3GPP TSG-RAN WG2 Meeting #113-e R2-210xxxx

Electronic, 25th Jan - 5th Feb, 2021

**Agenda item: 8.7.3**

**Source: CATT**

**Title: [AT113-e][607][Relay] Continuation of discovery open issues**

**Document for: Discussion and Decision**

# 1 Introduction

This contribution is used to further collect information for the summary R2-2102224, in order to converge on the critical proposals.

# 2 Contact Information

To make it easier to find the correct contact delegate in each company for potential follow-up questions, the rapporteur encourages the delegates who provide input to provide their contact information in this table:

|  |  |
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# 3 Discussion

## 3.1 Questions for Easy Proposals

According to the current TR 38.836 [1], there are still two editor notes in section 4.2 on sidelink discovery which marked with Editor note:

*Editor note: For Remote UE out of coverage, it is FFS whether transmission of discovery message is based on configuration from network if the Remote UE is already connected with network through a Relay UE.*

*Editor note: For Remote UE in RRC\_CONNECTED, the detail of configuration provided by serving gNB is FFS.*

Regarding to the 2nd editor note (marked with green), [9] proposed:

Proposal 3 For Remote UE in RRC\_CONNECTED, it may be configured with dedicated transmission resources and whether the UE is allowed to transmit remote UE related sidelink communication using the configured dedicated transmission resources.

But more companies [5][6][8][17][22] proposed to left it to WI phase.

**Q1-1: Do companies agree to remove the editor note and address this isssue in WI phase:**

**“Editor note: For Remote UE in RRC\_CONNECTED, the detail of configuration provided by serving gNB is FFS.”**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| Qualcomm | Yes |  |
| Ericsson  | Yes |  |
| Sony | Yes |  |
| Spreadtrum | Yes |  |
| InterDigital | Yes |  |
| OPPO | Yes |  |
| Huawei | Yes |  |
| MediaTek | Yes |  |
| Xiaomi | Yes |  |
| Nokia | Yes |  |
| vivo | Yes |  |
| Sharp | Yes |  |
| ETRI | Yes |  |
| Samsung | Yes |  |
| Philips | Yes |  |
| ZTE | Yes |  |
| ASUSTeK | Yes |  |
| Apple | Yes |  |
| LG | Yes |  |
| CATT | Yes |  |
| Lenovo&MM | Yes |  |

Regarding to the discovery model, in RAN2#111-e meeting, RAN2 has agreed to adopt model A and model B as a working assumption for both U2N relay and U2U relay. This has been captured in current TR 38.836 [1]. According to SA2 LS [27], it confirmed that both model A and model B are supported. Hence, contributions [5][11] [22] [26] are all suggested to confirm that for both L2 and L3 U2U relay, discovery model A and model B are agreed as discovery model.

**Q1-2: Do companies agree that for both L2 and L3 U2N and U2U relay, discovery model A and model B are agreed as discovery model?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| Qualcomm  | Yes but.. | We think the question itself is a bit confusing. We suggest to modify the wording in final proposal: “**For both L2 and L3 U2N and U2U relay, RAN2 confirm the working ssumption that discovery model A and model B are ~~agreed~~supported ~~as discovery model~~** |
| Ericsson | Yes |  |
| Sony | Yes |  |
| Spreadtrum | Yes |  |
| InterDigital | Yes |  |
| OPPO | Yes | We agree with Qualcomm’s comment |
| Huawei | Yes | Agree with QC’s wording. |
| MediaTek | Yes |  |
| Xiaomi | Yes |  |
| Nokia | Yes |  |
| vivo | Yes |  |
| Sharp | Yes |  |
| Intel | Yes |  |
| ETRI | Yes |  |
| Samsung | Yes |  |
| Philips | Yes | Agree with Qualcomm |
| ZTE | Yes |  |
| ASUSTeK | Yes |  |
| Apple | Yes |  |
| LG | Yes |  |
| CATT | Yes |  |
| Lenovo&MM | Yes | Agree with the modification from QC. |

Regarding to the sidelink discovery resource pool design, one possible method is to adopt a separate resource pool for sidelink discovery. With the separate resource pool, one open issue was whether to introduce a new LCID for discovery message. Contributions [5][6][9][19] discussed this issue and all supported to introduce a new LCID for discovery message in case of separate resource pool.

**Q1-3: Do companies agree to introduce a new LCID for discovery message for separate resource pool same as shared resource pool?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| Qualcomm | Yes | Please note that SA2 has agreed to specify a new ignalling different from PC5-S for discovery. Thus, a new SL-SRB is expected to be introduced no matter it is separate or shared resource. So, we prefer a unified design for separate resource pool and shared resource pool. In addition, it can also reduce spec work and UE implementation complexity for the UE to decides the LCID of the discovery message |
| Ericsson | Yes | It is beneficial to define a new LCID so that discovery message is distinguishable from other LCHs at the MAC layer. |
| Sony | No | We should discuss whether we need to introduce a separate resource pool, then we could further discuss whether we need a new LCID. This can be discussed in WI. |
| Spreadtrum | No | If a separate resource pool is adopted, the discovery message will not be multiplexed with other LCHs and can be identified via the used resource pool. |
| InterDigital | Yes | We should align separate resource pool and same resource pool as much as possible. |
| OPPO | Yes | We agree with Qualcom |
| Huawei | Yes | To address the concern from Sony, the updated wording could be:**introduce a new LCID for discovery message for separate resource pool, if agreed, same as shared resource pool.**As to the comments from Spreadtrum, the discussion point is not to use LCID to differentiate the discovery message. It is inevitable to define the LCID for discovery message’s RB. |
| MediaTek | Yes | The discovery message is anyway a message different from existing PC5-S message, so it makes sense to have its own (dedicated) SL-SRB and SL LCID. Thus, we think a dedicated SL LCID for discovery message is needed regardless of whether we apply dedicated or shared resource pool for discovery message. Besides, we also prefer aligned design if both configurations are supported, e.g. if whether to have a dedicated resource pool for discovery message is up to NW configuration. |
| Xiaomi | Yes | We prefer unified solution for both shared and separate resource pool. |
| Nokia | Yes | For the sake of consistency a unified solution to differentiate the discovery message from other SL messages for both, shared and separate resource pool, is beneficial. |
| Vivo | Yes | Agree with MediaTek that discovery message can have its own SL-SRB. |
| Sharp | Yes |  |
| Intel | Yes | We see no reason to have a different design from the shared resource pool case and given that SA2 has agreed to use new signalling for discovery, it makes logical sense to use a new LCID correspondingly. |
| ETRI | Yes |  |
| Samsung | Yes | Since discovery message is taken separately from PC5-S signalling, discovery message will be configured with new SL-SRB and new LCID other than those for PC5-S signalling. So a new LCID can be used for discovery message regardless of resource pool separation. |
| Philip | Yes |  |
| ZTE | Yes | If discovery message is configured with different LCIDs for separate and shared resource pool, this may increase implementation complexity for the UE to decide which LCID shall be used for the discovery message based on the resource pool. So we think the new LCID for the discovery message shall be used for both separate and shared resource pool. |
| ASUSTeK | Yes |  |
| Apple | Yes | We understand that whether there is a separated resource pool is to be determined by WI. But we are fine to always use a dedicated LCID for disvovery messages. |
| LG | Yes | Agree with QC |
| CATT | Yes |  |
| Lenovo&MM | No | If the shared resource pool is not agreed in WI, we don’t see the need to discuss this. Therefore, this issue should be discussed in WI. |

## 3.2 Questions for Proposals can be further discussed in SI stage

According to the current TR 38.836 [1], there are still two editor notes in section 4.2 on sidelink discovery which marked with FFS:

*Editor note: For Remote UE out of coverage, it is FFS whether transmission of discovery message is based on configuration from network if the Remote UE is already connected with network through a Relay UE.*

*Editor note: For Remote UE in RRC\_CONNECTED, the detail of configuration provided by serving gNB is FFS.*

Regarding to the 1st editor note (marked with yellow), it was discussed in email discussion #623 on discovery [4]. The summary of this topic is “13 out of 24 companies answer no while the rest 10 answer yes. Considering the solution is rather an optimization, rapporteur recommends not pursuing this”. In this meeting, contributions [5][6][8][9][10][12][15][17][20][22] discussed this question. There are mainly two options:

* Option 1: For OOC Remote UE connected to network via Layer 2 UE-to-NW relay, the discovery transmission is based on pre-configuration([5][6][8])
* Option 2: For OOC Remote UE connected to network via Layer 2 UE-to-NW relay, the transmission of discovery message is based on NW configuration([9][10][12][15][17][20][22]).

The rapporteur understands that it is technically feasible for gNB to provide discovery configuration to remote OOC UE through a relay UE, but the benefit is not obvious.

**Q2-1: Do companies agree that for the OOC remote UE connected to network via L2 relay, whether the discovery transmission can be based on pre-configuration or based on NW configuration can be discussed in SI phase?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| Qualcomm  | Yes | It is in existing editor note of TR, which of course needs to be discussed in SI.. |
| Ericsson | No with comments | The note is concerning remote UE RRC CONNECTED. In the TR, it has been already captured that- Whether Remote UE in RRC\_CONNECTED is allowed to transmit discovery is based on configuration provided by serving gNB. Therefore, the note is already addressed. Suggest to remove the note from the TR. |
| Sony | No | We think this can be discussed in WI. |
| Spreadtrum | No |  |
| InterDigital | No | This can be discussed in the WI phase. |
| OPPO | Yes | The text cited by Ericsson only address the case when UE is connected to network directly |
| Huawei | Remove the EN directly | Based on the comments, the consensus part is to remove the EN first.Then, we can further discuss this details in WI phase. |
| MediaTek | No | This is not an urgent issue for discussion in SI phase. |
| Xiaomi | Yes | We can try, but we feel it may be difficult to reach consensus in SI. |
| Nokia | No | To be discussed in WI phase |
| vivo | Yes  | We can have a try, but it is also ok to us to further discuss this issue in WI phase if no agreement can be taken. |
| Sharp | No | The open issue should be whether the discovery transmission of remote UE in RRC\_IDLE/INACTIVE can be based on NW configuration or pre-configuration. It is better to make EN clearer. |
| Intel | Yes | We think this is a rather fundamental question regarding UE behaviour for how to perform discovery and exactly the kind of question which should be addressed in the SI stage |
| ETRI | Yes |  |
| Samsung | Yes with comment | Since remote UE has already connected with network, the remote UE is not out of coverage and it is in RRC\_CONNECTED. The assumed case in the note is incorrect. So the note should be removed. |
| Philips | No | Given the time left for the SI, suggest to move EN to WI phase |
| ZTE | Yes |  |
| ASUSTeK | No | We prefer to discuss this in WI phase. |
| Apple | Yes | We agree that this problem is not that complicated. We can reach an agreement for L2 relay case then the EN can be removed. |
| LG | Yes |  |
| CATT | No | We think it can be down-selected in the WI phase |
| Lenovo&MM | Yes | We can try. If we cannot have a agreement for a short time, we can leave it to WI. |

**Q2-2: If the answer of Q2-1 is Yes, which option do companies prefer?**

* **Option 1: Based on pre-configuration;**
* **Option 2: Based on NW configuration received from relay UE;**
* **Option 3: Based on pre-configuration or NW configuration received from relay UE.**

|  |  |  |
| --- | --- | --- |
| Company | Option | Comment |
| Qualcomm | Option 1 | 1. Although it is technically feasible, we think it is a minor signalling optimization because remote OOC UE can rely on pre-configuration in this case. Its benefit over pre-configuration is not clear to us. As it is the first release of sidelink relay, we prefer to focus on basic functionalities.
2. From technique perspective, we are not sure how gNB can obtain and understand measurements of OOC remote UE. Then, if gNB has no measurements, why it can do better than pre-configuration?
3. If NW configuration is agreed, we think it will bring another controversial issue: how remote UE can decide to use pre-configuration or NW configuration? Is it left to UE implementation or UE behaviour is specified? We tend to avoid such discussion.
 |
| Ericsson | Option 3 | I think the question by itself is confusing. Both options are feasible. If there is NW configuration available, remote UE shall use the NW configuration. |
| OPPO | Option1 | We think preconfiguration in this case is sufficient |
| Huawei | Option3 | Clearly we can capture both pre-configuration and NW configuration options in the TR. |
| Xiaomi | Option 1 |  |
| vivo | Option 3 | For an OOC remote UE if there is configuration provided by NW, the OOC remote UE should follow the NW configuration. Otherwise, the OOC UE should follow pre-configuration. |
| Intel | Option 3 | Given that several aspects of remote UE behaviour, e.g. SIB forwarding are handled via the relay UE, we do not see a reason why the discovery related configuration cannot be provided by the gNB. Note that even if the gNB is not aware of the measurement results of the remote UE, it can still provide e.g. the link quality thresholds for the remote UE to start/stop the discovery procedure. This is also more flexible than the pre-configuration option, which is generally the last resort option. |
| ETRI | Option 3 |  |
| Samsung | See comment | For remote UE in RRC\_CONNECTED the TR captures as below: - Whether Remote UE in RRC\_CONNECTED is allowed to transmit discovery is based on configuration provided by serving gNB.  |
| ZTE | Option 2 | If the remote UE receives NW configuration, it shall use the NW configuration. If the remote UE dose not receive NW configuration, whether pre-configuration can be used is FFS. |
| Apple | Option 2 | We think for the UEs in the proximity of the gNB, the NW configuration would be compatible with the configurations used by OOC remote UE, so there is no performance issue here. The preconfiguration could be sufficient. But the principle in Sidelink is that UE, if in RRC\_CONNECTED, it need follow NW configuration even if the pre-configuration is as same as dedicated NW configuration.We do not understand the purpose of option 3…does it mean this is left to UE implementation. |
| LG | Option 3 | If the OoC remote UE is in RRC\_CONNECTEED state via relay UE, the remote UE follows NW configuration. Otherwise, OoC remote UE uses pre-configuration. |
| Lenovo&MM | Option3 | Which one (pre-configuration or network configuration) is used depends on the case. If the end-to-end RRC connection is available, the remote UE will follow network configuration. Otherwise, the pre-configuration can be used. For example, RLF happens on PC5 link or Uu link. |

In [5], it is also mentioned that for L3 U2U relay there is additional alternative i.e. Integrated PC5 unicast link establishment procedure (as described in sol#8 in[2]) apart from discovery model A and model B. Regarding to this issue, contributions[11][22] think that relay discovery integrated into the PC5 unicast link establishment procedure is considered to be supported by SA2 for both L2/L3 UE-to-UE Relay, so integrated PC5 unicast link establishment procedure should also be captured for U2U architecture. Contribution [26] proposed that RAN2 should discuss this question. Contribution [21] proposed that PC5 discovery should not necessarily lead to establishment of PC5 RRC Connection.

Rapporteur thinks that the intention of discussing this issue is to capture valuable conclusions from SA2 in order to further perfect our work from a technical point of view. The reality is that the decision for whether relay discovery integrated into the PC5 unicast link establishment procedure for U2U is out of RAN2 scope. And SA2 is going to discuss the detail further at next SA2 meeting.

**Q2-3: Do companies agree that the relay discovery integrated into the PC5 unicast link establishment procedure for U2U relay should be captured in TR38. 836?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| Qualcomm  | Yes but.. | For L3 U2U, we understand SA2 has agreed it, so it is fine to capture it in RAN2 TR.For L2 U2U, we understand SA2 has not finally agreed it. The wording in “conclusion” of SA2 TR is just “it is recommended”:* *For L2 UE-to-UE Relay discovery, both Model A and Model B are supported. It is recommended that Relay discovery is integrated into the PC5 unicast link establishment procedure.*

To avoid unnecessary discussion, we are fine to capture it also in L2 U2U section, but we should make it clear that it is finally SA2 to conclude whether it is adopted although it is captured in RAN2 TR. |
| Ericsson | Yes | Since SA2 has already made conclusion to support integrated procedure, there is no point to misaligned with SA2. In addition, the discovery procedure is within SA2 scope, RAN2 can just follow SA2 recommendation. |
| Sony | Yes |  |
| Spreadtrum | Yes |  |
| InterDigital | Yes | We should align with SA2 |
| OPPO | No | First of all we think this has nothing to do with AS layer procedure hence it is not necessary to capture in RAN2 TR. Secondly the sentence “*Relay discovery is integrated into the PC5 unicast link establishment procedure*” is not clear as such that it refers to solution of discovery procedure itself or it means discovery should be done before PC5 link establishment. Finally SA2’s text could be updated because SA2 may discuss this again at next meeting. |
| Huawei | No strong view | Adding SA2 reference should be sufficient. |
| MediaTek | Yes |  |
| Xiaomi | No | We feel it’s out of RAN2 discussion |
| Nokia | No | We are a bit hesitant to see the urgent need to mix PC5 link establishment procedure with relay discovery for L2 U2U relay as both procedures are for different purposes. The SA2 statement is a bit vague not providing any details on how to integrate one procedure into another one (which btw is RAN2 topic), e.g. is it optional (as SA2 says recommended) or does it mean that non SL-relay capable but NR SL capable UEs are excluded from this procedure ? Since it is not clarified how the procedure is defined it should not be captured in TR38.836 now.However, we want to note that we are open to discuss the integration of both procedures.  |
| vivo | Yes | We should keep alignment with SA2 conclusions.Additionally, if we don’t capture it in the RAN2 TR, it may be misleading that relay discovery integrated into the PC5 unicast link establishment procedure is not supported but only mode A/B is. |
| Sharp | Yes |  |
| Intel | Yes | We have similar view as Qualcomm, i.e. we can capture that it is finally up to SA2 to conclude |
| ETRI | Yes |  |
| Samsung | Yes with comment | Since this discovery procedure for U2U relay is up to SA2, RAN2 should follow what SA2 agrees. |
| Philips | Yes but | We can add an EN in section 5.2 of TR 38.836 stating: Integration of Relay discovery into the PC5 unicast link establishment procedure for L2 and L3 is pending SA2 normative work. |
| ZTE | Yes | Agree with Qualcomm. In this phase, we can just keep aligned with SA2. |
| ASUSTeK | No | We share the same view with Huawei. |
| Apple | No | Agree with OPPO. The procedure is not a discovery procedure. It is an optimization for the link setup steps after U2U relay discovery. |
| LG | Yes | Agree with Qualcomm’s opinion. |
| CATT | Yes | Adding SA2 reference is enough. |
| Lenovo&MM | Yes |  |

Based on the SA2 reply LS [30], SA2 agree that direct discovery message will be taken as new ignaling in ProSe layer separately from PC5-S ignaling. ProSe layer will indicate to AS layer whether the ignaling is discovery message or PC5-S signaling.

Hence [5][9][18] propose that according to SA2’s reply, the protocol stack for discovery message is Discovery/PDCP/RLC/MAC/PHY, which is shown in the following Figure-1:



**Figure-1 Sidelink discovery protocol stack**

However, [8] and [22] point that in the latest SA2 spec TR 23.752[2], the related descriptions are as below:

# **8 Conclusions**

Editor's note: This clause will list conclusions that have been agreed during the course of the study item activities.

**8.1 Key Issue #1: ProSe Direct discovery**

For Key Issue #1 (ProSe Direct discovery), the following aspects are concluded:

- For discovery procedure over PC5 for commercial services and public safety, both model A and model B as defined in TS 23.303 [9] are recommended to be standardized.

NOTE 1: Mechanism for discovering a UE-to-Network Relay and UE-to-UE Relay can be concluded in KI#3 and KI#4.

- PC5 communication channel is used to carry the discovery message over PC5 and discovery message over PC5 is differentiated with other PC5 messages by AS layer.

NOTE 2: Whether PC5-S signalling or any other new signalling in upper layer is used will be decided during the normative phase based on the protocol stack and the message structures/formats to be defined for PC5 direct discovery.

According to the above descriptions marked with yellow, SA2 has not decided whether it is PC5-S signalling or any other new signalling in upper layer, the detailed design will be decided during the normative phase. Hence, [8] and [22] suggests leaving it to WI phase. In addition, [8] also suggests to send LS for further clarification on whether the discovery message is a new PC5-S signalling or a new type of signalling different from PC5-S.

**Q2-4: Do companies agree to update TR 38.836 to clarify that the sidelink discovery protocol stack depends on SA2?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| Qualcomm  | Yes |  |
| Ericsson | No | According to the SA2 LS, RAN2 can decide the discovery protocol stack. i.e., as shown in Figure 1.  |
| Sony | yes |  |
| Spreadtrum | Yes |  |
| InterDigital | Yes |  |
| OPPO | No | We share Ericsson’s view |
| Huawei | No strong view | 38.836 is not specification. It is just R2 TR. Do we really need to make it 100% clear in case not conclusion in SA2 yet? |
| MediaTek | Yes |  |
| Xiaomi | Yes |  |
| Nokia | No | The statement above that “SA2 has not decided whether it is PC5-S signalling or any other new signalling in upper layer, the detailed design will be decided during the normative phase.” is incorrect – the LS from SA2 (already received by RAN2) is very clear and therelay discovery protocol stack is exactly as in Fig. 1. |
| vivo | Yes | No matter it is PC5-S signalling or any other new signalling, it is not decided yet and up to SA2 normative phase, which is clear from both LS and TR 23.752. So we can simply indicate this in the TR to clarify that the sidelink discovery protocol stack depends on SA2. |
| Sharp | Yes |  |
| Intel | Yes |  |
| Samsung | No | It is clear that direct discovery message is a new signalling in ProSe layer separately from PC5-S signalling from the SA2 LS. So the figure 1 is expected protocol stack for direct discovery message. |
| Philips | Yes | We should include figure 1 and update the second sentence of section 4.2 in TR 38.836; “The protocol stack of discovery message is as shown in figure 1. The signalling protocol used for the discovery is to be defined by SA2 during normative phase” |
| ZTE | No | RAN2 shall only consider the SA2 reply LS, which mentions that direct discovery message will be taken as new signalling in ProSe layer separately from PC5-S signalling. |
| ASUSTeK | No | We share the same view with Huawei. |
| Apple | No |  |
| LG | No | It’s better waiting the SA2’s decision. |
| CATT | Yes |  |
| Lenovo&MM | Yes | The protocol stack for the discovery message should be clear at the stage of SI.  |

Regarding to the sidelink discovery resource pool design, one possible method is to adopt a shared resource pool for sidelink discovery. With the shared resource pool, Contributions [5][10] discussed how to identify the discovery messages. In [5], it preferred not to introduce dedicated destination ID for discovery message.

|  |
| --- |
| Proposal 6: for shared resource pool, not to introduce dedicated destination ID for discovery message. |

While in [10], the following three options were provided:

* Option 1: Phy layer indication. For example, the UE could use one of the reserved bits in the SCI to indicate the presence of the discovery message.
* Option 2: Dedicated L1/L2 destination ID for discovery message. Specifically, SA2 would need to set aside a dedicated L2 destination ID for discovery message. This solution is feasible as long as SA2 does not plan to transmit discovery message with different existing L2 IDs (e.g. the L2 ID associated with the service).
* Option 3: A new L1 destination ID for discovery message. Specifically, AS may reserve a new L1 ID for the indication of a discovery message. In this case, the UE needs an alternative way convey the actual L2 destination ID. A new MAC header can be designed to convey the full L2 destination ID.

And either an explicit indication in SCI or by introducing a reserved L1 destination ID was preferred.

|  |
| --- |
| Proposal 4: For shared resource pool, discovery message can be identified with either an explicit indication in SCI, or by introducing a reserved L1 destination ID. |

**Q2-5: Do companies agree that whether the discovery message should be identified in L1 in case of shared resource pool should be discussed in SI phase?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| Qualcomm | No | We think since discovery message can be identified via LCID, it is an optimization with RAN1 impact. Considering we don’t have RAN1 TU, we prefer to focus on basic functionality.  |
| Ericsson | No | Since the options may have RAN1 impacts, it is not possible to address the issue by RAN2 without checking RAN1 during the last SI meeting, therefore, RAN2 shall postpone discussions to WI phase. |
| Sony | No | We think this is a WI issue. |
| Spreadtrum | No |  |
| InterDigital | No | We think this can be discussed in the WI phase. |
| OPPO | No | Agree with Qualcomm |
| Huawei | No | Agree with QC |
| MediaTek | No | We share same view with Ericsson. |
| Xiaomi | No | This is an enhancement. |
| Nokia | No | First of all as some companies already noted: RAN1 has no TU for SL relay and RAN2 should not offload this issue to RAN1. Secondly we discussed quite extensively the various option how to differentiate discovery message within L2. To our understanding discovery message is carried over new sidelink signalling radio bearer and gets a new LCID. |
| vivo | No | The exact design of discovery signal transmission should be determined in WI phase. |
| Sharp | No | It can be left to WI. |
| Intel | No | We also think this detail can be discussed in the WI phase |
| ETRI | No |  |
| Samsung | No | This can be discussed in WI phase with RAN1 consultant. |
| Philips | No | Agree with Ericsson |
| ZTE | No | We are not sure why L1 shall identify discovery message. It has impacts on RAN1. Considering there is no RAN1 TU, it is unnecessary to discuss this issue in SI phase. |
| ASUSTeK | No | We share the same view with Qualcomm. |
| Apple | No | RAN2 can rule out this L1 approach. We think the current solution with new Logical channel is sufficient. |
| LG | No | we agree with Ericsson  |
| CATT | No |  |
| Lenovo&MM | No | Only one of the shared resource pool and separate resource pool is supported. If the shared resource pool is finally supported, it is better not to impact the physical layer.  |

**Q2-6: If the answer of Q2-5 is Yes, which option do companies prefer?**

* **Option 1: the discovery message should be identified in L1;**
* **Option 2: the discovery message should not be identified in L1.**

|  |  |  |
| --- | --- | --- |
| Company | Option | Comment |
|  |  |  |
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|  |  |  |
|  |  |  |
|  |  |  |

In RAN2#111-e meeting, agreement has been made that LTE principle can be reused for relay UE in IDLE/INACTIVE state to decide whether it is allowed to transmit/receive discovery message.

But in the TR38.836 [1], according to the yellow part, it means both the minimum and maximum Uu thresholds need to be satisfied if gNB provided. The UE behaviour is unclear in the case only one threshold is configured or both are not configured. The LTE principle is not correctly captured.

|  |
| --- |
| For Relay UE of UE-to-Network Relay, - The Relay UE needs to be within a minimum and a maximum Uu signal strength threshold(s) if provided by gNB before it can transmit discovery message when in RRC\_IDLE or in RRC\_INACTIVE state.  |

Contributions [8] proposed that TR should be modified to correctly reflect the agreement reached on RAN2#111-e meeting.

|  |
| --- |
| Proposal 6: Modify the TR 38.836 to correctly reflect the agreement reached on RAN2#111-e meeting. |

**Q2-7: Do companies agree to update the description in TR 38.836 to correctly reflect the agreement reached on RAN2#111-e meeting?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| Qualcomm | No | We think the current TR is clear and correct. We understand the concern is optionality of these two thresholds. However, “if provided by gNB” somehow makes it clear at least in stage 2 level.In addition, we tend to think the suggested change (i.e. modified to “respect”) is even more confusing. The wording of “respect” is seldomly used in specification. If Rapporteur really want to clarify, we suggest to only add “same as LTE”, i.e. “Same as LTE, The Relay UE needs to be within a minimum and/or a maximum Uu signal strength threshold(s) if provided by gNB before it can transmit discovery message when in RRC\_IDLE or in RRC\_INACTIVE state. |
| Ericsson | No | The current texts in the TR are already sufficient.  |
| Sony | No |  |
| Spreadtrum | No |  |
| InterDigital | No |  |
| OPPO | No | This is raised mainly due to optionality of IE which is a stage3 issue and we think current text in TR is good enough. |
| Huawei  | No |  |
| MediaTek | No |  |
| Xiaomi | No |  |
| Nokia | No |  |
| vivo | No |  |
| Sharp | No |  |
| Intel | No | The current TR text seems clear to us |
| ETRI | Yes |  |
| Samsung | No | We do not see any critical issue on the current TR text. The detail configurations can be discussed in WI phase. |
| Philips | No | Philips |
| ZTE | No | We think the current TR is clear with “if provided by gNB” . |
| ASUSTeK | No |  |
| Apple | No | It is already clear. |
| LG | No |  |
| CATT | Yes |  |
| Lenovo&MM | No |  |

**Q2-8: If the answer of Q2-7 is Yes, do compaines agree the following revision? If not agree, please give your preferred description.**

|  |
| --- |
| For Relay UE of UE-to-Network Relay, - The Relay UE needs to ~~be within~~ respect a minimum and/or a maximum Uu signal strength threshold(s) if provided by gNB before it can transmit discovery message when in RRC\_IDLE or in RRC\_INACTIVE state.  |

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| CATT | Yes |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

## 3.3 Questions for Issues can be left to WI stage

For the contents of discovery message, contribution [6] discussed this question. It thinks that Cell ID of the serving cell of candidate relay UE is useful for L2 U2N relay, and relay’s PLMN ID is also useful for L2 relays during the relay (re)selection procedure to select a relay UE in allowed PLMNs. Hence it is proposed in [6]:

Proposal 2: Include relay’s serving cell ID and PLMN ID in discovery message for both L3 and L2 relay.

Considering only one company raises this question, and it is the last meeting for this study item, it is proposed the detailed design of the discovery message can be left to WI phase.

**Q3-1: Do compaines agree that the details of the discovery message design can be postponed to WI phase?** **If not agree, Please give the necessary and sufficient reasons for discussion in SI stage.**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| Qualcomm | Yes | We are fine to leave it to WI phase, although we think serving cell ID and PLMN ID are important to be included in discovery.  |
| Ericsson | Yes |  |
| Sony | Yes |  |
| Spreadtrum | Yes |  |
| InterDigital | Yes |  |
| OPPO | Yes |  |
| Huawei | Yes |  |
| MediaTek | Yes |  |
| Xiaomi | Yes |  |
| Nokia | Yes |  |
| vivo | Yes |  |
| Sharp | Yes |  |
| Intel | Yes | Ok to leave this to the WI phase, but we think it would be useful to agree to some baseline detail which most companies can agree upon, e.g. serving cell ID |
| ETRI | Yes |  |
| Samsung | Yes |  |
| Philips | Yes |  |
| ZTE | Yes |  |
| ASUSTeK | Yes |  |
| Apple | Yes |  |
| LG | Yes |  |
| CATT | Yes |  |
| Lenovo&MM | Yes |  |

Further, in [5], it is suggested to reuse Rel-16 PHY solution to transmit discovery message and no enhancement on RAN1 aspects are needed in principle:

|  |
| --- |
| Proposal8: For separate resource pool, reuse Rel16 PHY solution to transmit discovery message and no enhancement on RAN1 aspects are needed in principle. |

Since only one company provided the view on it and this is detail of discovery message transmission, rapporteur suggests the details can be discussed in the WI phase.

**Q3-2: Do compaines agree that for separate resource pool, the detail of discovery message transmission can be postponed to WI phase? If not agree, Please give the necessary and sufficient reasons for discussion in SI stage.**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| Qualcomm | Yes |  |
| Ericsson | Yes |  |
| Sony | Yes |  |
| Spreadtrum | Yes |  |
| InterDigital | Yes |  |
| OPPO | see comment | we feel to have some basic principle like proposal above could help reduce the work load in WI phase |
| Huawei | Yes |  |
| MediaTek | Yes |  |
| Xiaomi | Yes |  |
| Nokia | Yes |  |
| vivo | Yes |  |
| Sharp | Yes |  |
| Intel | Yes |  |
| ETRI | Yes |  |
| Samsung | Yes |  |
| Philips | Yes |  |
| ZTE | Yes |  |
| ASUSTeK | Yes |  |
| Apple | Yes |  |
| LG | Yes |  |
| CATT | Yes |  |
| Lenovo&MM | Yes |  |

Contributions [9][10] discussed logical priority of discovery message. In [9], it is suggested to configure a dedicated priority value for discovery message:

|  |
| --- |
| Proposal 4: RAN2 is suggested to configure a dedicated priority value for discovery message which can be different from other SL SRBs. |

In [10], it is suggested to use non-fixed priority for discovery message:

|  |
| --- |
| Proposal 5: Non-fixed priority for the discovery LCID is supported for the shared pool scenario. Details can be discussed in the WI phase.Proposal 9: Non-fixed priority for the discovery LCID is supported for the dedicated resource pool scenario. Details can be discussed in the WI phase. |

Since only 2 companies provided the view on this issue, and logical priority of discovery message is too detail for study item, hence, rapporteur suggests to postpone it to the WI phase.

**Q3-3: Do compaines agree that the logical priority of discovery message can be postponed to WI phase? If not agree, Please give the necessary and sufficient reasons for discussion in SI stage.**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| Qualcomm | See comments | We think it should be straight forward because SA2 has agreed to specify a new signalling different from PC5-S for discovery and RAN2 agreed to introduce a new SL-SRB and LCID. And it can further help separate the radio resources management for discovery, existing SL SRB (PC5-S and/or PC5-RRC), and other communication traffic. We don’t see any reason to specify a fixed logical priority for discovery.From progress, we can follow majority if majority prefers to discuss it in WI phase. |
| Ericsson | Yes |  |
| Sony | Yes |  |
| Spreadtrum | Yes |  |
| InterDigital | Yes |  |
| OPPO | Yes |  |
| Huawei | Yes |  |
| MediaTek | Yes |  |
| Xiaomi | Yes |  |
| Nokia | Yes |  |
| vivo | Yes |  |
| Sharp | Yes |  |
| Intel | Yes with comment | From flexibility point of view, we prefer to have a non-fixed priority for discovery, but we are also fine to delay this discussion to WI phase. |
| ETRI | Yes |  |
| Samsung | Yes |  |
| Philips | Yes |  |
| ZTE | Yes |  |
| ASUSTeK | Yes |  |
| Apple | Yes |  |
| LG | Yes |  |
| CATT | Yes |  |
| Lenovo&MM | Yes |  |

Contribution [10] proposed that for L2 relay UE, relay load can be used as a criteria for whether to transmit discovery messages.

|  |
| --- |
| Proposal 2: For L2 relay UE, relay load is used as a criteria for whether to transmit discovery messages. |

Contribution [5] proposed that once remote UE is triggered to do relay reselection, then it should be allowed to transmit discovery message for discovery model B. And it is actually general correct for both UE-to-UE relay and UE-to-Network relay, for both L3 and L2 solutions. The following is the proposal verbatim from the paper:

Proposal2: when remote UE is triggered to reselect relay, it should be allowed to transmit discovery message.

[21] proposed that the RLF should be used to triggered to transmit/receive the discovery message for U2N relay.

|  |
| --- |
| Proposal 6: The remote UE is triggered to transmit/receive the discovery message when the remote UE declares the sidelink RLF in the L2/L3 U2N relay case. |

In [23] proposed that relay-UE may perform the discovery procedure, only if the QoS requirements of the relay service can be fulfilled, based on the information obtained from gNB.

|  |
| --- |
| Proposal 7: gNB may indicate the services, whose QoS requirements can be fulfilled by sidelink relay, to the serving relay-UEs.Proposal 8: A relay-UE may perform the discovery procedure, only if the QoS requirements of the relay service can be fulfilled, based on the information obtained from gNB. |

Rapporteur think that [10] [21] [23] are all enhancements based on the current triggers. Considering the deadline of this SI, these proposals should be postponed to WI phase.

**Q3-4: Do compaines agree that the additional triggers/conditions for transmitting the sidelink discovery message in case of U2N relay can be postponed to WI phase? If not agree, Please give the necessary and sufficient reasons for discussion in SI stage.**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| Qualcomm | Yes |  |
| Ericsson | Yes | RAN2 has already made agreements that additional AS criteria shall be discussed during WI phase. |
| Sony | Yes |  |
| Spreadtrum | Yes |  |
| InterDigital | Yes |  |
| OPPO | Yes with comment | The proposal2 from [5] is however a general rule missed before which should be discussed at this meeting |
| Huawei | Yes |  |
| MediaTek | Yes |  |
| Xiaomi | Yes |  |
| Nokia | Yes | According to our understanding the question includes also discovery message for relay reselection. |
| vivo | Yes |  |
| Sharp | Yes |  |
| Intel | Yes |  |
| ETRI | Yes |  |
| Samsung | Yes |  |
| Philips | Yes |  |
| ZTE | Yes |  |
| ASUSTeK | Yes |  |
| Apple | Yes |  |
| LG | Yes |  |
| CATT | Yes |  |
| Lenovo&MM | Yes |  |

Contibution [16] proposed PC5 signal strength to be a trigger to transmit or receive discovery message：

|  |
| --- |
| Proposal 1: For U2U relay, RAN2 to discuss whether relay UE or remote UE is allowed to transmit or receive discovery message can be based on PC5 signal strength.Proposal 2: In order to check whether the UE is allowed to transmit or receive discovery message, AS layer needs an indication from the upper layer to differentiate U2N relay and U2U relay |

Contribution [5] proposed that once remote UE is triggered to do relay reselection, then it should be allowed to transmit discovery message for discovery model B. And it is actually general correct for both UE-to-UE relay and UE-to-Network relay, for both L3 and L2 solutions. The following is the proposal verbatim from the paper:

Proposal2: when remote UE is triggered to reselect relay, it should be allowed to transmit discovery message.

Contibution [21] proposed the RLF (bewteen relay UE and receiving remote UE\between relay UE and sending remote UE) should be used to triggered to transmit/receive the discovery message for U2U relay.

|  |
| --- |
| Proposal 7: The remote UE should transmit/receive the discovery message when the sidelink RLF on the link between the relay UE and the receiving UE happens in the L2/L3 U2U relay case;Proposal 8: The remote UE is triggered to transmit/receive the discovery message when the remote UE declares the sidelink RLF in the L2/L3 U2U relay case; |

Rapporteur think that the above mechanisms are both enhancements based on the current triggers. Considering the deadline of this SI, these proposals should be postponed to WI phase.

**Q3-5: Do compaines agree tha the additional triggers/conditions for transmitting the sidelink discovery message in case of U2U relay can be postponed to WI phase? If not agree, Please give the necessary and sufficient reasons for discussion in SI stage.**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| Qualcomm | Yes |  |
| Ericsson | Yes | RAN2 has already made agreements that additional AS criteria shall be discussed during WI phase. |
| Sony | Yes |  |
| Spreadtrum | Yes |  |
| InterDigital | Yes |  |
| OPPO | Yes with comment | The proposal2 from [5] is however a general rule missed before which should be discussed at this meeting |
| Huawei | Yes |  |
| MediaTek | Yes |  |
| Xiaomi | Yes |  |
| Nokia | Yes |  |
| vivo | Yes |  |
| Sharp | Yes with comment | The P2 from [16] is not AS criteria. It is based on the assumption that the AS criteria for U2U relay and U2N relay will be different. |
| Intel | Yes |  |
| ETRI | Yes |  |
| Samsung | Yes |  |
| Philips | Yes |  |
| ZTE | Yes |  |
| ASUSTeK | Yes |  |
| Apple | Yes |  |
| LG | Yes |  |
| CATT | Yes |  |
| Lenovo&MM | Yes |  |

For the last meeting, below agreements were reached for the definition of non SL Relay Capable gNB.

RAN2#112-e agreements:

Proposal 9: L3 U2N relay UE is allowed to transmit discovery message based on at least pre-configuration when it is connected to a non\_SL Relay\_Capable gNB whose serving carrier is not shared with SL carrier. Detailed definition of non\_SL Relay\_Capable gNB can be left for WI phase but at least should include the case that the gNB does not provide SL relay configuration, e.g. no discovery configuration.

Contribution [24] has discussed that one left issue is handling of potential cases where the serving gNB is not sidelink-capable and scenario regarding gNB capability. The following are the proposals verbatim from the paper:

|  |
| --- |
| Proposal 1: RAN2 to confirm L2 sidelink relay capable gNB shall support NR Sidelink. NR sidelink capable gNB may not be able to support L2 sidelink relay.Proposal 2: L2 sidelink relay capable gNB can be identified by UE in AS.Proposal 3: In L2 relay, UE should not transmit discovery message using sidelink communication resource pool provided by sidelink capable gNB, which is not relay capable.Proposal 4: Capture these scenarios where L2 remote UE connects to Non relay capable gNB in TR and consider how to support relay discovery for L2 remote UE.Proposal 5: It’s FFS whether L3 sidelink relay capable gNB can be identified by UE in AS. |

Since it was agreed that the detailed definition of non SL Relay Capable gNB can be left for WI phase, hence the non SL Relay Capable gNB related issues should be postponed to WI phase.

**Q3-6: Do compaines agree that the Non SL Relay Capable gNB related issues can be postponed to WI phase (We follow previously reached agreement)? If not agree, Please give the necessary and sufficient reasons for discussion in SI stage.**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| Qualcomm | Yes |  |
| Ericsson | Yes |  |
| Sony | Yes |  |
| Spreadtrum | Yes |  |
| InterDigital | Yes |  |
| OPPO | Yes |  |
| Huawei | Yes |  |
| MediaTek | Yes |  |
| Xiaomi | Comments | We think the scenarios could be captured in TR to save discussion in WI. |
| Nokia | Yes |  |
| vivo | Yes |  |
| Sharp | Yes |  |
| Intel | Yes |  |
| ETRI | Yes |  |
| Samsung | Yes | As captured in the TR “The detailed definition of a gNB which is not capable of sidelink relay operation can be left for WI phase but at least should include the case that the gNB does not provide SL relay configuration, e.g., no discovery configuration” |
| Philips | Yes |  |
| ZTE | Yes |  |
| ASUSTeK | Yes |  |
| Apple | Yes |  |
| LG | Yes |  |
| CATT | Yes |  |
| Lenovo&MM | Yes |  |

In [10], some proposals on resource selection for discovery message were provided.

|  |
| --- |
| Proposal 6: For the shared pool scenario, NR V2X resource selection is re-used for transmission of discovery message by a mode 2 UE.Proposal 7: For the shared pool scenario, resource selection rules for the retransmission resource are used to ensure frequency diversity by a mode 2 UE. Details can be discussed in the WI phase. Proposal 8: For the shared pool scenario, the UE applies the same principle related to CBR for transmission of both discovery and data.Proposal 10: For the dedicated resource pool scenario, introduce a new resource selection mechanism for mode 2 UE in the dedicated discovery resource pool which supports 1) random resource selection, 2) TX-probability-based transmission 3) frequency hopping for discovery retransmission.Proposal 11: For the dedicated resource pool scenario, RAN2 assumes that discovery and data resources can occur in the same slot (on different resource pools)Proposal 12: In the dedicated pool scenario, RAN2 studies mechanisms to avoid latency incurred on discovery transmission caused by slot-level collision between discovery and data transmissions. |

Only one company provided the view on details of resource selection for discovery message. In the Rapporteur ‘s understanding, it can be left to WI phase.

**Q3-7: Do compaines agree that details of resource selection for discovery message can be postponed to WI phase? If not agree, Please give the necessary and sufficient reasons for discussion in SI stage.**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| Qualcomm | Yes |  |
| Ericsson | Yes |  |
| Sony | Yes |  |
| Spreadtrum | Yes |  |
| InterDigital | Yes |  |
| OPPO | Yes |  |
| Huawei | Yes |  |
| MediaTek | Yes |  |
| Xiaomi | Yes |  |
| Nokia | Yes |  |
| vivo | Yes |  |
| Sharp | Yes |  |
| Intel | Yes |  |
| Samsung | Yes |  |
| Philips | Yes |  |
| ZTE | Yes |  |
| ASUSTeK | Yes |  |
| Apple | Yes |  |
| LG | Yes |  |
| CATT | Yes |  |
| Lenovo&MM | Yes |  |

Contribution [11] discussed the security related issue with the below proposals:

1. It is unnecessary to apply security protection in PDCP, since DDNMF is already available to provide security protection for discovery message.
2. Disabling security protection in PDCP is beneficial to reduce PDCP processing time for delay critical public safety services.
3. RAN2 confirms that discovery messages can be protected via DDNMF, therefore security protection (i.e., ciphering and integrity protection) is not performed in PDCP for discovery.

Regarding security, Rapporteur think we should wait for more information from SA3 because security topic is in the charge of SA3, for this reason, it is suggested to discuss this topic in the WI phase.

**Q3-8: Do compaines agree that details of security can be postponed to WI phase? If not agree, Please give the necessary and sufficient reasons for discussion in SI stage.**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| Qualcomm | Yes |  |
| Ericsson | No | The security issue is one fundamental issue for discovery. It needs to be addressed during the SI phase. |
| Sony | Yes |  |
| Spreadtrum | Yes |  |
| InterDigital | Yes |  |
| OPPO |  | Basically we agree those observations and proposal. If RAN2 can easily confirm we can do it during this meeting. |
|  Huawei  | Yes |   |
| MediaTek | Yes |  |
| Xiaomi | Yes |  |
| Nokia | comment | We agree with Ericsson that security is a critical issue that needs to be clarified as soon as possible. However, as the rapporteur noted RAN2 may need some SA3 consultation to conclude on security – so it seems not feasible to finish security discussion within the SI phase.  |
| vivo | Yes |  |
| Sharp | Yes |  |
| Intel | Yes |  |
| ETRI | Yes |  |
| Samsung | See comment | We share the view from Ericsson that this issue is one fundamental for SL discovery. However we also understand this may need SA3 consultant. |
| Philips | Yes |  |
| ZTE | Yes |  |
| ASUSTeK | Yes |  |
| Apple | Yes | PDCP security for SL broadcast is not feasible. This needs upper layer work anyway, we cannot solve the problem in RAN2. |
| LG | Yes |  |
| CATT | Yes |  |
| Lenovo&MM | Yes |  |

# 4 Conclusion

Based on the discussion in section 3, the proposals of summary document of AI 8.7.3 can be updated as below:

**TBD**

# 5 References

1. TR 38.836 V1.0.0 Study on NR sidelink relay (Release 17)
2. TR 23.752 V0.7.0 Study on system enhancement for Proximity based Services(ProSe) in the 5G System (5GS) (Release 17)
3. Draft R2-20xxxxx - [606][Relay] discovery model and procedure\_summary
4. R2-2010661 Summary of [Post111-e][623][Relay]Remaining issues on relay discovery (rapporteur)
5. R[2-2100100](file:///C%3A%5CUsers%5Cxuhao%5CDesktop%5CPre%20R2-113%5CTdocs%5CR2-2100100.zip) Remaining issues of Relay discovery and (re)selection OPPO discussion Rel-17 FS\_NR\_SL\_relay
6. R[2-2100126](file:///C%3A%5CUsers%5Cxuhao%5CDesktop%5CPre%20R2-113%5CTdocs%5CR2-2100126.zip) Remaining issues on discovery and relay (re)selection Qualcomm Incorporated discussion Rel-17
7. R[2-2100152](file:///C%3A%5CUsers%5Cxuhao%5CDesktop%5CPre%20R2-113%5CTdocs%5CR2-2100152.zip) Proposal of items to be examined on discovery and relay (re-)selection for UE-to-UE relay in WI phase Mitsubishi Electric Co. discussion Rel-17
8. R[2-2100204](file:///C%3A%5CUsers%5Cxuhao%5CDesktop%5CPre%20R2-113%5CTdocs%5CR2-2100204.zip) Miscellaneouse Issues on Relay Discovery CATT discussion Rel-17 FS\_NR\_SL\_relay
9. R[2-2100308](file:///C%3A%5CUsers%5Cxuhao%5CDesktop%5CPre%20R2-113%5CTdocs%5CR2-2100308.zip) Discussion on remaining issues for sidelink discovery ZTE Corporation discussion
10. R[2-2100522](file:///C%3A%5CUsers%5Cxuhao%5CDesktop%5CPre%20R2-113%5CTdocs%5CR2-2100522.zip) Discovery Procedure for sidelink relay InterDigital discussion Rel-17 FS\_NR\_SL\_relay
11. R[2-2100533](file:///C%3A%5CUsers%5Cxuhao%5CDesktop%5CPre%20R2-113%5CTdocs%5CR2-2100533.zip) Remaining aspects for discovery Ericsson discussion Rel-17 FS\_NR\_SL\_relay R2-2009228
12. R[2-2100624](file:///C%3A%5CUsers%5Cxuhao%5CDesktop%5CPre%20R2-113%5CTdocs%5CR2-2100624.zip) On SL discovery for relaying Intel Corporation Intel discussion Rel-17 FS\_NR\_SL\_relay
13. R[2-2100658](file:///C%3A%5CUsers%5Cxuhao%5CDesktop%5CPre%20R2-113%5CTdocs%5CR2-2100658.zip) Discussion on remaining issues on relay discovery Spreadtrum Communications discussion Rel-17 FS\_NR\_SL\_relay
14. R[2-2100707](file:///C%3A%5CUsers%5Cxuhao%5CDesktop%5CPre%20R2-113%5CTdocs%5CR2-2100707.zip) Relay reselection based on discovery Kyocera discussion Rel-17
15. R[2-2100726](file:///C%3A%5CUsers%5Cxuhao%5CDesktop%5CPre%20R2-113%5CTdocs%5CR2-2100726.zip) Relay discovery considerations Kyocera discussion Rel-17
16. R[2-2100804](file:///C%3A%5CUsers%5Cxuhao%5CDesktop%5CPre%20R2-113%5CTdocs%5CR2-2100804.zip) Discussion on sidelink relay discovery SHARP Corporation discussion
17. R[2-2100868](file:///C%3A%5CUsers%5Cxuhao%5CDesktop%5CPre%20R2-113%5CTdocs%5CR2-2100868.zip) Discussion on remaining issues on relay discovery Apple discussion Rel-17 FS\_NR\_SL\_relay
18. R[2-2100924](file:///C%3A%5CUsers%5Cxuhao%5CDesktop%5CPre%20R2-113%5CTdocs%5CR2-2100924.zip) Protocol stack for discovery message Samsung Electronics discussion Rel-17 FS\_NR\_SL\_relay
19. R[2-2100925](file:///C%3A%5CUsers%5Cxuhao%5CDesktop%5CPre%20R2-113%5CTdocs%5CR2-2100925.zip) Clarification on AS layer differentiation for discovery message Samsung Electronics discussion Rel-17 FS\_NR\_SL\_relay
20. R[2-2100926](file:///C%3A%5CUsers%5Cxuhao%5CDesktop%5CPre%20R2-113%5CTdocs%5CR2-2100926.zip) Discovery configuration for Remote UE out of coverage Samsung Electronics discussion Rel-17 FS\_NR\_SL\_relay
21. R[2-2101108](file:///C%3A%5CUsers%5Cxuhao%5CDesktop%5CPre%20R2-113%5CTdocs%5CR2-2101108.zip) Relay Discovery in L2 and L3 relay case Lenovo, Motorola Mobility discussion Rel-17
22. R[2-2101181](file:///C%3A%5CUsers%5Cxuhao%5CDesktop%5CPre%20R2-113%5CTdocs%5CR2-2101181.zip) Remaining issues of sidelink relay discovery procedure vivo discussion Rel-17
23. R[2-2101211](file:///C%3A%5CUsers%5Cxuhao%5CDesktop%5CPre%20R2-113%5CTdocs%5CR2-2101211.zip) UE-to-Nwk Relay Discovery and (Re)selection for Path Switching in SL Relay Nokia, Nokia Shanghai Bell discussion Rel-17 FS\_NR\_SL\_relay
24. R[2-2101597](file:///C%3A%5CUsers%5Cxuhao%5CDesktop%5CPre%20R2-113%5CTdocs%5CR2-2101597.zip) Discussion on relay discovery regarding non SL relay capable gNB Xiaomi communications discussion
25. R[2-2101624](file:///C%3A%5CUsers%5Cxuhao%5CDesktop%5CPre%20R2-113%5CTdocs%5CR2-2101624.zip) Relay discovery and (re)selection CMCC discussion Rel-17 FS\_NR\_SL\_relay
26. R[2-2101783](file:///C%3A%5CUsers%5Cxuhao%5CDesktop%5CPre%20R2-113%5CTdocs%5CR2-2101783.zip) Discussion on the discovery procedure Huawei, HiSilicon discussion Rel-17 FS\_NR\_SL\_relay
27. R2-2010693 LS on SA2 progress on UE-to-Network Relay and UE-to-UE Relay (S2-2007945; contact: OPPO) SA2 LS in Rel-17 FS\_5G\_ProSe To:RAN2, SA3
28. S2-2008296 Interim conclusion for L3 UE-to-Network Relay solutions for Key Issue#3
29. S2-2008298 KI#3: Evaluation for KI#3 on L2 UE-to-Network Relay
30. R2-2100070 Reply LS to Reply LS on Direct Discovery and Relay (S2-2009229; contact: OPPO) SA2 LS in Rel-17 FS\_5G\_ProSe To:RAN2