3GPP TSG-RAN WG2 #114-e Tdoc R2-21xxxxx

**Electronic Meeting, May 19 – 27, 2021**

Agenda Item: 8.7.2

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Document for: Discussion, Decision

# Introduction

This contribution is to summary all tdocs falls into agenda item 8.7.2 related to NR sidelink relay discovery.

# Discussion

## High-priority issues

### Discovery configuration

For the case that relay/remote UE in RRC IDLE/INACTIVE state, and in-coverage on the serving frequency, depending on the relationship between serving frequency and frequency to perform sidelink relay service, scenarios can be further categorized as per some companies’ suggestion:

* If there is discovery related SIB broadcasted on the serving frequency, and if the configuration of concerned frequency is included within the SIB of the serving frequency but the Tx resource pool configuration is absent, UE shall access into RRC CONNECTED state to acquire dedicated configuration on Tx resource pool.
* If the serving frequency is not shared with SL frequency and the configuration of concerned frequency is absent within the SIB of the serving frequency or if there is no discovery related SIB on the serving frequency, and if there is Uu deployed at the concerned frequency, UE shall rely on the discovery related SIB, if any, broadcasted in the SL frequency. Or if there is no related SIB broadcasted, SL discovery is not allowed.
* If the serving frequency is not shared with SL frequency and the configuration of concerned frequency is absent within the SIB of the serving frequency or if there is no discovery related SIB on the serving frequency, and if there is no Uu deployed at the concerned frequency, UE shall rely on pre-configuration.
* If the serving frequency is shared with SL frequency and if there is no discovery related SIB broadcasted on the serving frequency, UE does not perform SL discovery transmission/reception on the concerned frequency.

**Proposal 1a: RAN2 agree that for relay/remote UE in RRC IDLE/INACTIVE state, and in-coverage on the serving frequency:**

* **If there is discovery related SIB broadcasted on the serving frequency, and if the configuration of concerned SL frequency is included within the SIB of the serving frequency but the Tx resource pool configuration is absent, UE shall enter RRC CONNECTED state to acquire dedicated configuration on Tx resource pool.**

**Proposal 1b: RAN2 agree that for relay/remote UE in RRC IDLE/INACTIVE state, in-coverage on the serving frequency, and the serving frequency is not shared with concerned frequency, if the configuration of concerned SL frequency is absent within the SIB of the serving frequency or if there is no discovery related SIB on the serving frequency**

* **If there is Uu deployed at the concerned SL frequency, UE shall 1) rely on the discovery related SIB, if any broadcasted in the concerned SL frequency; Or 2) if there is no discovery related SIB on the concerned SL frequency, UE does not perform SL discovery transmission/reception on the concerned frequency.**
* **If there is no Uu deployed at the concerned frequency, UE shall rely on pre-configuration.**

**Proposal 1c: RAN2 agree that for relay/remote UE in RRC IDLE/INACTIVE state, in-coverage on the serving frequency，if the serving frequency is shared with concerned SL frequency**

* **If there is no discovery related SIB broadcasted on the serving carrier, UE does not perform SL discovery transmission/reception on the concerned frequency.**

Also, most companies agree to reuse legacy principle that when sidelink UE access into RRC CONNECTED state and is in coverage on the serving frequency, it can only use the SL Tx resource configuration provided via dedicated configuration.

**Proposal 2: RAN2 agree that RRC\_CONNECTED relay/remote UE which are in-coverage on the serving frequency, can only use the SL discovery Tx resource configuration provided by dedicated signalling if provided, or not transmit discovery if it is not provided.**

In the contributions, majority companies mentioned that for L2 remote UE which is out-of-coverage, if the remote UE has already set up the relay link, then it can acquire network configuration via relay link. In this case, remote UE shall firstly try to acquire network configuration, i.e., SIB or dedicated configuration, if it is existing. Otherwise, remote UE shall follow pre-configuration.

**Proposal 3a: RAN2 agree that for L2 remote UE which is out-of-coverage, but connected to network via a relay UE (i.e., either in RRC CONNECTED or RRC IDLE/INACTIVE), it should follow network configuration, i.e., SIB or dedicated signalling, if available; Otherwise, it uses pre-configured SL discovery configuration.**

**Proposal 3b: RAN2 confirm for L2 remote UE which is out-of-coverage, and has not connected to network directly or via a relay UE (i.e., neither RRC\_CONNECTED nor RRC\_IDLE/INACTIVE), it can rely on pre-configuration.**

On the other hand, companies also show their views on the similar scenario for L3 remote UE. For L3 remote UE which is out-of-coverage, no matter whether the remote UE is connecting to a relay UE, network cannot be aware of the existence of this remote UE, where it is different compared to L2 relay. Therefore, remote UE cannot acquire network configuration from relay link, then only pre-configuration can be applied.

**Proposal 4: RAN2 agree that for L3 remote UE which is out-of-coverage, and has not connected to network directly or via a relay UE (i.e., neither RRC\_CONNECTED nor RRC\_IDLE/INACTIVE), it should follow pre-configuration.**

The scenario for P1/2/3/4 are summarized using the table below

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| P | L2/3 relay/remote UE | RRC state | coverage status | shared carrier or cross-carrier case | SIB status on serving carrier | SIB status on SL carrier | UE behaviour |
| 1a | relay/remote UE | RRC IDLE/INACTIVE state | in-coverage on the serving frequency | (for both cases where serving frequency is shared with SL frequency, and not shared with SL frequency) | there is discovery related SIB broadcasted on the serving frequency and if the configuration of concerned SL frequency is included within the SIB of the serving frequency and the Tx resource pool configuration is absent |  | UE shall enter RRC CONNECTED state to acquire dedicated configuration on Tx resource pool |
| 1b | the serving frequency is not shared with concerned frequency | if there is no discovery related SIB on the serving frequency If the configuration of concerned SL frequency is absent within the SIB of the serving frequency or if there is no discovery related SIB on the serving frequency | if there is discovery related SIB broadcasted in the concerned SL frequency | UE shall rely on the discovery related SIB broadcasted in the concerned SL frequency |
| if there is no discovery related SIB on the concerned SL frequency | UE does not perform SL discovery transmission/reception on the concerned frequency |
| if there is no Uu deployed at the concerned frequency, | UE shall rely on pre-configuration |
| 1c | if the serving frequency is shared with concerned SL frequency | f there is no discovery related SIB broadcasted on the serving carrier |  | UE does not perform SL discovery transmission/reception on the concerned frequency |
| 2 | relay/remote | RRC\_CONNECTED | in-coverage on the serving frequency, |  |  |  | UE can only use the SL discovery Tx resource configuration provided by dedicated signalling |
| 3a | L2 remote UE | RRC\_CONNECTED, RRC\_IDLE or RRC\_INACTIVE | out-of-coverage, but connected to network via a relay UE (i.e., either in RRC\_CONNECTED or RRC\_IDLE/INACTIVE) |  |  |  | it should follow network configuration, i.e., SIB or dedicated signalling, if available; Otherwise, it sues pre-configured SL discovery configuration |
| 3b | - | out-of-coverage, and has not connected to network directly or via a relay UE (i.e., neither RRC\_CONNECTED nor RRC\_IDLE/INACTIVE) |  |  |  | it can rely on pre-configuration |
| 4 | L3 remote UE | - | out-of-coverage, and has not connected to network directly or via a relay UE (i.e., neither RRC\_CONNECTED nor RRC\_IDLE/INACTIVE) |  |  |  | it should follow pre-configuration |

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| Tdoc Num | Involved Proposals | Source |
| R2-2105740 | Proposal 5: In L2 U2N relay, RRC\_IDLE or RRC\_INACTIVE remote UE, which is out of coverage, can perform discovery transmission based on the discovery configuration in the SIB of gNB received via relay UE.  Proposal 6: In L2 U2N relay, RRC\_CONNECTED remote UE, which is out of coverage, should perform discovery transmission based on the discovery configuration in dedicated signalling received from gNB via relay UE.  Proposal 4: For Relay UE (both L2 and L3) and remote UE (both L2 and L3), the discovery configuration to be used (i.e. dedicated signalling, SIB or pre-configuration) follows the same principle of Rel-16 NR sidelink UE on which configuration to use for Tx RP, when the gNB is capable of sidelink relay operation, i.e.:  Relay UE and remote UE apply pre-configuration, when the sidelink carrier for discovery message transmission is neither the serving carrier of gNB nor included in SIB, and there is no Uu deployment at the sidelink carrier;  Relay UE and remote UE enters RRC\_CONNECTED state to request dedicated discovery configuration when sidelink carrier is either the serving carrier of gNB or included in SIB without Tx RP:  In this case, UE is not allowed to perform discovery message if dedicated discovery configuration is not provided;  Otherwise, UE uses the dedicated discovery configuration to transmit discovery message.  Proposal 3: Relay UE (both L2 and L3) and remote UE (both L2 and L3) are not allowed to transmit discovery when connecting to a gNB which is not capable of sidelink relay operation, in case its serving carrier is shared with carrier for sidelink operation. | Huawei |
| R2-2104869 | Proposal 6: For L2 remote UE out of coverage, the remote UE follows the discovery configuration from network (e.g. dedicated configuration) if the remote UE is RRC\_CONNECTED via a relay UE. | InterDigital |
| R2-2104892 | Proposal 7: Layer 2 out-of-coverage remote UE but connected to a relay UE should follow network configuration if exists.  Proposal 8: Layer 3 out-of-coverage remote UE but connected to a relay UE should use pre-configuration for transmission/reception of discovery message.  Proposal 1: If there is relay related SIB, and the concerned frequency is included within the SIB, but the Tx resource pool configuration is absent, remote UE, shall access into RRC connected state to acquire dedicated configuration on Tx resource pool.  Proposal 2: If there is relay related SIB, but the configuration of concerned frequency is not included within the SIB and if there is Uu deployed at the concerned frequency, remote UE, shall rely on the relayed related SIB, if any, broadcasted in the concerned frequency.  Proposal 3: If there is relay related SIB, but the configuration of concerned frequency is not included within the SIB and if there is no Uu deployed at the concerned frequency, remote UE, shall rely on pre-configuration.  Proposal 4: If there is Uu deployment but no relay related SIB broadcasted on a frequency, remote UE does not perform discovery transmission / reception on the concerned frequency.  Proposal 5: If there is neither relayed-related SIB nor Uu deployment on the concerned frequency, remote UE shall rely on pre-configuration.  Proposal 6: If there is relay related SIB, and the concerned frequency is included within the SIB, but the Rx resource pool configuration is absent and if there is Uu deployed at the concerned frequency, remote UE shall rely on the Rx pool configuration from relayed related SIB, if any, broadcasted in the concerned frequency. | OPPO |
| R2-2104958 | If the discovery configuration provided by the gNB is available for a L2/L3 remote UE, the remote UE should follow this discovery configuration instead of the pre-configuration. Otherwise, the remote UE can just follow the pre-configuration.  If the discovery configuration provided by the gNB is available for a L2/L3 remote UE, the remote UE should follow this discovery configuration instead of the pre-configuration. Otherwise, the remote UE can just follow the pre-configuration. | Vivo |
| R2-2104976 | Proposal 7: The out-of-coverage L2 remote UE can use the network configuration for discovery if it is connected to SL-capable gNB. Otherwise, it should use pre-configured SL discovery configuration.  Proposal 6: The out-of-coverage L3 remote UE can only use pre-configuration for discovery.  Proposal 4: If the SL SIB is not provided by gNB, relay/remote UE may regard the gNB as non-SL-capable gNB and use pre-configuration for discovery in case the serving carrier of gNB is not shared with carrier for sidelink operation.  Proposal 8: The RRC\_CONNECTED relay/remote UE can only use the SL discovery Tx resource configuration provided by dedicated signalling.  Proposal 5: Relay/remote UE can use pre-configuration for discovery if the SL carrier of discovery pre-configuration is neither the serving carrier of SL-capable gNB nor included in NR sidelink configuration within SIB12. | ZTE, Sanechips |
| R2-2105022 | Proposal 4: For OOC Remote UE connected to L3 UE-to-Network Relay and connected to a gNB indirectly, it can rely on pre-configuration to obtain discovery related configuration.  Proposal 5: For L2 based relaying, an out of coverage Remote UE indirectly connected to the network via a Relay UE can obtain SL discovery related configuration from the network for transmission of discovery message. In case it is not provided, the remote UE can rely on pre-configuration (assuming the serving carrier is not shared with the SL carrier).  Proposal 3: In-coverage Remote UE in RRC\_CONNECTED shall not use the discovery configuration provided via SIB signalling if the configuration via dedicated signalling is not provided. | Intel |
| R2-2105342 | Proposal 3. In L2 U2N relaying, Remote UE performs SL relay discovery based on dedicated configuration when it is provided with SL relay discovery configuration via dedicated RRC signalling from gNB directly or via Relay UE.  Proposal 4. In L3 U2N relaying, Remote UE performs SL relay discovery based on pre-configuration if the Remote UE is out of coverage. Remote UE use SL relay discovery configuration provided by gNB if available. | Samsung |
| R2-2105491 | Proposal 4 For Remote UE supporting L2 UE-to-Network Relay which is out of coverage and connected to a gNB indirectly, the remote UE transmits discovery message based on a configuration provided by the gNB (e.g., via SIB or via dedicated signaling).  Proposal 9 For UE in RRC IDLE or RRC INACTIVE, in case the gNB is capable of SL relay operation but does not provide discovery TX resource pool in the SIB on the serving carrier, and the serving carrier is not shared with carrier for SL operation, RAN2 to confirm the following scenarios same as for LTE Prose discovery to be supported:  a. Scenario 1: the gNB doesn’t signal TX resource pool in the SIB for the SL carrier, also indicates/signals that discovery for the SL carrier is not supported  b. Scenario 2: the gNB doesn’t signal TX resource pool in the SIB for the SL carrier, also indicates/signals that discovery for the SL carrier is supported, so UE needs to read SIB on the SL carrier for obtaining discovery configuration for the SL carrier  c. Scenario 3: the gNB doesn’t signal TX resource pool in the SIB for the SL carrier, also indicates/signals that discovery for the SL carrier is supported, so UE needs to needs to enter RRC CONNECTED to obtain dedicated configuration in the serving carrier for obtaining discovery configuration for the SL carrier.  Proposal 8 For UE in RRC IDLE or RRC INACTIVE, in case the gNB is capable of SL relay operation but does not provide resources for discovery message announcement in the SIB, and the serving carrier is shared with carrier for SL operation, the UE needs to enter RRC\_CONNECTED in order to request resources for discovery message announcement.  Proposal 10 For UE in RRC IDLE or RRC INACTIVE, in case the gNB is capable of SL relay operation but does not provide discovery TX resource pool in the SIB on the serving carrier, and the serving carrier is not shared with carrier for SL operation, RAN2 chooses LTE Prose discovery signaling alternative, i.e., the gNB indicates/signals in the SIB whether discovery for the concerned SL carrier is supported, and if so, whether the UE should read SIBs on the concerned SL carrier or the UE should enter RRC\_CONNECTED and request detailed discovery configuration from serving cell in order to obtain the required resources.  Proposal 12 For UE in RRC IDLE or RRC INACTIVE, if the gNB is capable of SL relay operation but doesn’t provide discovery configuration for the SL carrier which is neither the serving carrier of the gNB nor configured in the SIB by the gNB, the UE shall not use pre-configuration to transmit discovery on the SL carrier.  Proposal 7 For L3 Relay UE and remote UE (IC) in RRC CONNECTED and connected to a gNB not capable of SL relay operation, UE is allowed to use pre-configuration to transmit discovery in other frequencies.  Proposal 6 For Relay UE and remote UE (IC) in RRC CONNECTED and connected to a gNB capable of SL relay operation, if the discovery configuration via dedicated signaling is not available, UE shall not transmit discovery.  Proposal 11 For UE in RRC IDLE or RRC INACTIVE, if the gNB is not capable of SL relay operation, the UE shall not enter RRC\_CONNECTED on the serving cell to request discovery configuration. | Ericsson |
| R2-2105535 | Proposal 5: For Remote UE supporting L2 UE-to-Network Relay which is out of coverage and connected to a gNB indirectly, transmission of discovery message is based on pre-configuration.  Proposal 4: RAN2 confirm that L3 relay UE uses pre-configuration for discovery, only if the discovery SIB configuration is not provided by gNB, in case its serving carrier is not shared with carrier for sidelink operation. Otherwise, L3 relay UE uses the configuration for discovery provided by gNB.  Proposal 3: For RRC\_CONNECTED remote UE which is in coverage and connected to a gNB directly, the discovery configuration is provided via dedicated signalling. | Spreadtrum Communication |
| R2-2104736 | Proposal 12: In L2 relay: - IC remote UE performs discovery based on pre-configuration, only if the discovery SIB configuration is not provided by gNB. Otherwise, Remote UE uses the configuration for discovery provided by gNB.  - OOC remote UE performs discovery based on pre-configuration.  Proposal 13: Relay UE and remote UE (IC) in RRC CONNECTED use the configuration provided via SIB signalling if the configuration configured via dedicated signalling is not available.  Proposal 14: After relay reselection is triggered, remote UE is allowed to transmit discovery message without checking the Uu RSRP threshold | Qualcomm |
| R2-2106437 | Proposal 2: A IC L2/L3 relay/remote UE is not allowed to transmit discovery messsage, if the UE is connected to a gNB incapable of SL relay operation, in case its serving carrier is shared with carrier for sidelink operation. | MediaTek Inc. |
| R2-2106435 | Proposal 4: When connected to a gNB not capable of SL relay, remote UE can perform discovery based on pre-configuration, only if the discovery configuration is not provided by gNB and its serving carrier is not shared with SL carrier.  Proposal 1 When connected to a gNB capable of SL relay, relay UE and remote UE shall not perform discovery if configuration is not provided by dedicated signalling. | China Telecommunication |
| R2-2104746 | Proposal 7: If gNB supports both L2 SL relay and L3 SL relay, common sidelink discovery configuration in SIB and pre-configuration can be used as baseline. | CATT |
| R2-2105742 | L3 relay UE uses pre-configuration for discovery, only if the discovery SIB configuration is not provided by gNB, in case its serving carrier or a neighbour cell carrier is not shared with carrier for sidelink operation. Otherwise, L3 relay UE uses the configuration for discovery provided by gNB. | Beijing Xiaomi Mobile Software |

### Resource pool configuration for discovery

During last meeting, it has been agreed that shared resource pool configuration for relay service and normal sidelink communication service shall be regarded as baseline solution:

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| * [609] Shared resource pool shall be the baseline for discovery message transmission/reception. |

One left issue is to discuss whether dedicated/separate resource pool shall be configured for discovery message transmission. In the contributions, most companies expressed their views on this issue and majority prefers to apply dedicated discovery resource pool configuration on the basis of supporting shared resource pool configuration.

**Proposal 5: RAN2 discuss whether to support dedicated discovery resource pool besides shared resource pool configuration.**

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| Tdoc Num | Involved proposals | Source |
| R2-2104736 | Proposal 1: To provide more flexible / complementary way of discovery transmission, support separate discovery pool with the assumption that PHY layer parameters and design will reuse the R16 legacy resource pool design | Qualcomm |
| R2-2104892 | Proposal 10: Separate resource pool configuration for discovery message and normal sidelink communication shall also be applicable. | OPPO |
| R2-2104746 | Proposal 10: Separate resource pool should be supported for sidelink discovery message. | CATT |
| R2-2104958 | In addition to shared resource pool, RAN2 also support separate resource pool for discovery message transmission. | Vivo |
| R2-2104976 | Proposal 2: It is suggested to support the separated discovery resource pool which reuse the Rel-16 legacy resource pool design. | ZTE, Sanechips |
| R2-2105390 | Proposal 1 Separate resource pools for data and discovery should also be supported. | Kyocera |
| R2-2105535 | Proposal 1: Separate resource pool is supported for transmission of discovery message to differentiate discovery message and sidelink communication. | Spreadtrum |
| R2-2106437 | Proposal 1: RAN2 also support separated resource pool for discovery transmission/reception, but assume the PHY layer parameters and design will re-use the R16 legacy resource pool design. | MediaTek Inc. |
| R2-2105022 | Proposal 1: RAN2 shall agree that dedicated resource pool is not supported for SL discovery in this release. | Intel |
| R2-2105491 | Proposal 3 Separated resource pool for discovery transmission/reception is not supported in Rel-17. | Ericsson |
| R2-2105740 | Proposal 2 Separated resource pool for NR sidelink relay discovery message transmission is not needed. | Huawei, HiSilicon |
| R2-2106266 | Proposal 1 Only shared resource pool supports discovery message (not support separate resource pool for discovery message).  Proposal 4: Discovery message should not be multiplexed with general communication messages. | LG Electronics Inc. |
| R2-2106435 | Proposal 1 Not support separate resource pool in this release. | China Telecommunications |

### Power control for transmission of discovery message

Considering the issue of power control for transmission of discovery message, whether to fix the transmission power or reuse Rel-16 open loop power control has been discussed during last meeting. This meeting, in the contributions, quite a lot of companies raise the issue again and all of them support to reuse Rel-16 principle of open loop power control.

**Proposal 6: RAN2 agrees to reuse Rel-16 power control mechanism for transmission of discovery messages.**

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| Tdoc Num | Involved proposals | Source |
| R2-2104736 | Proposal 3: Rel-16 sidelink OLPC is applied to discovery message. Fixed transmit power like LTE discovery can be achieved via spec transparent mechanism for separate pool (i.e. special OLPC config for discovery pool) | Qualcomm |
| R2-2104869 | Proposal 9: Transmission power of discovery message is handled similar to R16 SL data transmission. | Interdigital |
| R2-2104892 | Proposal 11: To reuse Rel-16 open loop power control mechanism for the transmission of discovery message. | OPPO |
| R2-2104976 | Proposal 3: It is suggested that transmission power of discovery message is handled in the same way as normal SL data transmission. | ZTE, Sanechips |
| R2-2105491 | Proposal 5 Transmission power of discovery message is handled same as R16 SL data transmission i.e. transmit power subject to OLPC (Open Loop Power Control). | Ericsson |
| R2-2105740 | Proposal1 The transmission power of NR sidelink relay discovery message is determined based on OLPC. | Huawei, HiSilicon |
| R2-2106266 | Proposal 2: Transmission power of discovery message is handled the same as R16 SL broadcast/graoupcast data transmission. | LG Electronics Inc. |
| R2-2106435 | Proposal 4Transmission power of discovery message is handled same as R16 SL data transmission. | China Terlecommunications |

### Priority of sidelink discovery message

Companies proposed to discuss on how to configure the priority of sidelink discovery message. Some suggested to reuse the Rel-16 mechanism for determination of other SL-SRBs, that is, to fix the priority value in the specification, which can be a very simplified solution. The other companies proposed to consider some enhancement, e.g., to allow the priority to be configurable by the network to leave some flexibility. As per the outcome on each side, there are slightly more companies who supporting to use a fixed value as the priority of sidelink discovery message.

**Proposal 7: RAN2 discuss on how to configure the priority of sidelink discovery message.**

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| Tdoc Num | Involved proposals | Source |
| R2-2104746 | Proposal 4: The priority of sidelink discovery message can be fixed, e.g. equals to 1. | CATT |
| R2-2104892 | Proposal 12: To specify a fixed value as the priority of SL-SRB4. | OPPO |
| R2-2104958 | The new SL-SRB4 for discovery message transmission has the same fixed priority as for existing SL SRBs. | Vivo |
| R2-2104976 | Proposal 1: Specified configuration is used for the SL-SRB4 for discovery message. The logical channel priority can be set to 1. | ZTE, Sanechips |
| R2-2105342 | Proposal 1. Fixed priority value 1 can be assigned for the logical channel of SL-SRB4 for SL discovery messages. | Samsung |
| R2-2106266 | Proposal 3: Discovery message has a configurable priority value between the priority value of PC5-S/PC5-RRC message and the priority value of communication messages. | LG Electronics |
| R2-2104736 | Proposal 8: Logical channel priority of discovery message (corresponding to discovery LCID) is configurable for both shared and separate resource pool. | Qualcomm |
| R2-2104869 | Proposal 4: The priority(ies) of LCID is/are configurarable by the network. | InterDigital |
| R2-2105022 | Proposal 2: Configurable logical channel priority is defined for SL-SRB4 for the discovery message. | Intel |

### PDCP PDU format

Although one company raise this issue, from rapporteur’s perspective, it is necessary to clarify the PDCP data PDU format for SL-SRB4, as other SL-SRBs. As mentioned, since it is quite similar between SL-SRB0 and SL-SRB4 that AS ciphering and integrity protection will not be considered. Thus, the PDCP PDU format for SL-SRB0 can be considered to reuse for SL-SRB4.

**Proposal 8: The same PDCP data PDU format as SL-SRB0 is used for sidelink discovery message (SL-SRB4), and the SDU type field is not used for SL-SRB4.**

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| Tdoc Num | Involved proposals | Source |
| R2-2104746 | Proposal 3: The same PDCP data PDU format as SL-SRB0 can be used for sidelink discovery message (SL-SRB4), and the SDU type field is not used for SL-SRB4. | CATT |

## Issues to postpone or up to other WG

### Resource allocation

A few companies would like to discuss the relationship between resource allocation mechanism and discovery transmission. The main concern raised is whether UE can still use mode 1 resource allocation mechanism to transmit discovery message when L2 remote UE is under RRC CONNECTED state but via indirect relay link. As per rapporteur’s view, this issue is not specifically for sidelink relay discovery but generally applicable to L2 relay, including relay communication data transmission. Therefore, rapporteur suggests to postpone the discussion of this issue after June.

**Proposal 9: RAN2 agrees to postpone the discussion related to resource allocation since there is nothing particularly related to relay discovery.**

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| Tdoc Num | Involved proposals | Source |
| R2-2104736 | Proposal 7: Mode 1/Mode 2 resource allocation in Rel-16 NR V2X is reused for discovery transmission with exception that only Mode 2 can be used for remote UE indirectly connected to gNB | Qualcomm |
| R2-2104869 | Proposal 1: Restrictions on resource selection by the UE are introduced to ensure frequency diversity by a mode 2 UE. | InterDigital |
| R2-2105342 | Proposal 5. Remote UE is in RRC\_CONNECTED can be configured with mode 1 resource allocation by gNB for sidelink relay discovery transmission. | Samsung |

### Network Capability differentiation

During last meeting, some companies raise the issue on how to allow UE to differentiate the following two cases:

* Network support layer 2/3 relay but does not provide any layer 2/3 relay configuration
* Network does not support layer 2/3 relay

Thus, in the contributions, some companies provide alternative solutions to solve the issue. But others thought this issue can be solved during stage 3 ASN.1 discussion. From rapporteur perspective, considering the limited time left for closing objective 1, it is a valid suggestion to postpone the discussion to stage 3 ASN.1 when the L2 specific design also finish.

**Proposal 10: RAN2 to postpone the issue on network capability differentiation to stage 3 ASN.1 discussion.**

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| Tdoc Num | Involved proposals | Source |
| R2-2104892 | Proposal 9: Relay type (L2/3 relay) support should be reflected in the SIB to help UE differentiate the following cases:  - Network support layer 2/3 relay but does not provide any layer 2/3 relay configuration  - Network does not support layer 2/3 relay | OPPO |
| R2-2104958 | An indicator is introduced to indicate if the gNB support L2 SL relay, L3 SL relay or both. | Vivo |
| R2-2105740 | Proposal 7: The detailed ASN.1 design to differentiate the cases where gNB is “not capable” and “capable but does not provide discovery configuration in SIB” can be postponed to the running CR stage. | Huawei, HiSilicon |
| R2-2106437 | Proposal 4: The case “gNB is incapable” and the case “gNB is capable but does not provide discovery configuration in SIB” is distinguished via ASN.1 design.  Proposal 3: RAN2 discuss expected UE behavior when gNB is capable of SL relay operation but does not include discovery configuration n SIB. | MediaTek Inc. |

### L2 ID for discovery message

Rapporteur observed discussion on L2 ID for discovery message has been covered by SA2 (Besides the existing specification in TS 23.304, further SA2 Tdoc submission include S2-2104270/3929 and etc.), so there is no need for LS, and RAN2 can rely on SA2 to decide on it.

**Proposal 11: RAN2 rely on SA2 on the L2 ID design for discovery message. No LS is needed.**

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| Tdoc Num | Involved proposals | Source |
| [**R2-2104736**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_114-e/Docs/R2-2104736.zip) | Proposal 5: Because discovery message can be identified via LCID in MAC and lack of RAN1 TU, not introduce PHY solution to differentiate discovery message for both shared and separate resource pool. | Qualcomm Incorporated |
| [**R2-2104746**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_114-e/Docs/R2-2104746.zip) | Proposal 5: Send LS to SA2 and cc to RAN1 to check whether a sidelink discovery specific L2 destination ID should be allocated by SA2. | CATT |
| [**R2-2104869**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_114-e/Docs/R2-2104869.zip) | Proposal 3: Discovery message can be identified with a reserved L1 destination ID. No RAN1 or SA2 impacts are foreseen. | InterDigital |
| [**R2-2106266**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_114-e/Docs/R2-2106266.zip) | Proposal 4: Discovery message should not be multiplexed with general communication messages. | LG Electronics Inc. |

## Lower-priority issues

### Discovery gaps

A few companies raise the issue on whether to adopt discovery gap in Rel-17. In LTE, sidelink discovery gap was introduced to handle limited UE capability on Tx/Rx chain. For NR, considering it is anyway infeasible for shared resource pool which has been agreed already, and considering RAN plenary tasked RAN2 to complete discovery by June, rapp suggest RAN2 to de-prioritize it in Rel-17.

**Proposal 12: De-prioritize support of discovery gaps in Rel-17.**

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| Tdoc Num | Involved proposals | Source |
| R2-2104736 | Proposal 15: RAN2 confirm that discovery gap is not feasible for shared pool because the Network can’t predict when the discovery will happen. And RAN2 is kindly suggested to discuss whether to introduce discovery gap for separate pool. | Qualcomm |
| R2-2104746 | Proposal 12: Sidelink discovery gap does not need to be introduced in Rel-17. | CATT |
| R2-2105390 | Proposal 2 Discovery gaps for monitoring and transmission should be supported for NR. | Kyocera |

### Additional condition for discovery transmission/reception.

In RAN2#113bis, RAN2 has concluded on the core conditions for discovery transmission / reception condition, and relay (re)selection conditions, as in LTE. Considering that, there seems no big need to pursue additional optimization on the discovery message transmission/reception condition.

**Proposal 13: De-prioritize additional condition for discovery transmission/reception in Rel-17.**

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| Tdoc Num | Involved proposals | Source |
| [**R2-2104736**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_114-e/Docs/R2-2104736.zip) | Proposal 14: After relay reselection is triggered, remote UE is allowed to transmit discovery message without checking the Uu RSRP threshold | Qualcomm Incorporated |
| [**R2-2104746**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_114-e/Docs/R2-2104746.zip) | Proposal 8: For remote UE in OOC, no additional triggers for sidelink discovery message transmission need to be introduced except for relay reselection.  Proposal 9: For IC remote UE, when the sidelink relay reselection is triggered, remote UE can perform sidelink discovery message transmission only when the Uu RSRP of its serving cell is below a configured minimum threshold by a hysteresis. | CATT |
| [**R2-2105807**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_114-e/Docs/R2-2105807.zip) | Proposal 2: The remote UE should transmit/receive the discovery message when RLF on Uu link happens in the L2/L3 relay case.  Proposal 3: The remote UE should stop transmitting/receiving the discovery message when recovery on Uu link succeeds in the L2/L3 relay case.  Proposal 4: The remote UE transmits/receives the discovery message when the remote UE declares the sidelink RLF in the L2/L3 relay case. | Lenovo, Motorola Mobility |
| [**R2-210489**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_114-e/Docs/R2-2104892.zip)**3** | Proposal 2 RAN2 does not need to pursue any specification impact on capturing the stop condition for neither transmitting/monitoring discovery message, nor relay selection/reselection. | OPPO |

### Others

And some other misc-issues as follows.

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| [**R2-2104746**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_114-e/Docs/R2-2104746.zip) | Proposal 7: If gNB supports both L2 SL relay and L3 SL relay, common sidelink discovery configuration in SIB and pre-configuration can be used as baseline.  [Rapp-comment] Rapp understand it is quite detailed stage-3 level issue, and can be left to discussion on ASN.1 implementation. | Leftover Issues on Sidelink Discovery | CATT |
| [**R2-2104869**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_114-e/Docs/R2-2104869.zip) | Proposal 10: Dedicated congestion control parameters are configured for discovery.  [Rapp-comment] Since PHY channel for communication is reused and no RAN1 impact is expected, the congestion control parameter configuration should be the same as for communication. | Discovery Procedure for sidelink relay | InterDigital |
| [**R2-2104958**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_114-e/Docs/R2-2104958.zip) | RAN2 to consider the relay/remote UE behavior on discovery operation in relation to L2 and/or L3 SL relay support of gNB e.g., as presented in Table 1.  [Rapp-comment] UE behaviour should be clarified if the procedure for L2/3 relay has been clarified respectively. | Remaining issues on Relay discovery procedure | vivo |
| [**R2-2105491**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_114-e/Docs/R2-2105491.zip) | Proposal 1 RAN2 confirms the following UE behaviors  a. Relay UE initiates a discovery only using Model A.  b. Remote UE initiates a discovery only using Model B.    Proposal 2 A remote UE is allowed to monitor discovery announcement messages (from other relay UEs) while already performing a discovery procedure using Model B. Similarly, a relay UE is allowed to monitor discovery solicitation messages (from other remote UEs) while the relay UE has transmitted a discovery announcement using Model A.  [Rapp-comment] The model-specific discovery transmission/reception behaviour is covered by SA2, and has been specified in TS 23.304, so no need for RAN2 to cover that. | Left issues for SL discovery | Ericsson |
| [**R2-2106266**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_114-e/Docs/R2-2106266.zip) | Proposal 5: SD-RSRP should be measured after decoding source and destination address successfully the same as LTE.  [Rapp-comment] for the measurement, since PHY channel for communication is reused and no RAN1 impact is expected, special operation is not expected compared to the measurement for PHY channel carrying communication messages. | Left issues for relay discovery message transmission | LG Electronics Inc. |

# Conclusion

The summarized proposals are given below:

**Proposal 1a: RAN2 agree that for relay/remote UE in RRC IDLE/INACTIVE state, and in-coverage on the serving frequency:**

* **If there is discovery related SIB broadcasted on the serving frequency, and if the configuration of concerned SL frequency is included within the SIB of the serving frequency but the Tx resource pool configuration is absent, UE shall enter RRC CONNECTED state to acquire dedicated configuration on Tx resource pool.**

**Proposal 1b: RAN2 agree that for relay/remote UE in RRC IDLE/INACTIVE state, in-coverage on the serving frequency, and the serving frequency is not shared with concerned frequency,**

* **If the configuration of concerned SL frequency is absent within the SIB of the serving frequency or if there is no discovery related SIB on the serving frequency, and if there is Uu deployed at the concerned SL frequency, UE shall 1) rely on the discovery related SIB, if any broadcasted in the concerned SL frequency; Or 2) if there is no discovery related SIB on the concerned SL frequency, UE does not perform SL discovery transmission/reception on the concerned frequency.**
* **If the configuration of concerned SL frequency is absent within the SIB of the serving carrier or if there is no discovery related SIB on the serving frequency, and if there is no Uu deployed at the concerned frequency, UE shall rely on pre-configuration.**

**Proposal 1c: RAN2 agree that for relay/remote UE in RRC IDLE/INACTIVE state, in-coverage on the serving frequency，if the serving frequency is shared with concerned SL frequency**

* **If there is no discovery related SIB broadcasted on the serving carrier, UE does not perform SL discovery transmission/reception on the concerned frequency.**

**Proposal 2: RAN2 agree that RRC\_CONNECTED relay/remote UE which are in-coverage on the serving frequency, can only use the SL discovery Tx resource configuration provided by dedicated signalling.**

**Proposal 3a: RAN2 agree that for L2 remote UE which is out-of-coverage on the serving frequency, but connected to a relay UE, it should follow network configuration, i.e., SIB or dedicated signalling, if available; Otherwise, it sues pre-configured SL discovery configuration.**

**Proposal 3b: RAN2 agree for L2 remote UE which is out-of-coverage on serving frequency, and has not connected to a relay UE (i.e., neither RRC\_CONNECTED nor RRC\_IDLE/INACTIVE), it can rely on pre-configuration.**

**Proposal 4: RAN2 agree that for L3 remote UE which is out-of-coverage on the serving frequency, it should follow pre-configuration.**

**Proposal 5: RAN2 agrees to allow dedicated discovery resource pool besides shared resource pool configuration.**

**Proposal 6: RAN2 agrees to reuse Rel-16 power control mechanism for transmission of discovery messages.**

**Proposal 7: RAN2 discuss to fix the priority of sidelink discovery message.**

**Proposal 8: The same PDCP data PDU format as SL-SRB0 is used for sidelink discovery message (SL-SRB4), and the SDU type field is not used for SL-SRB4.**

**Proposal 9: RAN2 agrees to postpone the discussion related to resource allocation since there is nothing particularly related to relay discovery.**

**Proposal 10: RAN2 to postpone the issue on network capability differentiation to stage 3 ASN.1 discussion.**

**Proposal 11: RAN2 rely on SA2 on the L2 ID design for discovery message. No LS is needed.**

**Proposal 12: De-prioritize support of discovery gaps in Rel-17.**

**Proposal 13: De-prioritize additional condition for discovery transmission/reception in Rel-17.**

# References

[1] R2-2104736 Remaining issues on relay discovery Qualcomm Incorporated

[2] R2-2104746 Leftover Issues on Sidelink Discovery CATT

[3] R2-2104869 Discovery Procedure for sidelink relay InterDigital

[4] R2-2104892 Discussion on remaining issues of NR sidelink relay discovery OPPO

[5] R2-2104958 Remaining issues on Relay discovery procedure vivo

[6] R2-2104976 Discussion on Relay discovery in Sidelink Relay ZTE, Sanechips

[7] R2-2105022 Open aspects on relay discovery Intel Corporation

[8] R2-2105342 Remaining issues for SL relay discovery Samsung

[9] R2-2105390 Discovery resources for sidelink relaying Kyocera

[10] R2-2105491 Left issues for SL discovery Ericsson

[11] R2-2105535 Discussion on Ralay discovery Spreadtrum Communications

[12] R2-2105740 Remaining issues on discovery for sidelink relay Huawei, HiSilicon

[13] R2-2105742 Use of Pre-configuration and collocated neighbour cell carrier Xiaomi Mobile Software

[14] R2-2105807 Relay Discovery for L2 and L3 relay Lenovo, Motorola Mobility

[15] R2-2106266 Left issues for relay discovery message transmission LG Electronics Inc.

[16] R2-2106435 Consideration on remaining issues of NR sidelink relay discovery China Telecom

[17] R2-2106437 Remaining issues on Relay Discovery MediaTek Inc.