-4b] | No | No | The UE does not receive synchronization signalling from other UEs | Per band | N.A. | N.A. | N.A. | Note: configuration by NR Uu is not required to be supported in a band indicated with only the PC5 interface in 38.101-1 Table 5.2E.1-1 | Optional without capability signalling. |
| 32. NR\_SL\_enh | 32-4b | Synchronization sources for NR sidelink transmission | 1) UE supports GNSS as the synchronization reference according to the synchronization procedure with sl-SyncPriority set to GNSS and sl-NbAsSync set to false.  2) UE can transmit NR sidelink based on the synchronization to an gNB  3) UE additionally supports gNB and GNSS as the synchronization reference according to the synchronization procedure with sl-SyncPriority set to gnbEnb if the UE supports Components 1 and 2  4) UE additionally supports gNB and GNSS as the synchronization reference according to the synchronization procedure with sl-SyncPriority set to GNSS and sl-NbAsSync set to true if the UE supports Components 1 and 2.  5) UE can transmit S-SSB in NR sidelink if it supports 15-2 or 15-3 or 32-4 or 32-4a  6) UE supports SyncRef UE as the synchronization reference and can receive S-SSB in NR sidelink if it supports 15-1. |  | Yes | No |  | Per band | N.A. | N.A. | N.A. | Note: configuration by NR Uu is not required to be supported in a band indicated with only the PC5 interface in 38.101-1 Table 5.2E.1-1  Note: Component 1 is only required to be supported in a band indicated with only the PC5 interface in 38.101-1 Table 5.2E.1-1  Note: Components 2/3/4 are not required to be supported in a band indicated with only the PC5 interface in 38.101-1 Table 5.2E.1-1 | Optional with capability signalling. |

Following views are provided in contributions for the RAN1#110 meeting.

|  |  |  |
| --- | --- | --- |
| [2] | Huawei, HiSilicon | Note that a UE receiving S-SSB in NR sidelink does not mean that the SyncRef UE is always used as a synchronization reference but may synchronize to GNSS or gNB, therefore, there is not forced association to define that a UE receiving S-SSB must support SyncRefUE as the synchronization reference. In addition, the intention of S-SSB signal is used for the UEs that are out of coverage to synchronize with GNSS or gNB, for UEs within the coverage of GNSS or gNB, they will synchronize to GNSS or gNB first, therefore, it’s reasonable to support 32-4b as pre-requisites.  ***Proposal 2: On FG 32-2b：***   * ***Remove the blue components*** * ***Remove the brackets of blue pre-requisites.***   As for the component related to SyncRef UE in 32-4b, we think it should not be included in FG 32-4b since UE can report 15-2b for this purpose.  ***Proposal 5: Remove the component 6) related to SyncRef UE in FG 32-4b.*** |
| [3] | LG Electronics | There was a discussion on whether FG 32-4b (i.e., Synchronization sources for NR sidelink transmission) is defined as a prerequisite of FG 32-2b (i.e., Receiving NR sidelink of S-SSB). Since there is no strong motivation for this approach to be adopted, we think that it is clear that the 2nd component of “UE supports SyncRef UE as the synchronization reference” on FG 32-2b needs to be supported.  ***Proposal 1:***   * ***For FG 32-2b,***   + ***Support Component 2 of “UE supports SyncRef UE as the synchronization reference”***   We think that the features defined in Rel-17 should be available even when having another UE as the synchronization reference under the out-of-coverage and partial coverage scenarios. In other words, all WGs have never discussed the limitation of scenarios under which these features apply. So, the 6th component of “UE supports SyncRef UE as the synchronization reference and can receive S-SSB in NR sidelink if it supports 15-1” on FG 32-4b needs to be supported.  ***Proposal 2:***   * ***For FG 32-4b,***   + ***Support Component 6 of “UE supports SyncRef UE as the synchronization reference and can receive S-SSB in NR sidelink if it supports 15-1”*** |
| [4] | ZTE,Sanechips |  |
| [5] | OPPO |  |
| [6] | FUTUREWEI | 32-2b: At the moment we do not see a compelling reason to agree to introduce component 2 in this FG but are open for more discussion. The decision on component 2 and the pre-requisite can be made together. |
| [7] | CATT, GOHIGH | For FG32-2b, if a UE support receiving S-SSB in NR sidelink, it should support to performing synchronization procedure according to the priority level of the SyncRef UE. Therefore, it is preferred that FG32-4b should be the pre-requisite of FG32-2b. Another aspect on FG32-2b is that the component 2) is duplicated with component 6) in 32-4b, it is preferred to capture it in 32-4b, since 32-4b is a general FG for synchronization.  ***Proposal 1: Agree the proposal 2-1b provided by feature lead in RAN1#109e meeting***   * ***The prerequisite FGs of FG 32-2b is confirmed as "32-4b"*** * ***Delete component 2 in FG 32-2b***   The component 6 of FG32-4b is correlated with FG32-2b(S-SSB reception only), which need to be updated according FG32-2a.  ***Proposal 3: The component 6 of FG32-4b is updated as follows.***   * ***Component 6: UE supports SyncRef UE as the synchronization reference and can receive S-SSB in NR sidelink if it supports 15-1 or 32-2b*** |
| [8] | vivo | For the second and third bullets, the motivation seems to require the UE supporting FG 32-2b should also support use gNB/eNB/GNSS as synchronization source. Firstly, FG 32-2b is designed for using UE as synchronization source over sidelink interface, which can be separate from the other synchronization sources over other interfaces. Secondly, it is worth noting that in FG 32-4b it states “*5) UE can transmit S-SSB in NR sidelink if it supports 15-2 or 15-3 or 32-4 or 32-4a*”. Then if a UE supports both 32-4a (random selection) and 32-2b (which according to these two bullets should support 32-4b), **it is mandated to support transmitting S-SSB**. In other words, these two bullets preclude the Type-B UE that supporting only PSCCH/PSSCH transmission but not S-SSB transmission.  *Proposal 2:* *FG 32-4b is not defined as prerequisite of FG 32-2b, and component 2 of FG 32-2b is kept.*  Moreover, in this case the highlighted component 6 of 32-4b (i.e., *UE supports SyncRef UE as the synchronization reference and can receive S-SSB in NR sidelink if it supports 15-1*) becomes unnecessary. Thus, it can be simply removed.  *Proposal 3:* *Component 6 of 32-4b is removed.* |
| [9] | Qualcomm Incorporated | In the Release 17 sidelink UE feature discussions, RAN1 expended significant time discussion how to handle and undo the Release 16 sidelink UE feature prerequisites. To avoid such discussions in the future, we propose to not introduce additional prerequisites beyond what has already been agreed.  Proposal 1: No additional prerequisites are introduced beyond the already agreed ones.  RAN1 agreed to introduce a featuregroup for synchronization sources with the following component highlighted in yellow for further discussion:  [6) UE supports SyncRef UE as the synchronization reference and can receive S-SSB in NR sidelink if it supports 15-1.]  The ability to use a SyncRef UE as a synchronization reference is important to ensure communications when a UE is out of gNB coverage and GNSS reception is unavailable or unreliable. Hence, we propose to keep Component 6 in FG 32-4b and remove the brackets around it.  Proposal 3: FG 32-4b includes Component 6 “UE supports SyncRef UE as the synchronization reference and can receive S-SSB in NR sidelink if it supports 15-1” |
| [10] | Apple | In previous RAN1 meeting, there is a discussion whether feature 32-4b is a pre-requisite of feature 32-2b. If so, the component of “UE supports SyncRef UE as the synchronization reference” is removed. In our view, if feature 32-4b serves a pre-requisite feature of feature 32-2b, then UE needs to have the capability of transmitting NR sidelink, which is the second component of feature 32-4b. This bundling of S-SSB reception and NR sidelink transmission is unnecessary. Hence, we prefer to keep the component of “UE supports SyncRef UE as the synchronization reference” and does not add feature 32-4b as the pre-requisite feature as feature 32-2b.  ***Proposal 2:*** *In feature 32-2b, keep the component of “UE supports SyncRef UE as the synchronization reference” and has no pre-requisite feature.* |
| [11] | NTT DOCOMO, INC. | * **Component/Prerequisite**   It seems that FG32-2b and FG32-4b are highly related each other. These capabilities are discussed together here.  Firstly, we would like to clarify the motivation of these FGs. In Rel-16, there is a synchronization capability FG15-4, where UE shall be capable of S-SSB RX if the UE supports PSCCH/PSSCH RX. Meanwhile, Rel-17 SL intends to support a UE that is capable of S-SSB RX but incapable of PSCCH/PSSCH RX. These FGs are introduced for this purpose.  If this understanding is correct, it is quite unclear why the component 6 of FG32-4b is necessary. Difference between FG15-4 and FG32-4b with the component 6 should be clarified sufficiently; otherwise, we will keep our position, i.e., the component 6 of FG32-4b should be removed. For FG32-2b, if the component 6 of FG32-4b is removed as stated above, at least the component 2 of FG32-2b would be necessary since there is no component relevant to SyncRef UE in FG32-4b. In addition, the current prerequisite in FG32-2b should be maintained. Basically UE supporting SyncRef UE as the sync reference will support also GNSS/gNB as the sync reference. UE supporting SyncRef UE only would be infeasible in consideration of typical SL scenario, where other UEs try to use preferentially GNSS/gNB as the sync source.  **Proposal 2:**   * *The component 6 of FG32-4b is removed.* * *FG32-2b is updated as follows:*   + *Remove the brackets from ‘[2) UE supports SyncRef UE as the synchronization reference]’.*   + *Remove the brackets from ‘[32-4b]’.* |
| [12] | Ericsson | The FG 32-2b feature group is related to the reception fo S-SSB. On this regard, the pre-requisite group is only the one related to the synchronization sources for NR SL transmission. Moreover, since the UE can receive S-SSB it shall also support SyncRef as synchronization reference.  Proposal 2 FG 32-2-2 has the following components:   * Components: 2) UE supports SyncRef UE as the synchronization reference] * Prerequisites: FG 32-4b   For the FG 32-4b, there is only one open issue regarding whether to include the support of the SyncRefUE as a synchronization reference. In our view, if the UE supports the FG 15-1 as defined in Rel-16, it should also be able to support the SyncRefUE as a synchronization source. However, based on the current wording is not clear whether the UE will support both operations, i.e., supports SyncRef UE as the synchronization reference and can receive S-SSB in NR sidelink, therefore, we propose to change the wording to clarify the operation.  Proposal 5 For the FG 32-4b, include the following component:   * 6) If the UE supports 15-1, it supports SyncRef UE as the synchronization reference and can receive S-SSB in NR sidelink. |

Input summary:

For 32-2b

* Component 2 of FG 32-2b is
  + Kept: LGE, vivo, apple, DCM, Ericsson, Intel, QC
  + Removed: HW, (FW), CATT, ZTE/Sanechips
* FG 32-4b as pre-requisite of FG 32-2b is
  + Kept: HW, CATT, DCM, Ericsson, ZTE/Sanechips, Intel
  + Removed: vivo, QC, Apple

32-4b

* Component 6 of FG 32-4b is
  + Kept: LGE, QC, CATT (w/ update), Ericsson (w/ update), ZTE/Sanechips, Intel
  + Removed: HW, vivo, DCM

It seems that the proposals come from views on what UE type should be supported. They can be summarized as follows:

* **Point A: For SyncRef UE: UE that is capable of S-SSB RX**
  + Alt 1: shall support (i.e., component 2 of FG 32-2b is kept)
    - LGE, DCM, Ericsson
  + Alt 2: may/may not support (i.e., component 2 of FG 32-2b is removed)
    - HW, (CATT?)
* **Point B: For GNSS/gNB as sync source: UE that is capable of S-SSB RX**
  + Alt 1: shall support (pre-requisite is dependent on point C)
    - HW, CATT, DCM, Ericsson
  + Alt 2: may/may not support (i.e., FG 32-4b is not pre-requisite of FG 32-2b)
    - LGE, vivo
* **Point C: For S-SSB TX: UE that is capable of PSCCH/PSSCH TX**
  + Alt 1 shall support (pre-requisite is dependent on point B)
  + Alt 2: may/may not support (i.e., FG 32-4b is not pre-requisite of FG 32-2b)
    - Vivo, Apple
* **Point D: For S-SSB RX/SyncRef UE as sync source: UE that is capable of PSCCH/PSSCH TX**
  + Alt 1: shall support (i.e., component 6 of FG 32-4b is kept)
    - LGE, QC, CATT (w/ update), Ericsson (w/ update)
  + Alt 2: may/may not support (i.e., component 6 of FG 32-4b is removed)
    - HW, vivo, DCM

Based on above, following proposal should be discussed at the RAN1#110 meeting.

### **High priority proposal 2-2-1:**

* **For component 2 of FG 32-2b**
  + **~~Alt 1:~~ Remove the brackets of the component 2 (i.e., support the component 2)**
  + **~~Alt 2: Remove the component 2 (i.e., not support the component 2)~~**

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| Company | Comment |
| Moderator (NTT DOCOMO) | This is based on the discussion on whether UE that is capable of S-SSB RX shall support SyncRef UE as sync source or not;   * If YES, component 2 of FG 32-2b is kept * If NO, component 2 of FG 32-2b is removed |
| ZTE,Sanechips | Alt 2, the syncrhonizattion capability are already there in 32-4b/32-4c, no need to duplicate |
| Intel | We are fine to support component 2 (Alt.1) |
| Qualcomm | We support keeping Component 2, otherwise the capability is only about receiving S-SSB without stating whether it is used or not. Huawei brought up the point as to whether SyncRef UE excludes UEs transmitted S-SSB are synchronized to gNB/GNSS. In our view, it should not and would be open to updating the wording to clarify that point if necessary:  2) UE supports ~~SyncRef UE as the synchronization reference~~ synchronization to a reference UE. |
| Moderator (NTT DOCOMO) | Based on the feedbacks, the situation is updated as below.   * Component 2 of FG 32-2b is   + Kept: LGE, vivo, apple, DCM, Ericsson, Intel, QC   + Removed: HW, (FW), CATT, ZTE/Sanechips   We can check if the updated proposal below is agreeable.   * **For component 2 of FG 32-2b**   + **~~Alt 1:~~ Remove the brackets of the component 2 (i.e., support the component 2)**   + **~~Alt 2: Remove the component 2 (i.e., not support the component 2)~~** |
| Qualcomm | We support the proposal |
| CATT, GOHIGH | The answer for FL’s first round question is Yes, but the component 2 in 32-2b is somehow duplicated with component 6 in 32-4b. From our understanding, it would be better to include it into 32-4b which is generic sync related FG. |

### **High priority proposal 2-2-2:**

* **For the prerequisite FGs for FG 32-2b,**
  + **~~Alt 1:~~ Remove the brackets of the pre-requisite (i.e., support ’32-4b’)**
  + **~~Alt 2: Remove the yellow-highlighted part (i.e., not support ’32-4b’)~~**

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| Company | Comment |
| Moderator (NTT DOCOMO) | This is based on the discussion on Q1: whether UE that is capable of S-SSB RX shall support GNSS/gNB as sync source or not, and Q2: whether UE that is capable of PSCCH/PSSCH TX shall support S-SSB TX or not;   * If answers for both Q1 and Q2 is YES, FG 32-4b is pre-requisite of FG 32-2b. * If answers for both Q1 and Q2 is NO, FG 32-4b is not pre-requisite of FG 32-2b. * If answer for either is YES and for the other is NO, discuss how the approach is achieved. |
| ZTE, Sanechips | Alt 1. The sync prerequisite for a reduced capability UE should be 32-4b. |
| Intel | Alt.1 |
| Qualcomm | Alt 2.  The intention of Alt 1 is to require GNSS and/or gNB sync. This, however, can already be achieved using the sl-SyncAllowed resource pool parameter that only allows transmission on a resource pool if the UE supports and uses the listed synchronize references. |
| Moderator (NTT DOCOMO) | Based on the feedbacks, the situation is updated as below.   * FG 32-4b as pre-requisite of FG 32-2b is   + Kept: HW, CATT, DCM, Ericsson, ZTE/Sanechips, Intel   + Removed: vivo, QC, Apple   We can check if the updated proposal below is agreeable.   * **For the prerequisite FGs for FG 32-2b,**   + **~~Alt 1:~~ Remove the brackets of the pre-requisite (i.e., support ’32-4b’)**   + **~~Alt 2: Remove the yellow-highlighted part (i.e., not support ’32-4b’)~~** |
| Qualcomm | We do not support the proposal |
| CATT,GOHIGH | The answer for FL’s first round questions are as follows.  For Q1, it a UE is capable of S-SSB Rx, it should support the sync reference source determining procedure according to the sync priority level(GNSS/gNB is the highest priority sync source). Therefore, the answer is Yes.  For Q2, from our understanding, this answer is not necessary. but we think it would be better to support S-SSB Tx when a UE is capable of PSCCH/PSSCH Tx.  Therefore, we support this proposal. |

### **High priority proposal 2-2-3:**

* **For component 6 of FG 32-4b**
  + **~~Alt 1:~~ Remove the brackets of the component 6 (i.e., support the component 6)**
  + **~~Alt 2: Remove the component 6 (i.e., not support the component 6)~~**

|  |  |
| --- | --- |
| Company | Comment |
| Moderator (NTT DOCOMO) | This is based on the discussion on whether UE that is capable of PSCCH/PSSCH TX shall support S-SSB RX and SyncRef UE as sync source or not;   * If YES, component 6 of FG 32-4b is kept * If NO, component 6 of FG 32-4b is removed |
| ZTE,Sanechips | Alt 1. A complete sync. FG is desired |
| Intel | Alt.1 |
| Qualcomm | Alt 1  It is important to ensure that synchronization and communications can continue when GNSS/network coverage is not available. Component 6 provides this assurance while still allowing for UEs that do not support any SL reception. We also open to updating the wording to clarify that it includes synchronization to UEs directly or indirectly synchronized to GNSS/gNB  UE supports ~~SyncRef UE as the synchronization reference~~ synchronization to a reference UE and can receive S-SSB in NR sidelink if it supports 15-1 |
| Moderator (NTT DOCOMO) | Based on the feedbacks, the situation is updated as below.   * Component 6 of FG 32-4b is   + Kept: LGE, QC, CATT (w/ update), Ericsson (w/ update), ZTE/Sanechips, Intel   + Removed: HW, vivo, DCM   We can check if the updated proposal below is agreeable.   * **For component 6 of FG 32-4b**   + **~~Alt 1:~~ Remove the brackets of the component 6 (i.e., support the component 6)**   + **~~Alt 2: Remove the component 6 (i.e., not support the component 6)~~** |
| Qualcomm | We support the proposal |
| CATT, GOHIGH | We support this proposal in principle. But additionally, when a UE is not capable 15-1, but capable of 32-2b, it can also support component 6.  Therefore, the component 6 is updated as following.  ***UE supports SyncRef UE as the synchronization reference and can receive S-SSB in NR sidelink if it supports 15-1 or 32-2b*** |

## **2.3 32-4/32-4a: Partial sensing, random selection**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 32. NR\_SL\_enh | 32-4 | Transmitting NR sidelink mode 2 with partial sensing | 1) UE can transmit PSCCH/PSSCH using NR sidelink mode 2 with partial sensing configured by NR Uu or preconfiguration. Up to B sidelink processes are supported.  2) UE can transmit PSSCH according to the normal 64QAM MCS table.  3) UE supports PT-RS transmission in FR2.  4) UE can perform periodic-based partial sensing and resource allocation operation.  5) UE can perform contiguous partial sensing and resource allocation operation.  6) UE can transmit using the subcarrier spacing and CP length defined for a given band in RAN4  8) Supports 14-symbol SL slot with all DMRS patterns corresponding to {#PSSCH symbols} = {12, 9} for slots w/wo PSFCH. If UE signals support of ECP, support 12-symbol SL slot with all DMRS patterns corresponding to {#PSSCH symbols} = {10,7} for slots w/wo PSFCH.  10) UE can transmit using 30 kHz and normal CP subcarrier spacing in FR1, 120 kHz subcarrier spacing with normal CP FR2  11) DL pathloss based open loop power control when mode 2 is configured by NR Uu | [TBD] | Yes | No | UE does not support transmission according to the partial sensing and resource allocation | Per FS | N.A. | N.A. | N.A. | Note: Random selection in the exceptional pool is supported.  Note: configuration by NR Uu is not required to be supported in a band indicated with only the PC5 interface in 38.101-1 Table 5.2E.1-1  Candidate values for B are {8,16}  If UE reports more than one FGs of 15-3, 32-4 and 32-4a, the reported value B in each FG is the total number of SL processes and the same among those FGs.  Note: Component 6 is not required to be signalled in a band indicated with only the PC5 interface in 38.101-1 Table 5.2E.1-1  Component-6 candidate value set in FR1:  {{15 kHz}, {30 kHz}, {60 kHz}, {15, 30 kHz}, {30, 60 kHz}, {15, 60 kHz}, {15, 30, 60 kHz}}  Component-6 candidate value set in FR2:  {{60 kHz}, {120 kHz}, {60, 120 kHz}}  Component-6 candidate value set for CP length: {NCP,NCP and ECP}  (ECP only applies to SCS of 60 kHz)  Note: Component 10 is only required in a band indicated with only the PC5 interface in 38.101-1 Table 5.2E.1-1  Note: Component 11 is not required to be supported in a band indicated with only the PC5 interface in 38.101-1 Table 5.2E.1-1 | Optional with capability signalling. |
| 32. NR\_SL\_enh | 32-4a | Transmitting NR sidelink mode 2 with random resource selection | 1) UE can transmit PSCCH/PSSCH using NR sidelink mode 2 with random resource selection configured by NR Uu or preconfiguration. Up to B sidelink processes are supported.  2) UE can transmit PSSCH according to the normal 64QAM MCS table.  3) UE supports PT-RS transmission in FR2.  4) UE can transmit using the subcarrier spacing and CP length defined for a given band in RAN4  5) Supports 14-symbol SL slot with all DMRS patterns corresponding to {#PSSCH symbols} = {12, 9} for slots w/wo PSFCH. If UE signals support of ECP, support 12-symbol SL slot with all DMRS patterns corresponding to {#PSSCH symbols} = {10,7} for slots w/wo PSFCH.  6) UE can transmit using 30 kHz and normal CP subcarrier spacing in FR1, 120 kHz subcarrier spacing with normal CP FR2  7) DL pathloss based open loop power control when mode 2 is configured by NR Uu | [TBD] | Yes | No | UE does not support transmission according to the random resource selection and resource allocation | Per band | N.A. | N.A. | N.A. | Note: Random selection in the exceptional pool is supported.  Note: configuration by NR Uu is not required to be supported in a band indicated with only the PC5 interface in 38.101-1 Table 5.2E.1-1  Candidate values for B are {8,16}  If UE reports more than one FGs of 15-3, 32-4 and 32-4a, the reported value B in each FG is the total number of SL processes and the same among those FGs.  Note: Component 4 is not required to be signalled in a band indicated with only the PC5 interface in 38.101-1 Table 5.2E.1-1  Component-4 candidate value set in FR1:  {{15 kHz}, {30 kHz}, {60 kHz}, {15, 30 kHz}, {30, 60 kHz}, {15, 60 kHz}, {15, 30, 60 kHz}}  Component-4 candidate value set in FR2:  {{60 kHz}, {120 kHz}, {60, 120 kHz}}  Component-4 candidate value set for CP length: {NCP,NCP and ECP}  (ECP only applies to SCS of 60 kHz)  Note: Component 6 is only required in a band indicated with only the PC5 interface in 38.101-1 Table 5.2E.1-1  Note: Component 7 is not required to be supported in a band indicated with only the PC5 interface in 38.101-1 Table 5.2E.1-1 | Optional with capability signalling. |

Following views are provided in contributions for the RAN1#110 meeting.

|  |  |  |
| --- | --- | --- |
| [2] | Huawei, HiSilicon | For FG 32-4 Transmitting NR sidelink mode 2 with partial sensing, there is no difference from receiving aspect compared with mode 2 full sensing scheme. It also need to receive and decode SCIs to perform resource exclusion. It is a UE with SL reception, and we notice that the FGs 15-1, 15-4, 15-5, 15-11 and 15-23 are basic FGs in Rel-16. This principle can be applicable in all Rel-17 UE with SL reception including UE supports inter-UE coordination. Besides, FG 15-14 was defined as mandatory with capability signalling for UEs supporting NR sidelink, in order to ensure the performance of NR sidleink, it can also be pre-requisite of Rel-17 UE with sidelink reception.  ***Proposal 3: A Rel-17 UE with NR SL reception needs to indicate FG 15-1, 15-4, 15-5, 15-11, 15-14, 15-23. This can be captured by pre-requisite listing in Rel-17, or by a separate agreement in TR 38.822.***  Since FG 32-4a can imply the case of UE without NR SL reception, we cannot directly reuse existing FG 15-4. FG 32-4b is defined in RAN1#108-e to meet synchronization requirements for UEs without SL reception, which includes sync source of GNSS and gNB.  ***Proposal 4: At least one of 15-4 and 32-4b is defined as the prerequisite feature group for 32-4a.*** |
| [3] | LG Electronics |  |
| [4] | ZTE,Sanechips | For 32-4 transmitting NR sidelink mode 2 with partial sensing, given the necessary components for mode 2 Tx have already been captured, the prerequisites should include the basic components related to the functionality of NR sidelink such as 15-1 receiving NR sidelink and 15-4 Synchronization for NR sidelink. It was suggested during the discussion using the synchronization for Rel-17 32-4b or 32-4c and reception capability 32-2b, however these capabilities as reduced capabilities excluding some components e.g. the transmission of S-SSB is inappropriate being used as prerequisites to mode 2 partial sensing if we consider the partial sensing 32-4 has all the components of FG 15-3 mode 2 transmission. What serves more appropriately as prerequisites, should be the prerequisites and basic FGs related to the fundamental functionality of mode 2 transmission.  Proposal 1: The prerequisites to 32-4, 32-5a are captured respectively as below   * The prerequisites to 32-4 are 15-1 and 15-4 |
| [5] | OPPO |  |
| [6] | FUTUREWEI | 32-4: A Rel-17 partial sensing UE should not be less functional than a Rel-16 full sensing UE other than in the details of the sensing operation. In fact, in a system with a mix of Rel-16 full sensing UEs and Rel-17 partial sensing UEs, it would be perhaps unfair if the Rel-17 UEs did not support 15-5 (congestion control), and a bit strange if they did not also support 15-1, 15-11 (PSFCH format 0, components may need to be discussed), and 15-23 (open loop SL power control and RSRP report). Regarding synchronization, in RAN1#108-e we made the following agreement.  **Agreement**   * For the synchronization sources for NR sidelink transmission for FGs 32-4/4a,   + Add a new FG 32-4b for synchronization sources for NR sidelink transmission as follows   This agreement implies that 32-4b has been agreed as a pre-requisite for FGs 32-4/4a. However, for a partial sensing UE it also makes sense that the UE can *alternatively* indicate support for 15-4. Finally, our preference is that Rel-17 RRS 32-4b forms a sort of minimum expected capability for Rel-17, so 32-4b can also be a pre-requisite of 32-4.  **Proposal 1: The pre-requisites for 32-4 partial sensing at least include 15-1 / 15-5 / (15-4 or 32-4b). Discuss further whether or not to also include 15-11 / 15-23 / 32-4a.**  32-4a: RRS could be handled similarly as partial sensing. However, we also have the conclusion from RAN1#106bis-e to support “Type A” UEs:  **Conclusion**   * UE without NR SL reception is supported in Rel-17   Assuming the group continues to desire to support type A UEs, the UE that makes the most sense not to have SL reception is a simple RRS UE that does not perform sensing.  **Proposal 2: 32-4a RRS does not have any pre-requisites.** |
| [7] | CATT, GOHIGH | One remaining issue on FG32-4 and FG32-4a is the prerequisite of both FGs. From our understanding, for any NR sidelink transmission, it need to obtain sidelink reference timing at first, otherwise, the NR sidelink transmission can not perform. Therefore, at least one of 15-4 and 32-4b should be the pre-requisite of FG32-4/FG32-4a.  ***Proposal 2: For FG32-4/FG32-4a, in order to obtain sidelink reference timing for NR sidelink transmission, at least one of 15-4 and 32-4b should be the pre-requisite of FG32-4/FG32-4a.*** |
| [8] | vivo | In our view no additional prerequisite is needed to be defined, especially for FG 32-4a, which is mainly designed for Type-A UE that does not support any sidelink reception. It is not necessary to mandate the UE to indicate the synchronization source related FGs (i.e., 32-2b, 32-4b, 32-4c, etc.). Anyway, the existing specification does not forbid the UE from indicating the corresponding FGs if it supports gNB/eNB or GNSS as synchronization source.  Similarly, we don’t think additional prerequisite are needed for FG 32-4, i.e., partial sensing. As a compromise we can accept having one of {32-2b, 32-4b, 32-4c} as prerequisite for FG 32-4.  *Proposal 4:* *No* *additional prerequisite is defined for FG 32-4a.*  *Proposal 5:* *No* *additional prerequisite is needed for FG 32-4, while as a compromise, one of {32-2b, 32-4b, 32-4c} can be considered.* |
| [9] | Qualcomm Incorporated | In the Release 17 sidelink UE feature discussions, RAN1 expended significant time discussion how to handle and undo the Release 16 sidelink UE feature prerequisites. To avoid such discussions in the future, we propose to not introduce additional prerequisites beyond what has already been agreed.  Proposal 1: No additional prerequisites are introduced beyond the already agreed ones. |
| [10] | Apple | The pre-requisite for the features 32-4 and 32-4a is open. As discussed in previous RAN1 meetings, the sidelink synchronization is necessary for NR sidelink transmission with reduced sensing. Here, the feature 32-4b or 32-4c or 32-2b could serve as pre-requisite.  ***Proposal 3:*** *In both feature 32-4 and feature 32-4a, pre-requisite feature is at least one of 32-4b, 32-4c and 32-2b.* |
| [11] | NTT DOCOMO, INC. | * **Pre-requisite**   Required feature for transmission with partial sensing is only synchronization perspective. For synchronization, FG15-4 (full capability) / FG32-4b (partial capability) are the candidates. At least one of them should be prerequisite of this FG.  **Proposal 3:**   * *‘At least one of FG 15-4 or FG 32-4b’ is added as pre-requisite of FG 32-4 and FG32-4a.* |
| [12] | Ericsson | There is one remaining issues for the FG 32-4 which is related to the pre-requisite feature groups. In our view, a UE that performs partial sensing, i.e., both periodic and contiguous partial sensing, needs to be able to synchronize with the rest of UEs and/or the network/GNSS system. Therefore, we propose to include as pre-requisite the FG which are related to the acquisition of synchronization signalling from UEs and from the network, i.e., FG 32-4b, 32-4c and 32-2b.   1. A UE performing partial sensing in mode 2 is required to be able to synchronize to other UEs and/or the network/GNSS.   Another issue with the pre-requisite feature groups is that a UE performing partial sensing operation shall be able to perform random resource allocation procedures as it is one of the potential options to be used when performing partial sensing operation as given by the following RAN1 agreement:   |  | | --- | | **Agreement**  When UE performs at least contiguous partial sensing in a mode 2 Tx pool for a resource (re)selection procedure triggered by aperiodic transmission (*P*rsvp\_TX*=0*) in slot *n*,   * The UE selects a set of *Y’* candidate slots with corresponding PBPS and/or CPS results (if available) within the RSW.   + If the total number of *Y’* candidate slots is less than a (pre-)configured threshold *Y’min*,     - How UE includes other candidate slots is up to UE implementation * Candidate resource set (*SA*) is initialized to the set of all single-slot candidate resources in the selected *Y’* candidate slots. * For the CPS monitoring window [*n*+*T*A, *n*+*T*B]:   + *TA* and *TB* are both selected such that UE has sensing results starting at *M* consecutive logical slots before *ty0* and ending at *Tproc,0* + *Tproc,1* slots earlier than *ty0*.     - FFS: By default, *M* is 31 unless (pre-)configured with another value, where *M* is (pre-)configured based on transmission priority     - FFS: The range of (pre-)configured *M* from a TBD lowest value up to 30     - When the minimum *M* slots for CPS cannot be guaranteed, support both       * Option A, the UE ensures the *Y’min* criterion is fulfilled       * Option B: UE performs random resource selection       * When the UE performs Option A or Option B is up to UE implementation |   Therefore, as a pre-requisite group the UE shall support the feature group related to random resource selection, i.e., 32-4a.  Proposal 3 For the FG 32-4, the remaining unstable fields are completed as follows:   * Pre-requisite FGs: 32-4a and at least one from 32-4b, 32-4c and 32-2b.   Using a similar reasoning as for the feature group related to partial sensing operation. In our view, a UE that performs random resource selection needs to be able to synchronize with the rest of UEs and/or the network/GNSS system. Therefore, we propose to include as pre-requisite the FG which are related to the acquisition of synchronization signalling from UEs and from the network, i.e., FG 32-4b, 32-4c and 32-2b.   1. A UE performing random resource selection in mode 2 is required to be able to synchronize to other UEs and/or the network/GNSS.   Moreover, a UE performing random resource selection will benefit from receiving PSFCH information, i.e., in order to perform retransmission of a previous transmission. The UE does not need to perform sensing upon receiving the HARQ-ACK information and it will trigger a random resource selection for a retransmission. Therefore, we propose the following pre-requisite feature group for the FG 32-4a:  Proposal 4 For the FG 32-4a, the remaining unstable fields are completed as follows:   * Pre-requisite FGs: 32-2a and one of 32-4b, 32-4c and 32-2b. |

Input summary:

For FG 32-4

* Alt 1: Add one or more FGs as prerequisite
  + Alt 1-1: based on Rel-16 basic FGs
    - HW: 15-1, 15-4, 15-5, 15-11, 15-14, 15-23
    - ZTE: 15-1, 15-4
    - FW: at least 15-1 / 15-5 / (15-4 or 32-4b) [/ 15-11 / 15-23 / 32-4a]
  + Alt 1-2: based on sync-related FGs only
    - CATT, DCM: at least one of 15-4 and 32-4b
    - Vivo (as compromise), Apple: one of {32-2b, 32-4b, 32-4c}
    - Ericsson: 32-4a and one of {32-2b, 32-4b, 32-4c}
* Alt 2: Not add any FG as prerequisite
  + Vivo, QC
    - No problem if there is no prerequisite.
    - To avoid long discussion in future release when such pre-requisite does not make sense.

For FG32-4a

* Alt 1: Add one or more FGs as prerequisite
  + HW, CATT, DCM: At least one of 15-4 and 32-4b
  + Apple: one of {32-2b, 32-4b, 32-4c}
  + Ericsson: 32-2a and one of {32-2b, 32-4b, 32-4c}
* Alt 2: Not add any FG as prerequisite
  + FW, vivo, QC
    - No problem if there is no prerequisite.
    - To avoid long discussion in future release when such pre-requisite does not make sense.
    - To support type A UE

Based on above, following proposal should be discussed at the RAN1#110 meeting.

### **High priority proposal 2-3-1:**

* **For the prerequisite FGs for FG 32-4,**
  + **~~Alt 1:~~ Add one or more FGs as prerequisite**
    - **Alt 1-1: one or more Rel-16 basic FGs (e.g., 15-1/15-4/15-5/…)**
    - **Alt 1-2: one or more sync-related FGs (e.g., 15-4/32-4b/32-2b/…)**
  + **~~Alt 2: Not add any FG as prerequisite~~**

|  |  |
| --- | --- |
| Company | Comment |
| ZTE,Sanechips | Prefer to follow Alt 1 given partial sensing capability is in essence the same as Rel 16 full sensing. It’s more appropriate to follow the Rel16 FGs. |
| Intel | Alt.1 |
| Qualcomm | Alt 2.  The listed prerequisites do not impact the system but could cause issues and reopen discussions in future releases. |
| Moderator (NTT DOCOMO) | Based on the feedbacks, the situation is updated as below.   * Alt 1: Add one or more FGs as prerequisite   + Alt 1-1: based on Rel-16 basic FGs     - HW: 15-1, 15-4, 15-5, 15-11, 15-14, 15-23     - ZTE: 15-1, 15-4     - FW: at least 15-1 / 15-5 / (15-4 or 32-4b) [/ 15-11 / 15-23 / 32-4a]   + Alt 1-2: based on sync-related FGs only     - CATT, DCM: at least one of 15-4 and 32-4b     - Vivo (as compromise), Apple: one of {32-2b, 32-4b, 32-4c}     - Ericsson: 32-4a and one of {32-2b, 32-4b, 32-4c}   + Intel * Alt 2: Not add any FG as prerequisite   + Vivo, QC   We can discuss the following updated proposal.   * **For the prerequisite FGs for FG 32-4,**   + **~~Alt 1:~~ Add one or more FGs as prerequisite**     - **Alt 1-1: one or more Rel-16 basic FGs (e.g., 15-1/15-4/15-5/…)**     - **Alt 1-2: one or more sync-related FGs (e.g., 15-4/32-4b/32-2b/…)**   + **~~Alt 2: Not add any FG as prerequisite~~** |
| Qualcomm | We do not support the proposal |
| CATT, GOHIGH | We support this proposal, and prefer alt 1-2. |

### **High priority proposal 2-3-2:**

* **For the prerequisite FGs for FG 32-4a,**
  + **~~Alt 1:~~ Add one or more sync-related FGs as prerequisite (e.g., 15-4/32-4b/32-2b/…)**
  + **~~Alt 2: Not add any FG as prerequisite~~**

|  |  |
| --- | --- |
| Company | Comment |
| ZTE,Sanechips | Sync capability had better be supported, i.e. at least one of {**15-4/32-4b/32-4c**} |
| Qualcomm | Alt 2  The listed prerequisites do not impact the system but could cause issues and reopen discussions in future releases. The resource pool parameter sl-SyncAllowed already enables the introduction of access |
| Moderator (NTT DOCOMO) | Based on the feedbacks, the situation is updated as below.   * Alt 1: Add one or more FGs as prerequisite   + HW, CATT, DCM: At least one of 15-4 and 32-4b   + Apple: one of {32-2b, 32-4b, 32-4c}   + Ericsson: 32-2a and one of {32-2b, 32-4b, 32-4c}   + ZTE/Sanechips: at least one of {15-4, 32-4b, 32-4c} * Alt 2: Not add any FG as prerequisite   + FW, vivo, QC   We can discuss the following updated proposal.   * **For the prerequisite FGs for FG 32-4a,**   + **~~Alt 1:~~ Add one or more sync-related FGs as prerequisite (e.g., 15-4/32-4b/32-2b/…)**   + **~~Alt 2: Not add any FG as prerequisite~~** |
| Qualcomm | We do not support the proposal |
| CATT, GOHIGH | We support this proposal. |

## **2.4 32-5a-1: IUC scheme 1 TX**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 32. NR\_SL\_enh | 32-5a-1 | Transmitting Inter-UE coordination scheme 1 in NR sidelink mode 2 | 1) UE can transmit inter-UE coordination information of preferred resource set/non-preferred resource set in NR sidelink mode 2.  2) UE can receive an explicit request for inter-UE coordination information of both preferred resource set and non-preferred resource set. | [At least one of 32-5a-2 and 32-5a-3] | Yes | Yes | UE does not support transmitting inter-UE coordination scheme 1 in NR sidelink mode 2.  UE cannot receive an explicit request for inter-UE coordination information | Per FS | N.A. | N.A. | N.A. | Note: configuration by NR Uu is not required to be supported in a band indicated with only the PC5 interface in 38.101-1 Table 5.2E.1-1” in FG 32-5a-1/32-5a-2/32-5a-3/32-5b-1/32-5b-2 | Optional with capability signalling. |

Following views are provided in contributions for the RAN1#110 meeting.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| [2] | Huawei, HiSilicon | For inter-UE scheme 1 for UE-A transmitting coordination information:   * The way that RX capability is a pre-requisite of TX capability should be followed, one of 32-5a-2/32-5a-3 is sufficient since these two are RX capability related to scheme1.   ***Proposal 6: The pre-requisites of FGs related to inter-UE coordination are defined as follows:***   |  |  |  |  | | --- | --- | --- | --- | | 32-5a-1 | Transmitting Inter-UE coordination scheme 1 in NR sidelink mode 2 | 1. UE can transmit inter-UE coordination information of preferred resource set/non-preferred resource set in NR sidelink mode 2. 2. UE can receive an explicit request for inter-UE coordination information of both preferred resource set and non-preferred resource set. | At least one of 32-5a-2 and 32-5a-3 | |
| [3] | LG Electronics |  |
| [4] | ZTE,Sanechips | For 32-5a-1 Transmitting Inter-UE coordination scheme 1 in NR sidelink mode 2, in addition to at least one of 32-5a-2 or 32-5a-3 the reception of either the preferred or non-preferred resource set, either the Rel-17 gNB, Rel-17 eNB synchronization or Rel-16 synchronization FG 32-4b, 32-4c or 15-4 shall be used as prerequisite. In the meantime, given mode 2 Tx 15-3 should be supported as prerequisite for the reception of IUC 32-5a-2 and 32-5a-3, there is no need to duplicate the presence of the prerequisite of FG 15-3 herein.  Proposal 1: The prerequisites to 32-4, 32-5a are captured respectively as below   * The prerequisites to 32-5a-1 are at least one of 32-5a-2,32-5a-3, at least one of 32-4b , 32-4c or 15-4 |
| [5] | OPPO | For 32-5a-1, as the UE needs to perform sensing operation defined in Rel-16 to determine preferred or non-preferred resource set, the FG 15-3 (Transmitting NR sidelink mode 2) has to be a prerequisite feature group for it.  **Proposal 1:**   * + **Prerequisite feature groups for 32-5a-1 should include FG 15-3 (Transmitting NR sidelink mode 2);** |
| [6] | FUTUREWEI | For the remaining IUC features, there is a (relatively) simple discussion on the transmit and receive relationship for Scheme 1, which we propose is handled the same way as scheme 2.  **Proposal 3: Scheme 1 IUC is handled in the same way as Scheme 2 IUC, with Scheme 1 transmission (32-5-a1) having Scheme 1 reception (32-5-a2 or 32-5-a3) as a pre-requisite.** |
| [7] | CATT, GOHIGH |  |
| [8] | vivo | In the previous meeting, there were some discussions on whether/how to introduce prerequisites for both scheme 1 and 2 of inter-UE coordination, such as FG 32-5a-1, 32-5a-2, 32-5a-3, 32-5b-1, and 32-5b-2. Although various candidate FGs are proposed, such as FG 15-1, 15-3, 15-4, 32-2b, 32-4b, etc., we don’t see strong needs of any of them. In our view, given the high implementation flexibility and variations of sidelink UE, and no base FGs defined for Rel-17 sidelink UEs, it would be difficult to define reasonable pre-requisite for every sidelink UE FG. Improper pre-requisite definition would undesirably reduce the implementation flexibility and may introduce backward compatibility issue in future releases. On the other hand, anyway, there would be no problem if no additional prerequisite is defined. Therefore, we suggest not defining any additional prerequisites for FGs 32-5x.  *Proposal 6:* *No* *additional prerequisite is defined for FG 32-5x.* |
| [9] | Qualcomm Incorporated | In the Release 17 sidelink UE feature discussions, RAN1 expended significant time discussion how to handle and undo the Release 16 sidelink UE feature prerequisites. To avoid such discussions in the future, we propose to not introduce additional prerequisites beyond what has already been agreed.  Proposal 1: No additional prerequisites are introduced beyond the already agreed ones. |
| [10] | Apple | The pre-requisite for the feature 32-5a-1 is open. In our view, for a UE to transmit inter-UE coordination information, it must have the capability of mode 2 resource selection. Here, one of the features of 15-3, 32-4 and 32-4a could be pre-requisite feature. On the other hand, for a UE to determine a set of preferred resources or a set of non-preferred resources, this UE must have sensing capability. Hence, feature 32-4a (transmitting NR sidelink mode 2 with random resource selection) is not a proper way.  On the other hand, we think feature 15-1 is also a pre-requisite of feature 32-5a-1 since UE needs to receive explicit request for inter-UE coordination.  ***Proposal 4:*** *In feature 32-5a-1, the pre-requisite feature group is feature 15-1 and at least one of the features 15-3 and 32-4.* |
| [11] | NTT DOCOMO, INC. | * **Pre-requisite**   On whether RX capability is pre-requisite of TX capability, we believe that the way agreed for IUC scheme 2 capability should be applied to also scheme 1. Therefore, the current pre-requisite in FG 32-5a-1 should be maintained.  (If the above is agreed,) Regarding PSCCH/PSSCH transmission and reception, which is necessary for this FG, corresponding FGs should be included as pre-requisite in FGs 32-5a-2/32-5a-3.  **Proposal 4:**   * *For prerequisite of FG32-5a-1, remove the brackets from ‘[At least one of 32-5a-2 and 32-5a-3]’.* |
| [12] | Ericsson | For the FG32-5a-1, there are several open issues to be decided in RAN1. The first issue corresponds to the pre-requisite feature groups. In our view, a UE that is capable of transmitting inter-UE coordination scheme 1 needs to support the feature groups which are related to the transmissions and reception of SL transmissions. Therefore, we propose to include the FG 15-1 and FG 15-3 as defined for Rel-16 SL UEs. Moreover, it is also possible that a UE involved in the transmission of the inter-UE coordination message for scheme 1 can be performing partial sensing mechanism, and therefore, we propose to include it too.  Proposal 6 Add in the pre-requisite feature groups field for the FG 32-5a-1 the FGs related to SL transmission, reception and sensing, i.e., 15-1, 15-3 and 32-4.  Additionally, it was discussed during the last RAN1 meeting the inclusion as pre-requisite FGs of reception of inter-UE coordination scheme 1 (both for preferred and non-preferred resource set). We think that this is a reasonable manner to ensure that the inter-UE coordination mechanism is useful, i.e., there are UEs which assist other UEs while also being able to receive this assistance.  Proposal 7 Include as pre-requisite FGs for the FG 32-5a-1, the feature groups related to the reception of inter-UE coordination scheme 1 for both preferred and non-preferred resource set.  Proposal 8 For the FG 32-5a, the remaining unstable fields are completed as follows:   * Pre-requisite FGs: 15-1, 15-3, 32-4 and at least one of 32-5a-2 and 32-5a-3 |

Input summary:

Alt 1: Remove the brackets of the pre-requisite (i.e., support ‘At least one of 32-5a-2 and 32-5a-3’)

* Alt 1-1: without any additional FG
  + HW, FW, DCM
* Alt 1-2: with at least one of 32-4b, 32-4c or 15-4
  + ZTE
* Alt 1-3: with 15-1, 15-3, 32-4
  + Ericsson

Alt 2: Remove the yellow-highlighted part (i.e., not support ‘At least one of 32-5a-2 and 32-5a-3’)

* vivo, QC

Alt 3: Add FG 15-3 as prerequisite

* OPPO

Alt 4: Prerequisite is FG 15-1 and one of 15-3 and 32-4

* Apple

Based on above, following proposal should be discussed at the RAN1#110 meeting.

### **High priority proposal 2-4:**

* **For the prerequisite FGs for FG 32-5a-1,**
  + **Alt 1: Remove the brackets of the pre-requisite (i.e., support ‘At least one of 32-5a-2 and 32-5a-3’)**
    - **Alt 1-1: without any additional FG**
    - **Alt 1-2: with at least one of 32-4b, 32-4c or 15-4**
    - **Alt 1-3: with 15-1, 15-3, 32-4**
  + **Alt 2: Remove the yellow-highlighted part (i.e., not support ‘At least one of 32-5a-2 and 32-5a-3’)**
  + **Alt 3: Add FG 15-3**
  + **Alt 4: Add FG 15-1 and at least one of 15-3 and 32-4**

|  |  |
| --- | --- |
| Company | Comment |
| ZTE,Sanechips | Our position is that 32-5a-2 and 32-5a-3 should be supported with additionally 32-4b, 32-4c or 15-4 supported on top.  For 32-5a-1 Transmitting Inter-UE coordination scheme 1 in NR sidelink mode 2, in addition to at least one of 32-5a-2 or 32-5a-3 the reception of either the preferred or non-preferred resource set, either the Rel-17 gNB, Rel-17 eNB synchronization or Rel-16 synchronization FG 32-4b, 32-4c or 15-4 shall be used as prerequisite. In the meantime, given mode 2 Tx 15-3 should be supported as prerequisite for the reception of IUC 32-5a-2 and 32-5a-3, there is no need to duplicate the presence of the prerequisite of FG 15-3 herein. |
| Qualcomm | Alt 2  Support for transmission of inter-UE coordination is unrelated to its reception. |
| Moderator (NTT DOCOMO) | We need online discussion. |

## **2.5 32-5a-2/32-5a-3: IUC scheme 1 RX**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 32. NR\_SL\_enh | 32-5a-2 | Receiving Inter-UE coordination information of preferred resource set in NR sidelink mode 2 | 1) UE can receive inter-UE coordination information of preferred resource set and use the received information in its own resource (re-)selection in NR sidelink mode 2.  2) UE can transmit an explicit request for inter-UE coordination information of preferred resource set only. | [TBD] | Yes | Yes | UE does not support receiving inter-UE coordination of preferred resource set in NR sidelink mode 2.  UE does not transmit an explicit request for inter-UE coordination information of preferred resource set only | Per band | N.A. | N.A. | N.A. | Note: configuration by NR Uu is not required to be supported in a band indicated with only the PC5 interface in 38.101-1 Table 5.2E.1-1” in FG 32-5a-1/32-5a-2/32-5a-3/32-5b-1/32-5b-2 | Optional with capability signalling. |
| 32. NR\_SL\_enh | 32-5a-3 | Receiving Inter-UE coordination information of non-preferred resource set in NR sidelink mode 2 | 1) UE can receive inter-UE coordination information of non-preferred resource set and use the received information in its own resource (re-)selection in NR sidelink mode 2.  2) UE can transmit an explicit request for inter-UE coordination information of non-preferred resource set only. | [TBD] | Yes | Yes | UE does not support receiving inter-UE coordination of non-preferred resource set in NR sidelink mode 2.  UE does not transmit an explicit request for inter-UE coordination information of non-preferred resource set only | Per band | N.A. | N.A. | N.A. | Note: configuration by NR Uu is not required to be supported in a band indicated with only the PC5 interface in 38.101-1 Table 5.2E.1-1” in FG 32-5a-1/32-5a-2/32-5a-3/32-5b-1/32-5b-2 | Optional with capability signalling. |

Following views are provided in contributions for the RAN1#110 meeting.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [2] | Huawei, HiSilicon | For inter-UE scheme 1 for UE-B receiving coordination information:   * + The other basic FGs from Rel-16 are pre-requisite for the operation.   + There has to be at least one of {full, partial}-sensing supported by UE-B, i.e. 15-3 or 32-4. UE-B may also support random resource selection 32-4a, but only support of that is not sufficient to have inter-UE coordination.   ***Proposal 6: The pre-requisites of FGs related to inter-UE coordination are defined as follows:***   |  |  |  |  | | --- | --- | --- | --- | | 32-5a-2 | Receiving Inter-UE coordination information of preferred resource set in NR sidelink mode 2 | 1. UE can receive inter-UE coordination information of preferred resource set and use the received information in its own resource (re-)selection in NR sidelink mode 2. 2. UE can transmit an explicit request for inter-UE coordination information of preferred resource set only. | At least one of 15-3, 32-4, | | 32-5a-3 | Receiving Inter-UE coordination information of non-preferred resource set in NR sidelink mode 2 | 1. UE can receive inter-UE coordination information of non-preferred resource set and use the received information in its own resource (re-)selection in NR sidelink mode 2. 2. UE can transmit an explicit request for inter-UE coordination information of preferred resource set only. | At least one of 15-3, 32-4 | |
| [3] | LG Electronics |  |
| [4] | ZTE,Sanechips | For 32-5a-2 or 32-5a-3, with similar reason to 32-4,15-1 and 15-4 should be the prerequisite of these FGs. Moreover, given an explicit request should be transmitted relying on mode 2 operation, either 15-3 or 32-4 should be taken as prerequisite also.  Proposal 1: The prerequisites to 32-4, 32-5a are captured respectively as below   * The prerequisites to 32-5a-2/32-5a-3 are 15-1, 15-4, at least one of 15-3 , 32-4 |
| [5] | OPPO | Similarly, according to [3], a UE use non-preferred resource set (in Step 6b)) only after Step 6, which is Rel-16 sensing based resource exclusion procedure, hence FG 15-3 (Transmitting NR sidelink mode 2) should also be a prerequisite feature group for 32-5a-3. For a received preferred resource set, a UE can combine the set with its own sensing results if the UE performs sensing, or directly select resource within the set if it does not perform sensing, so the UE can support 32-5a-2 as long as it supports one of 15-3(Transmitting NR sidelink mode 2), 32-4(Transmitting NR sidelink mode 2 with partial sensing), or 32-4a (Transmitting NR sidelink mode 2 with random resource).  **Proposal 1:**   * + **Prerequisite feature groups for 32-5a-2: At least one of FG 15-3 (Transmitting NR sidelink mode 2), 32-4(Transmitting NR sidelink mode 2 with partial sensing), or 32-4a (Transmitting NR sidelink mode 2 with random resource);**   + **Prerequisite feature groups for 32-5a-3: FG 15-3 (Transmitting NR sidelink mode 2);** |
| [6] | FUTUREWEI |  |
| [7] | CATT, GOHIGH |  |
| [8] | vivo | In the previous meeting, there were some discussions on whether/how to introduce prerequisites for both scheme 1 and 2 of inter-UE coordination, such as FG 32-5a-1, 32-5a-2, 32-5a-3, 32-5b-1, and 32-5b-2. Although various candidate FGs are proposed, such as FG 15-1, 15-3, 15-4, 32-2b, 32-4b, etc., we don’t see strong needs of any of them. In our view, given the high implementation flexibility and variations of sidelink UE, and no base FGs defined for Rel-17 sidelink UEs, it would be difficult to define reasonable pre-requisite for every sidelink UE FG. Improper pre-requisite definition would undesirably reduce the implementation flexibility and may introduce backward compatibility issue in future releases. On the other hand, anyway, there would be no problem if no additional prerequisite is defined. Therefore, we suggest not defining any additional prerequisites for FGs 32-5x.  *Proposal 6:* *No* *additional prerequisite is defined for FG 32-5x.* |
| [9] | Qualcomm Incorporated | In the Release 17 sidelink UE feature discussions, RAN1 expended significant time discussion how to handle and undo the Release 16 sidelink UE feature prerequisites. To avoid such discussions in the future, we propose to not introduce additional prerequisites beyond what has already been agreed.  Proposal 1: No additional prerequisites are introduced beyond the already agreed ones. |
| [10] | Apple | The pre-requisite for the feature 32-5a-2 is open. In our view, for a UE to receive inter-UE coordination information of preferred resource set, this UE needs to decode PSSCH since inter-UE coordination information is carried in MAC CE. Hence, feature 15-1 is a pre-requisite feature.  On the other hand, for a UE to transmit an explicit request for inter-UE coordination, one of the features 15-3, 32-4 and 32-4a is needed.  ***Proposal 5:*** *In feature 32-5a-2, the pre-requisite feature group is feature 15-1 and at least one of the features 15-3, 32-4 and 32-4a.*  The pre-requisite for the feature 32-5a-3 is open. In our view, for a UE to receive inter-UE coordination information of non-preferred resource set, this UE needs to decode PSSCH since inter-UE coordination information is carried in MAC CE. Hence, feature 15-1 is a pre-requisite feature.  On the other hand, for a UE to transmit an explicit request for inter-UE coordination, one of the features 15-3, 32-4 and 32-4a is needed. The set of non-preferred resources are used in UE’s resource selection procedure, which implies that UE has sensing results. Hence, feature 32-4a is not a proper pre-requisite. Hence, we have the following proposal.  ***Proposal 6:*** *In feature 32-5a-3, the pre-requisite feature group is feature 15-1 and at least one of the features 15-3 and 32-4.* |
| [11] | NTT DOCOMO, INC. | * **Pre-requisite**   To perform these UE behaviors, PSCCH/PSSCH transmission and reception shall be supported by the UE. The corresponding capabilities are FG 15-1 for reception and FGs 15-3/32-4/32-4a for transmission.  **Proposal 5:**   * *‘FG 15-1 and one of FGs 15-3/32-4/32-4a’ are added as pre-requisite of FGs 32-5a-2/32-5a-3.* |
| [12] | Ericsson | For the FG32-5a-2, the main remaining issue is to decide on the pre-requisite FGs that are needed for this feature. In our view, since this feature is related to the reception of the inter-UE coordination message, the UE is required to support as pre-requisite the FGs which are related to the reception of SL transmissions. Therefore, we propose to include as pre-requisite FG, the FG 15-1.  Proposal 9 Include as pre-requisite FG for 32-5a-2, the FGs related to the reception of SL transmission, i.e., FG 15-1.  Additionally, the UE supports the transmission of an explicit request to a peer UE in order to request a set of preferred resources. On this regard, the UE should be able to perform sensing of the resource pool in order to obtain the free resources to send its request to the other UE. Therefore, we propose to include as pre-requisite FGs the following ones: 15-3, 32-4. Additionally, the UE can perform random resource selection in order to send the request.  Proposal 10 For FG 32-5a-2, the UE is able to transmit a request to a peer UE(s). Therefore, it is required to have as pre-requisite the FGs related to the transmission in mode 2, i.e., FGs 15-3, 32-4 and 32-4a.  Proposal 11 For the FG 32-5a-2, the remaining unstable fields are completed as follows:   * Pre-requisite FGs: 15-1 and at least one of 15-3, 32-4 and 32-4a.   For the FG32-5a-3, the main remaining issue is to decide on the pre-requisite FGs that are needed for this feature. In our view, since this feature is related to the reception of the inter-UE coordination message, the UE is required to support as pre-requisite the FGs which are related to the reception of SL transmissions. Therefore, we propose to include as pre-requisite FG, the FG 15-1 as defined in NR SL Rel-16. Moreover, since this features group is related to the reception of non-preferred resources, the UE needs to be capable of creating its own sensing results. Consequently, we propose to add the FGs related to transmitting in SL using sensing information, i.e., 32-4 (partial sensing) and 15-3 (full sensing).  Proposal 12 Include as pre-requisite FG for 32-5a-3, the FGs related to the reception of SL transmission and performing SL transmission including sensing, i.e., FG 15-1, 15-3 and 32-4.  Additionally, the UE supports the transmission of an explicit request to a peer UE in order to request a set of preferred resources. On this regard, the UE should be able to perform sensing of the resource pool in order to obtain the free resources to send its request to the other UE. Therefore, we propose to include as pre-requisite FGs the following ones: 15-3, 32-4. Additionally, the UE can perform random resource selection in order to send the request.  Proposal 13 For FG 32-5a-3, the UE is able to transmit a request to a peer UE(s). Therefore, it is required to have as pre-requisite the FGs related to the transmission in mode 2, i.e., FGs 15-3, 32-4 and 32-4a.  Proposal 14 For the FG 32-5a-3, the remaining unstable fields are completed as follows:   * Pre-requisite FGs: 15-1 and at least one of 15-3, 32-4 and 32-4a. |

Input summary:

For FG32-5a-2

* Alt 1: Add one or more FGs as prerequisite
  + Alt 1-1: at least one of 15-3, 32-4
    - HW
  + Alt 1-2: 15-1, 15-4, at least one of 15-3, 32-4
    - ZTE
  + Alt 1-3: 15-1 and at least one of 15-3, 32-4 and 32-4a
    - Apple, DCM, Ericsson
  + Alt 1-4: at least one of 15-3, 32-4 and 32-4a
    - OPPO
* Alt 2: Not add any FG as prerequisite
  + Vivo, QC

For FG32-5a-3

* Alt 1: Add one or more FGs as prerequisite
  + Alt 1-1: at least one of 15-3, 32-4
    - HW
  + Alt 1-2: 15-1, 15-4, at least one of 15-3, 32-4
    - ZTE
  + Alt 1-3: at least one of 15-3 and 32-4
    - Apple
  + Alt 1-4: 15-3
    - OPPO
  + Alt 1-5: 15-1 and at least one of 15-3, 32-4 and 32-4a
    - DCM, Ericsson
* Alt 2: Not add any FG as prerequisite
  + Vivo, QC

Based on above, following proposal should be discussed at the RAN1#110 meeting.

### **High priority proposal 2-5-1:**

* **For the prerequisite FGs for FG 32-5a-2,**
  + **Alt 1: Add one or more FGs as prerequisite**
    - **Alt 1-1: at least one of 15-3, 32-4**
    - **Alt 1-2: 15-1, 15-4, at least one of 15-3, 32-4**
    - **Alt 1-3: 15-1 and at least one of 15-3, 32-4 and 32-4a**
    - **Alt 1-4: at least one of 15-3, 32-4 and 32-4a**
  + **Alt 2: Not add any FG as prerequisite**

|  |  |
| --- | --- |
| Company | Comment |
| ZTE,Sanechips | For 32-5a-2 Receiving Inter-UE coordination information of preferred resource set in NR sidelink mode 2 relies on, the prerequisites should include the basic components related to the functionality of NR sidelink such as 15-1 receiving NR sidelink and 15-4 Synchronization for NR sidelink. Given an explicit request should be transmitted relying on mode 2 operation, either 15-3 or 32-4 should be taken as prerequisite also. |
| Qualcomm | Alt 2 |
| Moderator (NTT DOCOMO) | We need online discussion. |

### **High priority proposal 2-5-2:**

* **For the prerequisite FGs for FG 32-5a-3,**
  + **Alt 1: Add one or more FGs as prerequisite**
    - **Alt 1-1: at least one of 15-3, 32-4**
    - **Alt 1-2: 15-1, 15-4, at least one of 15-3, 32-4**
    - **Alt 1-3: at least one of 15-3 and 32-4**
    - **Alt 1-4: 15-3**
    - **Alt 1-5: 15-1 and at least one of 15-3, 32-4 and 32-4a**
  + **Alt 2: Not add any FG as prerequisite**

|  |  |
| --- | --- |
| Company | Comment |
| ZTE,Sanecips | For 32-5-3 Receiving Inter-UE coordination information of non-preferred resource set in NR sidelink mode 2 , the prerequisites should include the basic components related to the functionality of NR sidelink such as 15-1 receiving NR sidelink and 15-4 Synchronization for NR sidelink. Given an explicit request should be transmitted relying on mode 2 operation, either 15-3 or 32-4 should be taken as prerequisite also. |
| Qualcomm | Alt 2 |
| Moderator (NTT DOCOMO) | We need online discussion. |

## **2.6 32-5b-1: IUC scheme 2 TX**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 32. NR\_SL\_enh | 32-5b-1 | Transmitting Inter-UE coordination scheme 2 in NR sidelink mode 2 | 1) UE can transmit inter-UE coordination information of presence of expected/potential resource conflict in NR sidelink mode 2.  2) UE can transmit up to M PSFCH(s) resources in a slot | 32-5b-2, TBD | Yes | Yes | UE does not support transmitting inter-UE coordination scheme 2 in NR sidelink mode 2. | Per FS | N.A. | N.A. | N.A. | Note: configuration by NR Uu is not required to be supported in a band indicated with only the PC5 interface in 38.101-1 Table 5.2E.1-1  Candidate values for M are {4, 8, 16}  If UE reports more than one FGs of 15-11 and 32-5b-1, the reported value M in each FG is the total number and the same among those FGs. | Optional with capability signalling. |

Following views are provided in contributions for the RAN1#110 meeting.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| [2] | Huawei, HiSilicon | For inter-UE scheme 2 UE-A transmitting coordination information   * + 15-1 is needed to allow monitoring for conflicts, etc. of UE-B.   + Synchronization is required via either 15-4 or 32-2. 32-4b is not included because it is intended only for the support of random selection UEs without sidelink reception capability, while this FG requires sidelink reception for monitoring conflicts.   + Other Rel-16 basic FGs are not needed, since PSFCH is captured via the components   ***Proposal 6: The pre-requisites of FGs related to inter-UE coordination are defined as follows:***   |  |  |  |  | | --- | --- | --- | --- | | 32-5b-1 | Transmitting Inter-UE coordination scheme 2 in NR sidelink mode 2 | 1. UE can transmit inter-UE coordination information of presence of expected/potential resource conflict in NR sidelink mode 2. 2. UE can transmit up to M PSFCH(s) resources in a slot | 15-1, and either 15-4 or 32-2. | |
| [3] | LG Electronics |  |
| [4] | ZTE,Sanechips |  |
| [5] | OPPO | For FG 32-5b-1, UE supporting this FG should at least support PSCCH reception to determine which resources are reserved by peer UE (UE-B), hence, the UE should at least support one of FG 15-3 (Transmitting NR sidelink mode 2) or 32-4(Transmitting NR sidelink mode 2 with partial sensing). Furthermore, the UE should also support FG 15-11 (PSFCH format 0).  **Proposal 2:**   * + **Prerequisite feature groups for 32-5b-1 should include at least one of FG 15-3 (Transmitting NR sidelink mode 2) or 32-4(Transmitting NR sidelink mode 2 with partial sensing), and include FG 15-11 (PSFCH format 0);** |
| [6] | FUTUREWEI |  |
| [7] | CATT, GOHIGH |  |
| [8] | vivo | In the previous meeting, there were some discussions on whether/how to introduce prerequisites for both scheme 1 and 2 of inter-UE coordination, such as FG 32-5a-1, 32-5a-2, 32-5a-3, 32-5b-1, and 32-5b-2. Although various candidate FGs are proposed, such as FG 15-1, 15-3, 15-4, 32-2b, 32-4b, etc., we don’t see strong needs of any of them. In our view, given the high implementation flexibility and variations of sidelink UE, and no base FGs defined for Rel-17 sidelink UEs, it would be difficult to define reasonable pre-requisite for every sidelink UE FG. Improper pre-requisite definition would undesirably reduce the implementation flexibility and may introduce backward compatibility issue in future releases. On the other hand, anyway, there would be no problem if no additional prerequisite is defined. Therefore, we suggest not defining any additional prerequisites for FGs 32-5x.  *Proposal 6:* *No* *additional prerequisite is defined for FG 32-5x.* |
| [9] | Qualcomm Incorporated | In the Release 17 sidelink UE feature discussions, RAN1 expended significant time discussion how to handle and undo the Release 16 sidelink UE feature prerequisites. To avoid such discussions in the future, we propose to not introduce additional prerequisites beyond what has already been agreed.  Proposal 1: No additional prerequisites are introduced beyond the already agreed ones. |
| [10] | Apple | The pre-requisite for the feature 32-5b-1 is open. In our view, for a UE to determine the presence of expected resource conflict in NR sidelink mode 2, this UE needs to have the sensing capability. Hence, at least one of the features 15-3 and 32-4 is the pre-requisite.  On the other hand, the feature 32-5b-2 is already a pre-requisite feature of feature 32-5b-1. In case the pre-requisite feature of 32-5b-2 includes feature 15-3 and 32-4, then we do not need to additionally add any pre-requisite feature groups for feature 32-5b-1.  ***Proposal 7:*** *In feature 32-5b-1, the pre-requisite feature group is at least one of the features 15-3 and 32-4.*   * *In case the features 15-3 and 32-4 are pre-requisite features for 32-5b-2, then no additional pre-requisite features are needed for feature 32-5b-1.* |
| [11] | NTT DOCOMO, INC. | * **Pre-requisite**   To perform this UE behavior, the UE shall perform sensing to detect resource conflict. Based on that, the following is proposed.  **Proposal 6:**   * *‘at least one of FGs ~~15-1~~ 15-3/32-4’ is added as pre-requisite of FG 32-5b-1.* |
| [12] | Ericsson | For the FG32-5b-1, the main remaining issue is to decide on the pre-requisite FGs that are needed for this feature. In our view, the UE should be able to perform sensing of the resource pool in order to obtain the free resources to send its request to the other UE. Therefore, we propose to include as pre-requisite FGs the following ones: 15-3, 32-4.  Proposal 15 For FG 32-5b-1, the UE is able to transmit a request to a peer UE(s). Therefore, it is required to have as pre-requisite the FGs related to the transmission in mode 2, i.e., FGs 15-3, 32-4.  Proposal 16 For the FG 32-5b-1, the remaining unstable fields are completed as follows:   * Pre-requisite FGs: 15-3, 32-4. |

Input summary:

* Alt 1: Add one or more FGs as prerequisite
  + Alt 1-1: 15-1, and either 15-4 or 32-2
    - HW
  + Alt 1-2: 15-11 and at least one of 15-3, 32-4
    - OPPO
  + Alt 1-3: at least one of 15-3 and 32-4
    - DCM
  + Alt 1-4: 15-3, 32-4
    - Ericsson
* Alt 2: Not add any FG as prerequisite
  + Vivo, QC, Apple (if 32-5b-2 is kept), ZTE/Sanechips, Intel

Based on above, following proposal should be discussed at the RAN1#110 meeting.

### **High priority proposal 2-6:**

* **For the prerequisite FGs for FG 32-5b-1,**
  + **~~Alt 1: Add one or more FGs as prerequisite~~**
    - **~~Alt 1-1: 15-1, and either 15-4 or 32-2~~**
    - **~~Alt 1-2: 15-11 and at least one of 15-3, 32-4~~**
    - **~~Alt 1-3: at least one of 15-3 and 32-4~~**
    - **~~Alt 1-4: 15-3, 32-4~~**
  + **~~Alt 2:~~ Not add any FG as prerequisite**

|  |  |
| --- | --- |
| Company | Comment |
| ZTE,Sanechips | Alt2, 32-5b-2 as prerequisite is sufficient |
| Intel | Alt.2 |
| Qualcomm | Alt 2 |
| Moderator (NTT DOCOMO) | Based on the feedbacks, the situation is updated as below.   * Alt 1: Add one or more FGs as prerequisite   + Alt 1-1: 15-1, and either 15-4 or 32-2     - HW   + Alt 1-2: 15-11 and at least one of 15-3, 32-4     - OPPO   + Alt 1-3: at least one of 15-3 and 32-4     - DCM   + Alt 1-4: 15-3, 32-4     - Ericsson * Alt 2: Not add any FG as prerequisite   + Vivo, QC, Apple (if 32-5b-2 is kept), ZTE/Sanechips, Intel   We can check if the updated proposal below is agreeable.   * **For the prerequisite FGs for FG 32-5b-1,**   + **~~Alt 1: Add one or more FGs as prerequisite~~**     - **~~Alt 1-1: 15-1, and either 15-4 or 32-2~~**     - **~~Alt 1-2: 15-11 and at least one of 15-3, 32-4~~**     - **~~Alt 1-3: at least one of 15-3 and 32-4~~**     - **~~Alt 1-4: 15-3, 32-4~~**   + **~~Alt 2:~~ Not add any FG as prerequisite** |
| Qualcomm | We support the proposal |

## **2.7 32-5b-2: IUC scheme 2 RX**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 32. NR\_SL\_enh | 32-5b-2 | Receiving Inter-UE coordination scheme 2 in NR sidelink mode 2 | 1) UE can receive inter-UE coordination information of presence of expected/potential resource conflict and use the received information in its own resource re-selection in NR sidelink mode 2.  2) UE can receive up to N PSFCH(s) resources in a slot. | [TBD] | Yes | Yes | UE does not support receiving inter-UE coordination scheme 2 in NR sidelink mode 2. | Per band | N.A. | N.A. | N.A. | Note: configuration by NR Uu is not required to be supported in a band indicated with only the PC5 interface in 38.101-1 Table 5.2E.1-1  Candidate values for N are {5, 15, 25, 32, 35, 45, 50, 64}  If UE reports more than one FGs of 15-11, 32-2a and 32-5b-2, the reported value N in each FG is the total number and the same among those FGs. | Optional with capability signalling. |

Following views are provided in contributions for the RAN1#110 meeting.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| [2] | Huawei, HiSilicon | For inter-UE scheme 2 UE-B receiving coordination information:   * There has to be at least one of {full, partial}-sensing supported by UE-B, i.e. 15-3 or 32-4. UE-B may also support random resource selection 32-4a, but only support of that is not sufficient to have inter-UE coordination. * Synchronization is required via either 15-4 or 32-2. 32-4b is not included because it is intended only for the support of random selection UEs without sidelink reception capability, while this FG requires sidelink reception. * Other Rel-16 basic FGs are not needed, since PSFCH is captured via the components   ***Proposal 6: The pre-requisites of FGs related to inter-UE coordination are defined as follows:***   |  |  |  |  | | --- | --- | --- | --- | | 32-5b-2 | Receiving Inter-UE coordination scheme 2 in NR sidelink mode 2 | 1. UE can receive inter-UE coordination information of presence of expected/potential resource conflict and use the received information in its own resource re-selection in NR sidelink mode 2. 2. UE can receive up to N PSFCH(s) resources in a slot. | At least one of 15-3, 32-4;  Either 15-4 or 32-4b | |
| [3] | LG Electronics |  |
| [4] | ZTE,Sanechips | For 32-5b-2 receiving IUC scheme 2 in NR sidelink mode 2, the prerequisites should be the same as those to the reception of IUC scheme 1, i.e. 32-5a-2/32-5a-3. As the PSFCH reception capability of 15-11 is shared with the PSFCH reception capability of 32-5b-2 as elaborated by the note, it seems unnecessary to say the PSFCH reception part of 15-11 is the prerequisite to 32-5b-2 or vice verse.  Proposal 1: The prerequisites to 32-4, 32-5a are captured respectively as below   * The prerequisites to 32-5b-2 are 15-1,15-4, at least one of 15-3 or 32-4 |
| [5] | OPPO | For 32-5b-2, the UE support the FG should at least support one of FG 15-3 (Transmitting NR sidelink mode 2), 32-4(Transmitting NR sidelink mode 2 with partial sensing), or 32-4a (Transmitting NR sidelink mode 2 with random resource), such that it can use the received IUC information. Furthermore, the UE should also support at least one of FG 15-11 (PSFCH format 0) or 32-2 (Receiving NR sidelink of PSFCH/S-SSB).  **Proposal 2:**   * + **Prerequisite feature groups for 32-5b-2 should include at least one of FG 15-3 (Transmitting NR sidelink mode 2), 32-4(Transmitting NR sidelink mode 2 with partial sensing), or 32-4a (Transmitting NR sidelink mode 2 with random resource), and should also include at least one of FG 15-11 (PSFCH format 0) or 32-2 (Receiving NR sidelink of PSFCH/S-SSB);** |
| [6] | FUTUREWEI |  |
| [7] | CATT, GOHIGH |  |
| [8] | vivo | In the previous meeting, there were some discussions on whether/how to introduce prerequisites for both scheme 1 and 2 of inter-UE coordination, such as FG 32-5a-1, 32-5a-2, 32-5a-3, 32-5b-1, and 32-5b-2. Although various candidate FGs are proposed, such as FG 15-1, 15-3, 15-4, 32-2b, 32-4b, etc., we don’t see strong needs of any of them. In our view, given the high implementation flexibility and variations of sidelink UE, and no base FGs defined for Rel-17 sidelink UEs, it would be difficult to define reasonable pre-requisite for every sidelink UE FG. Improper pre-requisite definition would undesirably reduce the implementation flexibility and may introduce backward compatibility issue in future releases. On the other hand, anyway, there would be no problem if no additional prerequisite is defined. Therefore, we suggest not defining any additional prerequisites for FGs 32-5x.  *Proposal 6:* *No* *additional prerequisite is defined for FG 32-5x.* |
| [9] | Qualcomm Incorporated | In the Release 17 sidelink UE feature discussions, RAN1 expended significant time discussion how to handle and undo the Release 16 sidelink UE feature prerequisites. To avoid such discussions in the future, we propose to not introduce additional prerequisites beyond what has already been agreed.  Proposal 1: No additional prerequisites are introduced beyond the already agreed ones. |
| [10] | Apple | The feature 32-5b-2 is to receive inter-UE coordination information scheme 2 in NR sidelink mode 2. The reception of inter-UE coordination scheme 2 is based on transmitting NR sidelink mode 2. Hence, the pre-requisite feature of 32-5b-2 is one of features 15-3, 32-4 and 32-4a.  ***Proposal 8:*** *In feature 32-5b-2, the pre-requisite feature group is at least one of features 15-3, 32-4 and 32-4a.* |
| [11] | NTT DOCOMO, INC. | * **Pre-requisite**   Receiving collision indication means that this UE sent reservation information before that. Therefore, this UE is capable of PSCCH/PSSCH transmission.  **Proposal 7:**   * *‘At least one of FGs 15-3/32-4/32-4a’ is added as pre-requisite of FG 32-5b-2.* |
| [12] | Ericsson | Moreover, once the UE receives the conflict indication, the resource re-evaluation and/or re-selection is triggered. On this regard, the UE shall be able to perform sensing in order to do these operations. Therefore, we propose to include as pre-requisite FGs the ones related to the sensing operation that is performed for re-evaluation and re-selection of resources upon receiving the conflict indication from a peer UE.  Proposal 17 For FG 32-5b-2, include as pre-requisite the FGs related to the re-evaluation and re-selection operation upon receiving the conflict indication, i.e., FGs 15-3 and 32-4.  Proposal 18 For the FG 32-5b-2, the remaining unstable fields are completed as follows:   * Pre-requisite FGs: 15-3 and 32-4 |

Input summary:

* Alt 1: Add one or more FGs as prerequisite
  + Alt 1-1: At least one of 15-3, 32-4; at least one of 15-4, 32-4b
    - HW
  + Alt 1-2: 15-1, 15-4, at least one of 15-3 or 32-4
    - ZTE
  + Alt 1-3: at least one of 15-3, 32-4, 32-4a; at least one of 15-11, 32-2
    - OPPO
  + Alt 1-4: at least one of 15-3, 32-4, 32-4a
    - Apple, DCM
  + Alt 1-5: 15-3, 32-4
    - Ericsson
* Alt 2: Not add any FG as prerequisite
  + Vivo, QC

Based on above, following proposal should be discussed at the RAN1#110 meeting.

### **High priority proposal 2-7:**

* **For the prerequisite FGs for FG 32-5b-1,**
  + **Alt 1: Add one or more FGs as prerequisite**
    - **Alt 1-1: At least one of 15-3, 32-4; at least one of 15-4, 32-4b**
    - **Alt 1-2: 15-1, 15-4, at least one of 15-3 or 32-4**
    - **Alt 1-3: at least one of 15-3, 32-4, 32-4a; at least one of 15-11, 32-2**
    - **Alt 1-4: at least one of 15-3, 32-4, 32-4a**
    - **Alt 1-5: 15-3, 32-4**
  + **Alt 2: Not add any FG as prerequisite**

|  |  |
| --- | --- |
| Company | Comment |
| ZTE,Sanechips | For 32-5b-2 receiving IUC scheme 2 in NR sidelink mode 2, the prerequisites should be the same as those to the reception of IUC scheme 1, i.e. 32-5a-2/32-5a-3. As the PSFCH reception capability of 15-11 is shared with the PSFCH reception capability of 32-5b-2 as elaborated by the note, it seems unnecessary to say the PSFCH reception part of 15-11 is the prerequisite to 32-5b-2 or vice verse. |
| Qualcomm | Alt 2 |
| Moderator (NTT DOCOMO) | We need online discussion. |

## **2.8 Others**

Following views are provided in contributions for the RAN1#110 meeting.

|  |  |  |
| --- | --- | --- |
| [2] | Huawei, HiSilicon | In Rel-16, it was decided that a UE would need to support mode 1 in licensed spectrum where gNB is defined. This was to ensure network operator control could be exercised over sidelink when in licensed spectrum. The Rel-16 principle and agreement extend to Rel-17, where otherwise a UE might report only Rel-17 FGs (and associated pre-requisites), all of which apply to mode 2 only, and hence be always beyond network control in licensed spectrum.  The simplest way to capture this in the Rel-17 FG list is, as with Rel-16, adding to the notes column of the rows for partial sensing, random selection, inter-UE scheme 1, and inter-UE scheme 2.  ***Proposal 7: Add a note for Rel-17 resource allocation FGs 32-4, 32-4a, 32-5a-x, 32-5b-x:***   * ***“For UE supports this FG, and NR sidelink in licensed spectrum where gNB is defined, UE must indicate FG 15-2 is supported.”*** |
| [3] | LG Electronics |  |
| [4] | ZTE,Sanechips | During RAN1#109-e, it was discussed that whether to add the note below for UE operating under NW configuration/control.  *For UE supports this FG, and NR sidelink in licensed spectrum where gNB is defined, UE must indicate FG 15-2 is supported*  From companies' views, it seems the major concern is the complexity issue of the potential mode 1 components for UE having the sole need to support 32-4 Transmitting NR sidelink mode 2 with partial sensing and/or 32-4a Transmitting NR sidelink mode 2 with random resource selection, which are irrelevant to mode 1 operation. However, as very clearly stated in Rel-16 counterpart of this note under the FG 15-2 Transmitting NR sidelink mode 1 scheduled by NR Uu, the support of this FG is only needed for a gNB managing or operating on a certain spectrum and can be optional otherwise, leaving the UE not supporting NR sidelink in licensed spectrum the flexibility of not having this component. This support of mode 1 components in FG 15-2 is for sure critical for a UE supporting NR sidelink in licensed spectrum where a gNB is defined.  *This is the basic FG for sidelink in licensed spectrum where gNB is operating on or managing that spectrum and optional FG otherwise*  With that, it is proposed to add the note with clarification to the FG 32-4, 32-4a, 32-5b-2, 32-5a-2, 32-5a-3   1. Add the following note to FG 32-4, 32-4a, 32-5b-2, 32-5a-2, 32-5a-3   ***Note: For UE supports this FG, and NR sidelink in licensed spectrum where gNB is defined, UE must indicate FG 15-2 is supported and UE is not required to indicate FG 15-2 is supported otherwise***  Regarding the prerequisite to 32-6-1, the reception of IUC info. over 2nd SCI, either 32-5a-2 or 32-5a-3 is sufficient as prerequisite.  Proposal 1: The prerequisites to 32-4, 32-5a are captured respectively as below   * The prerequisites to 32-6-1 are at least one of 32-5a-2, 32-5a-3   With respect to 32-6-2, the reception of Scheme 1 explicit request over 2nd SCI, the transmission of IUC information 32-5a-1 should be its prerequisite.  Proposal 1: The prerequisites to 32-4, 32-5a are captured respectively as below   * The prerequisites to 32-6-2 are 32-5a-1 |
| [5] | OPPO |  |
| [6] | FUTUREWEI | A more difficult discussion is on the “TBD”s for the IUC features. At the heart of the discussion is whether IUC capable UEs exist in a vacuum or as part of the SL ecosystem as a mode 2 enhancement. As IUC is a mode 2 enhancement in the WID, the burden of proof that IUC UEs should *not* support other sidelink features should be on the proponent. In particular, it does not seem appropriate to use the IUC feature group to introduce Rel-17 *full sensing* UEs that bypass the basic features that all Rel-16 *full sensing* UEs must support. To be clear, to our knowledge no company has indicated that any Rel-16 basic feature is broken and therefore should not be implemented in Rel-17 UEs. We suggest therefore capturing that principle, then working out the detailed pre-requisites for the IUC “TBD”s.  **Proposal 4: Rel-17 full sensing UEs are *at least* as capable as Rel-16 UEs.** |
| [7] | CATT, GOHIGH |  |
| [8] | vivo |  |
| [9] | Qualcomm Incorporated | A proposal to introduce a requirement of supporting Mode 1 in licensed bands to the FGs for random selection, partial sensing, and inter-UE coordination was discussed in RAN1 #109-e:  **[FL3] Low priority question 3-2:**   * **Companies are encouraged to provide view whether the following note is added in FGs 32-4/32-4a**   + **For UE supports this FG, and NR sidelink in licensed spectrum where gNB is defined, UE must indicate FG 15-2 is supported**   **[FL3] Low priority question 4-2:**   * **Companies are encouraged to provide view whether the following note is added in FGs 32-5a-1/32-5a-2/32-5a-3/32-5b-1/32-5b-2**   + **For UE supports this FG, and NR sidelink in licensed spectrum where gNB is defined, UE must indicate FG 15-2 is supported**   The FGs in questions are related to Mode 2, not Mode 1. Further, the network will still have control over UEs in licensed spectrum since the network controls the configuration in such cases. Hence, there is no need to add the requirement.  Proposal 2: Do not introduce a note requiring support for Mode 1 in licensed spectrum for FGs 32-4/32-4a/32-5a-1/32-5a-2/32-5a-3/32-5b-1/32-5b-2. |
| [10] | Apple |  |
| [11] | NTT DOCOMO, INC. |  |
| [12] | Ericsson |  |

Input summary

Mode 1-related discussion

* Add a note for Rel-17 resource allocation FGs (i.e., 32-4, 32-4a, 32-5a-x, 32-5b-x): For UE supports this FG, and NR sidelink in licensed spectrum where gNB is defined, UE must indicate FG 15-2 is supported.
  + YES: HW, ZTE
  + NO: QC

FG 32-6-x

* ZTE: The prerequisites to 32-6-1 are at least one of 32-5a-2, 32-5a-3. The prerequisites to 32-6-2 are 32-5a-1.
  + Note: These have already been included.

Rel-17 Full sensing

* FW: Rel-17 full sensing UEs are at least as capable as Rel-16 UEs.

Based on above, following proposal should be discussed at the RAN1#110 meeting.

### **High priority proposal 2-8-1:**

* **~~Discuss whether~~ the following note is added for Rel-17 resource allocation FGs (i.e., 32-4, 32-4a, 32-5a-x, 32-5b-x) ~~or not~~**
  + **For UE supports this FG, and NR sidelink in licensed spectrum where gNB is defined, UE must indicate FG 15-2 is supported**

|  |  |
| --- | --- |
| Company | Comment |
| ZTE, Sanechips | Support to add the note above for Rel-17 resource allocation FGs (i.e., 32-4, 32-4a, 32-5a-x, 32-5b-x). |
| Intel | OK to add the note |
| Qualcomm | No, the note is not needed since these are Mode 2 FGs and are unrelated to Mode 1. Configuration can also restrict which RA mode is supported in a given resource pool. |
| Moderator (NTT DOCOMO) | Based on the feedbacks, the situation is updated as below.   * Add a note for Rel-17 resource allocation FGs (i.e., 32-4, 32-4a, 32-5a-x, 32-5b-x): For UE supports this FG, and NR sidelink in licensed spectrum where gNB is defined, UE must indicate FG 15-2 is supported.   + YES: HW, ZTE, Intel   + NO: QC   We can check if the updated proposal below is agreeable.   * **~~Discuss whether~~ the following note is added for Rel-17 resource allocation FGs (i.e., 32-4, 32-4a, 32-5a-x, 32-5b-x) ~~or not~~**   + **For UE supports this FG, and NR sidelink in licensed spectrum where gNB is defined, UE must indicate FG 15-2 is supported** |
| Qualcomm | We do not support the proposal |

### **Low priority proposal 2-8-2:**

* **Rel-17 full sensing UEs are at least as capable as Rel-16 UEs.**

|  |  |
| --- | --- |
| Company | Comment |
| ZTE, Sanechips | Agree. |
| Intel | Agree. |
|  |  |

# **Conclusions**

Proposals for Tuesday online session

* Quickly check if following updated proposals in R1-2207703 can be agreed one by one.
  + 2-1
  + 2-2-1
  + 2-2-2
  + 2-2-3
  + 2-6
  + 2-8-1
* Discuss following proposals in R1-2207703 one by one.
  + 2-3-1
  + 2-3-2
  + 2-4
  + 2-5-1
  + 2-5-2
  + 2-7

# **References**

[1] R1-2205608 Updated RAN1 UE features list for Rel-17 NR after RAN1 #109-e including remaining RAN1 issues Moderators (AT&T, NTT DOCOMO, INC.)

[2] R1-2205767 Remaining issues on UE feature for sidelink Huawei, HiSilicon

[3] R1-2205849 Discussion on UE features for NR sidelink enhancement LG Electronics

[4] R1-2206156 On UE features for NR sidelink enhancement ZTE,Sanechips

[5] R1-2206284 On UE feature list for NR sidelink enhancement OPPO

[6] R1-2206335 On the pre-requisites for Rel-17 SL feature groups FUTUREWEI

[7] R1-2206373 Remaining issues on Rel-17 UE features for sidelink enhancements CATT, GOHIGH

[8] R1-2206768 Remaining issues on UE features for NR sidelink enhancement vivo

[9] R1-2207212 UE features for NR sidelink enhancements Qualcomm Incorporated

[10] R1-2207317 On Rel-17 NR Sidelink UE Features Apple

[11] R1-2207390 Discussion on Rel.17 UE features for NR sidelink enhancement NTT DOCOMO, INC.

[12] R1-2207564 UE features for NR sidelink enhancements Ericsson