3GPP TSG-RAN WG3 #117-e R3-225032

Online, 15th -24th August, 2022

Agenda Item: 13.4

Source: ZTE (moderator)

**Title: Summary of CB # IAB4\_IntMit**

Document for: Approval

# Introduction

This paper is for the following offline discussion:

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| --- |
| **CB: # IAB4\_IntMit**  **- Should specific solutions for PCI collision avoidance/resolution be adopted on top of existing ones?**  **- Should specific solutions for RACH collision avoidance/resolution be adopted on top of existing ones?**  **- Should specific solutions for resource coordination be adopted on top of existing ones?**  (ZTE - moderator)  Summary of offline disc [R3-225032](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Users/lilisi/Downloads/Inbox/R3-225032.zip) |

This discussion has two phases:

**Phase 1:** Converge on potential proposals. Please give your feedback before **Thursday, August 18th at 23.59 UTC**

**Phase 2: TBD**

The following contributions will be discussed in this CB:

|  |  |  |
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| [R3-224357](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224357.zip) | Discussion on the interference mitigation (Huawei) | Discussion |
| [R3-224379](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224379.zip) | Interference mitigation for mobile IAB (Nokia, Nokia Shanghai Bell) | Discussion |
| [R3-224432](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224432.zip) | Interference mitigation of mobile IAB-node mobility (Lenovo) | Discussion |
| [R3-224499](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224499.zip) | Mitigation of Interference and Reference Signal Collisions for Mobile IAB-Nodes (Ericsson) | Discussion |
| [R3-224506](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224506.zip) | PCI collision avoidance for mobile IAB (Qualcomm Inc.) | Discussion |
| [R3-224707](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224707.zip) | Avoidance of resource collisions due to IAB-node mobility (Fujitsu) | Discussion |
| [R3-224714](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224714.zip) | Discussion on mitigation of interference in mobile IAB scenario (ZTE) | Discussion |
| [R3-224769](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224769.zip) | Discussion on mitigation of interference (Xiaomi) | Discussion |
| [R3-224828](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224828.zip) | Discussion on mitigation of interference (samsung) | Discussion |

# For the Chair’s Notes

Propose to capture the following **Agreements**:

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**Proposal 1: Existing mechanism can be used for PCI collision detection in mobile IAB scenario from RAN3 perspective.**

**Proposal 2: UE handover can be used to avoid service interruption due to PCI change.**

**Proposal 3: No enhancement is needed for RACH collision except requested by other WGs.**

**Proposal 4: No enhancement is needed for resource coordination in mobile IAB scenario presently.**

# PHASE 1: Discussion

## Handling of PCI collision

Based on the above mentioned contributions, all contributions agree that PCI of mobile IAB-DU could be configured via OAM as in current specification. The scenario of PCI collision includes PCI collision between mobile IAB-DU cell and fixed cell, and between mobile IAB-DU cells.

**Avoidance of PCI collision via OAM/PCI partitioning**

Based on contributions [R3-224499](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224499.zip) (Ericsson), [R3-224432](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224432.zip)(Lenovo), [R3-224379](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224379.zip) (Nokia), [R3-224769](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224769.zip)(Xiaomi), PCI partitioning (i.e. dedicated PCI space) could be used for mobile IAB to avoid PCI collision between mobile IAB-DU cell and fixed cells when the trajectory of mobile IAB node is predictable. [R3-224506](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224506.zip)(Qualcomm) observes that with only 1008 PCI values available, PCI partitioning to avoid PCI collision for mobile IAB is not practical in many scenarios. And [R3-224379](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224379.zip) (Nokia) observes that the probability of PCI collision between mobile IAB-nodes depends on the use case and deployment scenario.

**Q1: Do you agree that PCI collision in mobile IAB scenario could be avoided by OAM//PCI partitioning?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Xiaomi | No | For the mobile IAB node with known trajectory, the PCI collision can be avoided by OAM, however, there’re also many mobile IAB nodes without known trajectory out there, the PCI collision cannot be avoided in that case.  Even through there’re 1008 PCI values, some physical layer signals (SS, DMRS & SRS) are designed based on PCI, avoid interference should also consider PCI Mod3 (for PSS) interference, PCI Mod4 (for DMRS) interference and PCI Mod30 (for DMRS/SRS) interference, PCI partitioning cannot satisfy the requirements for mobile IAB. |
| Huawei | **Yes, but only for some cases** | We see that such PCI partition or OAM configuration can avoid PCI collision for some implemented scenarios, e.g. in case the route of the vehicle is predetermined. But in some other cases (e.g. mobile IAB mounted at some randomly moved vehicles), this may not work well. |
| Qualcomm | See comment | The question is too narrow. PCI collision in mobile IAB can always be avoided via PCI partitioning. The question is if this is the only solution or if other dynamic PCI change needs to be considered as well. |
| **Ericsson** | **Yes, we believe it would be good enough** | In fact, we do not think that the claimed problem deserves a dedicated standardized solution - the PCI collision situations for mIAB nodes will be short-lived, so the existing mechanism for PCI optimization is sufficient. Then, we also have PCI space partitioning, which should do the trick, if needed. We do not think that partitioning has scaling issues, because mIAB nodes will typically spend very little time in each other’s vicinity. |
| Lenovo | Yes | PCI collision can be avoided via OAM in most cases of mobile IAB scenario. And the PCI Optimisation Function can be applied as a supplement if PCI suffers collision in some other cases. |
| Fujitsu | No | The PCI collision avoidance based on partitioning of PCIs is not sufficient in case of mobile IAB-node. If PCI of the mobile IAB-node is dedicated, the OAM has to guarantee the PCIs for neighbour cells surrounding the mobile IAB-node are different with the PCI of the mobile IAB-node. Due to the mobility of IAB-node, there is substantial limitation on the available PCIs for the cells within the area of IAB-nodes’ movement in case the number of IAB-nodes is increased. |
| Nokia | Yes, but depend on use cases | Depending on the use case, collisions may be rare or could be even avoided and no enhancements would be needed. Operator input is needed, regarding whether mobile IAB is only deployed on vehicle with pre-determined route. |
| ZTE | Yes for some cases | PCI partitioning/OAM could be used for mobile IAB to avoid PCI collision between mobile IAB-DU cell and fixed cells when the trajectory of mobile IAB node is predictable. There may still be PCI collision between mobile IAB nodes especially when the trajectory is not predictable. |
| Samsung | Yes, but only for some cases | For PCI partition, PCI collision can be avoided between mobile IAB-DU cell and fixed cells, but cannot be avoided between mobile IAB-DU cells  For OAM configuration, PCI collision can be avoided with known trajectory, but cannot be avoided without known trajectory. |
| AT&T | Yes and no | Certainly for limited use cases of mobile IAB deployments with fixed trajectories, PCI collision can be mitigated by good partitioning. However, this will not be scalable as it will limit the size of the PCI space for donors/stationary IAB nodes. Also, it is very important for mobile IAB to support deployments which are not necessarily planned in advance and would not be practical for static partitioning (e.g. disaster scenarios, temporary hotspot deployments, coverage extension for public safety, etc.). As a result we support a dynamic solution as well. |
| MITRE | No | Fixed mIAB trajectory is a limited use-case. |

**Summary:**

8 of 11 companies believe that PCI collision avoidance by OAM//PCI partitioning is not sufficient in mobile IAB scenario.

2 companies think PCI collision in mobile IAB scenario is short lived or PCI collision can be avoided via OAM in most cases. And even if there is PCI collision, existing mechanism for PCI optimization is sufficient.

1 company thinks it depends on use cases.

So the moderator proposes that PCI collision avoidance via dynamic PCI configuration is discussed in RAN3 as in the below.

**Detection of PCI collision**

Assume that PCI collision occurs, the first issue is how to detect the PCI collision. Based on [R3-224506](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224506.zip)(Qualcomm), enhancements to measurements in support of PCI collision detection are in RAN2 scope. Based on [R3-224828](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224828.zip)(samsung), four cases should be considered for PCI conflict detection: Case 1: PCI conflict prediction before full migration; Case 2: PCI conflict detection during full migration; Case 3: PCI conflict detection after full migration; Case 4: PCI conflict between different mobile IAB nodes. Based on [R3-224499](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224499.zip) (Ericsson), detection of PCI collision could be already supported by existing PCI Optimisation Function. Based on [R3-224714](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224714.zip)(ZTE), after receiving PCI of mobile IAB-DU cells via F1 setup procedure, the IAB-donor can detect whether the PCI of mobile IAB-DU cell collide with neighbour cells. And based on [R3-224707](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224707.zip)(Fujitsu), some enhancements to F1AP or XnAP signaling are proposed so that F1-terminating donor-CU can determine whether PCI/RACH reconfiguration is needed.

**Q2: Is there any enhancement needed for detection of PCI collision? If yes, what enhancement is needed? Is it in RAN2 or RAN3 scope?**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Xiaomi | Yes | In our understanding, current PCI optimization function is for the stationary cells, but the cells provided by mobile IAB are moving and the trajectory for some of them cannot be predicted, and the collision caused by the moving cell may change fast compare to the fixed cell, we think the enhancements are needed and we can use existing PCI optimization function as baseline. And it’s in RAN3 scope, as the enhancement may focus on F1AP. |
| Huawei | Yes | Maybe both RAN2 and RAN3.  If the PCI collision is detected by the IAB-MT, it is mainly RAN2 work. If the PCI collision detection is performed by the IAB-DU or the IAB-donor-CU, then RAN3 needs to be involved.  For the potential enhancement in RAN3, if the PCI collision is detected by the IAB-DU, some neighboring node PCIs can be sent to the IAB-DU by the IAB-donor-CU. Or, the inter-CU coordination may be applied for PCI conflict detection and reconfiguration. |
| Qualcomm | Enhancements are always welcome but may not be necessary.  Anyway: RAN2 scope. | There are already multiple means to discover PCI collision. Potential PCI collision might be predictable based on the mIAB-MT’s attachment point. There are also UE and MT measurement reports that can be used. These mechanisms may not be perfect, but they are certainly helpful.  In any case, this is in RAN2 scope. |
| **Ericsson** | **This is RAN2 scope** | As of today, PCI collision detection is up to implementation. Besides, we think that the PCI collision situations for mIAB nodes will be short-lived. |
| Lenovo | Depend on the detail solutions | PCI collision detection is up to implementation of network node. And the network node can detect the collision via the legacy measurement reports or F1 setup procedure as clarified above.  Whether the enhancement is needed can be discussed case by case for the proposed solutions based on the benefit.  Anyway, this is in RAN2 scope. |
| Fujitsu | Yes | The condition of interference of mIAB is different from that for stationary IAB since the cell is moving together with the mobile IAB-node and the neighbor cells are changing fast.  We think some enhancement can be considered on XnAP. The scope is mainly in RAN3.  During inter-CU mobility when the mobile IAB-MT accesses to the non-F1-terminating donor-CU, F1-terminating donor-CU is only aware of the access cell of the mobile IAB-MT rather than the neighbour cells of the mobile IAB-node. It cannot derive the information on potential PCI collision reported by the UEs who are surrounding the mobile IAB-node either the information reported by the mobile IAB-MT, since those UEs as well as the mobile IAB-MT are connecting with the non-F1-termnating donor-CU.  Therefore, the information reported by UEs and mobile IAB-MT can be delivered via XnAP, so that the F1-terminating donor-CU can determine whether to reconfigure the PCI of the mobile IAB-DU. |
| Nokia | Not necessary, and RAN2 scope | Please note current standard already support distributed PCI assignment, “The gNB may restrict this list by removing some PCIs that are reported by UEs, reported over the Xn interface by neighboring gNBs, and/or acquired through other methods, e.g. detected over the air using a downlink receiver.” This is enough for detecting PCI collision. |
| ZTE | No | PCI collision detection can be achieved by existing mechanism and we don’t see any issue in current mechanism. |
| Samsung | Yes | Agree with Huawei.  During full migration procedure, source IAB-donor or target IAB-donor may detect PCI collision first, and this will impact how PCI collision should be resolved. Therefore, some enhancements for the inter-CU coordination can be considered, and it’s in RAN3 scope. |
| AT&T |  | Ok to discuss this issue in RAN2 |
| MITRE | RAN2 scope |  |

**Summary:**

4 companies think that enhancement is needed which involves RAN3 work.

4 company think that no enhancement is needed and 3 of them think it’s in RAN2 scope.

7 companies in total think it’s in RAN2 scope.

In moderator’s view, during full migration, target donor could detect PCI collision upon receiving F1 setup request from mobile IAB-DU using existing mechanism since the target donor could be aware of PCIs used in neighbour cells. In the scenario of partial migration between non-F1-terminating donors, the mobile IAB-DU has only F1 connection with F1-terminating donor and won’t send F1 setup request to target donor of mobile IAB-MT. In this case, F1-terminating donor can be aware of the target donor of the mobile IAB-MT. And the F1-terminating donor can be aware of PCIs of serving cells and neighbour cells of the target donor via existing XnAP signaling, e.g., Xn SETUP REQUEST/RESPONSE. Thus F1-terminating donor can detect PCI collision and reconfigure PCI for mobile IAB-DU if necessary. It seems there is no issue on PCI collision detection from RAN3 perspective. So the moderator proposes:

**Proposal 1: Existing mechanism can be used for PCI collision detection in mobile IAB scenario from RAN3 perspective.**

**How to reconfigure PCI**

After PCI collision is detected, PCI could be reconfigured for mobile IAB-DU cell. Based on [R3-224357](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224357.zip)(Huawei), [R3-224499](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224499.zip) (Ericsson), [R3-224432](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224432.zip)(Lenovo), [R3-224714](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224714.zip)(ZTE), legacy PCI Optimisation Function could be reused, i.e. donor CU can reconfigure the PCI of mobile IAB-DU cell. Based on [R3-224707](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224707.zip)(Fujitsu), the F1-terminating donor-CU could reconfigure the PCI after detection of collision. Based on [R3-224769](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224769.zip)(Xiaomi), the following two scenarios needs to be considered: scenario1, IAB-donor is changed, i.e. during full migration; scenario2, IAB-donor is unchanged, i.e. not in full migration. And mobile IAB-node, serving IAB-donor or target IAB-donor is responsible for the PCI/RACH (re)configuration.

Regarding how to determine the PCI change, [R3-224506](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224506.zip)(Qualcomm) proposes that the decision on network-controlled PCI change is conducted by the IAB-donor-CU-CP, and it is up to implementation. [R3-224769](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224769.zip)(Xiaomi) proposes that some additional information should be considered for dynamic PCI/RACH (re)configuration. [R3-224707](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224707.zip)(Fujitsu) proposes that the dynamic resource configuration could be performed according to the actual location.

**Q3: Is there any enhancement needed for reconfiguration of PCI of mobile IAB-DU cell? If yes, what enhancement is needed?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Xiaomi | Depends | There are two cases for PCI reconfiguration to be considered:  Case 1, the IAB-donor is not changed.  Case 2, the IAB-donor is changing, i.e. during full migration  For case1, legacy PCI reconfiguration can be reused.  For case2, since two logical DUs with different physical resources may be used in full migration, the PCI reconfiguration can be performed based on the procedure of full migration. |
| Huawei | Yes | Maybe the large range of neighboring node PCIs should be considered when reconfigure the PCI of mobile IAB node. |
| Qualcomm | See comment | There are two options:  A) Use legacy F1AP and reconfigure PCI. This leads to RLF for all UEs.  B) Use the mechanism introduced in full migration, where a second logical cell with a different PCI is established and all UEs are handed over. Note that this can be applied even if the CU does not change.  We do not have to discuss solution B) at this point since it will automatically come out of the full migration discussion. |
| **Ericsson** | **No** | Once again, we think that the PCI collision situations for mIAB nodes will be short-lived and we don’t think that there is a need for changing the PCI of mIAB nodes for the sake of collision avoidance. Should such a need exist, the existing mechanism for PCI optimization is sufficient, and its use is not constrained to an ongoing HO – if needed, nothing prevents us to use it with or without inter-donor migration taking place. |
| Lenovo | No | Legacy PCI Optimisation Function is enough. |
| Fujitsu | See comment | The reconfiguration of PCI for the mobile IAB-DU is determined by F1-terminating donor-CU, based on location of the mobile IAB-DU, access cell of the mobile IAB-MT, reported information by UEs or coordination information from other nodes. The present F1AP signaling already support the reconfiguration of PCI.  Since there are two methods to change PCI, one is based on legacy F1AP message and the other is utilizing full migration procedure, choosing which method depends on whether full migration is supported in mIAB and the resource configuration for DU of mIAB. Note that the service interruption to UEs cannot be avoided if there is only one set of physical resource for the DU of mIAB when performing full migration. |
| Nokia | No | In case PCI collision is detected, CU can ask IAB-DU to use a different PCI before IAB-DU starts the normal operation. In case of PCI collision detected during full migration, target CU can configure DU2 to use a new PCI during the F1 setup between DU2 and target CU. Please clarify why enhancement is needed. |
| ZTE | No | Donor CU can reconfigure the PCI of mobile IAB-DU cell via legacy PCI Optimisation Function after PCI collision is detected. |
| Samsung | See comment | The PCI collision may occur between mobile IAB node DU cell and fixed node cell during full migration procedure, or PCI collision may occur between different mobile IAB nodes after full migration. Therefore, it is better to propose an enhancement to reconfiguration of PCI for these two situations, otherwise, PCI may need to be reconfigured multiple times. |
| AT&T |  | Minimizing service interruption to the UEs should be a key metric when evaluating the alternative solutions |
| MITRE | Neutral |  |

**Summary:**

5 companies think enhancements on PCI reconfiguration may be needed. And 3 of them think it is related to full migration procedure, which means it will be discussed in full migration section.

4 companies think no enhancement is needed.

1 company suggests that minimizing service interruption to the UEs should be a key metric when evaluating the alternative solutions. 1 company is neutral on this issue.

Based on the above discussion, there may be some enhancements regarding how to avoid UE service interruption at PCI change and PCI configuration (i.e. new PCI) of target logical DU, which can be discussed in full migration section. So there is no proposal here.

**How to avoid UE service interruption due to PCI change**

Based on [R3-224379](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224379.zip) (Nokia), when PCI collision occurs, the PCI of one of the colliding mobile IAB cells needs to be reconfigured, which would have impact to UEs connected to the mobile IAB-node that has to change the PCI. Based on [R3-224357](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224357.zip)(Huawei), NW use handover procedure to switch the UEs to the new cell with this updated PCI. Based on [R3-224506](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224506.zip)(Qualcomm), network-controlled PCI change should be supported without inter-donor full migration which use inter-cell UE handover while the mobile IAB-DU remains connected to the same CU.

**Q4: Is there any enhancement needed to avoid UE service interruption due to PCI change? If yes, what enhancement is needed?**

|  |  |  |  |
| --- | --- | --- | --- |
| **Company** | **Yes/No** | **Comments** | |
| Xiaomi | Not sure | We tend to agree handover procedure can be used to switch UEs to realize PCI reconfiguration, but the procedure may be the same as group UE mobility, we didn’t see any additional enhancements needed. | |
| Huawei | Yes | For example, to avoid the UE service interruption, the IAB-node can activate cells with new PCI and UE performs handover to this new PCI cell, when PCI collision is detected. | |
| Qualcomm | See comment | If we reuse the full-migration-based cell-change procedure (albeit without changing CUs at the same time), we may not need anything new and the UEs are not going through RLF. | |
| **Ericsson** | **RAN2 turf** | Once again, we think that the PCI collision situations for mIAB nodes will be short-lived and we don’t think that there is a need for changing the PCI of mIAB nodes for the sake of collision avoidance. Should such a need exist, the existing mechanism for PCI optimization is sufficient. This is certainly not a RAN3 issue. | |
| Lenovo | No | This is not the specific issue for mobile IAB-node. So, no dedicated enhancements are expected for mobile IAB. | |
| Fujitsu | See comment | If there is only one set of physical resource for DU of mIAB, the service interruption due to PCI change can hardly be avoided at least to legacy UEs. Some solution can be considered, e.g., configuring CHO to UEs can be used for avoidance of service interruption. | |
| Nokia | No | Please refer to our comments on Q3. | |
| ZTE | See comments | | UE handover procedure could be used to hand the UEs over to the new cell with this updated PCI to reduce service interruption. The situation is the same as in the full migration procedure. | |
| AT&T |  | | Agree this seems to be handled by the type of migration procedure itself | |
| MITRE | Neutral | |  | |

**Summary:**

3 company think no enhancement is needed to avoid UE service interruption due to PCI change.

5 companies think UE HO (with or without IAB donor CU change) could be used to avoid UE service interruption.

1 company think some enhancement may be needed if there is only one set of physical resource for 2 logical DU2 of mIAB.

In moderator’s view, the potential enhancement to avoid UE service interruption due to PCI change could be discussed in full migration section. So the moderator proposes:

**Proposal 2: UE handover can be used to avoid service interruption due to PCI change.**

Besides, the issue on PCI configuration of logical IAB-DU cells (e.g. whether the same or different PCIs are used between two logical DUs) mentioned in [R3-224379](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224379.zip) (Nokia) and [R3-224432](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224432.zip)(Lenovo) is not covered in this CB since it will be discussed in CB # IAB2\_Mobility.

## Handling of RACH collision

Regarding handling of RACH collision, it seems that two issues are mentioned in [R3-224357](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224357.zip)(Huawei), [R3-224432](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224432.zip)(Lenovo), [R3-224499](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224499.zip) (Ericsson), [R3-224828](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224828.zip)(samsung), [R3-224769](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224769.zip)(Xiaomi), [R3-224707](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224707.zip)(Fujitsu), and [R3-224714](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224714.zip)(ZTE). based on [R3-224499](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224499.zip) (Ericsson), no enhancement is needed

**- Issue 1: conflict of the RACH resource configuration**

For issue 1, [R3-224357](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224357.zip)(Huawei) proposes to ask RAN1 whether enhancement is needed for solving the potential confliction of the RACH resource configuration or any other physical resource configurations.

[R3-224769](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224769.zip)(Xiaomi) and [R3-224707](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224707.zip)(Fujitsu) propose to use dynamic resource configuration (e.g. PCI/RACH, etc) for mobile IAB-DU.

**- Issue 2: collision of RACH attempts from UEs due to IAB node migration**

For issue 2, [R3-224432](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224432.zip)(Lenovo) observes that RACH-less handover for the served UEs can avoid the potential RACH collision due to mobile IAB-node mobility. And [R3-224432](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224432.zip)(Lenovo) proposes to ask RAN1 to firstly evaluate whether the legacy RACH configurations are sufficient for the case that legacy handover including RACH needs to be performed. Based on [R3-224828](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224828.zip)(samsung), some enhancements should be proposed to resolve RACH issues. Based on [R3-224714](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224714.zip)(ZTE), the RACH collision issue may only exist in the full migration procedure without inter-topology transport, and the RACH collision issue could be discussed after we have conclusion on whether inter-topology transport is supported in full migration.

**Q5-1: What’s the issue to be discussed regarding RACH collision in R18 mobile IAB, issue 1 and/or issue 2?**

**Q5-2: For issue 1, is there any enhancement needed to resolve the issue? If yes, what enhancement is needed? Do we need to send an LS to RAN1 to ask RAN1 whether enhancement is needed for solving the potential conflict of the RACH or any other physical resource configurations?**

**Q5-3: For issue 2, is there any enhancement needed to resolve the issue? If yes, what enhancement is needed? Do we need to discuss this issue at the beginning of R18 IAB?**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Company** | **Yes/No** | | **Comments** | |
| Xiaomi | Q5-1, both  Q5-2, Yes  Q5-3,  Should be discussed in RAN2 | | We think both issues can be considered in R18 mobile IAB.  For issue1, we think the enhancement may be exchange some RACH configurations, similar to PCI configuration, to avoid configuration conflict considering the cell is always moving. Regarding send LS to RAN1, is the intension to let RAN1 design a new type of preamble or physical resource of RACH for the moving cells in mobile IAB? Not sure RAN1 has time to address such big issue.  For issue2, we agree that RACH-less handover can be considered to avoid collision, but this may need to be discussed in RAN2 first. | |
| Huawei |  | | Q5-1, both  Q5-2, we see no enhancement is needed at current stage  Q5-3, RACH less HO for the connected UEs can be considered | |
| Qualcomm | RAN2 topic | | We are not even sure there is a problem. RAN2 should take this on and involve RAN1 if necessary. | |
| **Ericsson** | **Issue 1 requires no enhancements;**  **Issue 2 – is in RAN2 scope** | | **Q5-1 and Q5-2:**  Wrt **Issue 1**, mIAB cells are expected to be small with lower transmit power than regular gNBs, which means that each root sequence will generate more preambles than for normal macro cells, given that cyclic shifts of small cells are short. This implies a lower probability of the issue occurring in mIAB cells than in other types of cells. We do not think that the claimed issue deserves dedicated enhancements.  **Q5-3:** As we pointed out in the MobEnh CB, **Issue 2** should be discussed in RAN2. | |
| Lenovo |  | | Q5-1: Issue 2 (if needed)  Q5-2: For Issue 1, agree with Ericsson that only a lower probability of RACH collision between mobile IAB-MT and other cells. And all the moving UEs have the same issue and no dedicated enhancements are expected for mobile IAB-MT.  Q5-3: For Issue 2, it may need to be evaluated by RAN1 firstly. We can discuss it later based on the inputs from RAN1/RAN2. | |
| Fujitsu | Q5-1, both  Q5-2, Yes  Q5-3,  See comment | | Q5-1: Both issue 1 and issue 2 should be discussed.  Q5-2:Issue 1 is similar with the PCI collision issue.The information for RACH collision detection reported by UEs and mobile IAB-MT can be delivered from the non-F1-terminating donor-CU to the F1-terminating donor-CU, so that the F1-terminating donor-CU can be aware of the existence of RACH resource collision. But this issue may not need RAN1 effort.  Q5-3: Some enhancement, e.g., RACH-less handover, can be considered after the baseline procedure of full migration is determined. | |
| Nokia | RAN2 scope | | Q5-1/2: Existing specifications provide means for RACH configurations to cope with mobile scenarios as well. Anyway, this is in RAN2 scope. | |
| ZTE | | Q5-1: both  Q5-2: no  Q5-3: in RAN2 scope | | Q5-2: RACH configuration exchange between neighbouring cells has been specified in R17 and it can be used in mobile IAB scenario.  Q5-3: this issue is in RAN2 scope. | |
| Samsung | |  | | Q5-1: Issue 2  Q5-2: No strong view.  Q5-3: Similar view with Xiaomi. | |
| AT&T | | RAN1/2 scope | | We believe coordination is needed, but the details can be investigated by RAN2 with RAN1 involvement as needed | |
| MITRE | | RAN2 scope | |  | |

**Summary:**

5 companies think both the following two issues on RACH collision needs to be considered in R18 mobile IAB: 1) conflict of the RACH resource configuration of IAB-DU; 2) collision of RACH attempts from UEs. 2 companies think only issue 2 needs to be considered. 1 company think it’s in RAN2’s scope.

- For issue 1: 6 companies think no enhancement is needed for RACH resource configuration presently. 3 companies believe some enhancement is needed on RACH configurations coordination. 1 of them think the details can be investigated by RAN2 with RAN1 involvement as needed. 1 company has no strong view.

- For issue 2: all the 11 companies agree that this issue is in RAN2 scope and RAN1 may be involved if needed.

So the moderator proposes:

**Proposal 3: No enhancement is needed for RACH collision except requested by other WGs.**

## Resource coordination

Based on [R3-224379](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224379.zip) (Nokia), Rel.17 XnAP provides means can be reused to share relevant information about the cell configurations to anticipate potential interference issues while the IAB-node is moving, and RAN3 can wait conclusions of the other WGs whether Rel.17 provides sufficient information sharing between the nodes. Based on [R3-224499](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23117.exe/会议硬盘/TSGR3_117-e/Docs/R3-224499.zip) (Ericsson), resource coordination between the mIAB and its parent nodes is enabled by the existing XnAP and F1AP procedures for the coordination of semi-static cell-level configurations, and hence no further enhancement is needed.

**Q6: Is there any enhancement needed for resource coordination for interference mitigation in mobile IAB scenario? If yes, what enhancement is needed?**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Xiaomi | Yes | We think the enhancements are needed. Existing cell-level configuration is for the fixed cell, of which the interference situation is almost static, but for the moving cells, things are different, resource coordination can be useful to avoid interference for right now and for the future as well. The detail enhancements may be further discussed based on the discussion above. |
| Huawei | no | we see no enhancement is needed at current stage |
| Qualcomm | See comment | Presently, we do not see any issue. We may encounter one if time moves on. |
| **Ericsson** | **No enhancement is needed** |  |
| Lenovo | No |  |
| Fujitsu | Yes/No | Agree to wait for the conclusion from other topics for the information sharing between nodes.  On the interference mitigation in case the F1-terminating donor-CU is not changed for mobile IAB-node, the information for RACH/PCI collision detection reported by UEs and mobile IAB-MT can be delivered from the non-F1-terminating donor-CU to the F1-terminating donor-CU that the F1-terminating donor-CU can determine whether there is interference on resource between mobile IAB-node and neighbor cells. The impact to spec can be further studied. |
| Nokia |  | RAN3 can wait conclusions of the other WGs whether Rel.17 provides sufficient information sharing between the nodes. |
| ZTE | No | We don’t see any issue on resource coordination as of now. |
| AT&T | Yes, but can wait | Once the details of the migration procedure is clear, whether enhancements are needed to support resource coordination with the multiple logical DUs and neighboring IAB nodes (including mobile IAB nodes) may be needed beyond what was supported in Rel-16/17 for fixed deployments. |
| MITRE | Yes |  |

Summary:

5 companies think no enhancement is needed presently.

4 companies think the potential enhancements may be needed and 3 of them suggest to wait for the progress of other topics.

1 company suggest to wait conclusions of the other WGs.

So the moderator proposes:

**Proposal 4: No enhancement is needed for resource coordination in mobile IAB scenario presently.**

## Others

**Q7: Is there any other issue to be discussed for interference mitigation in mobile IAB scenario?**

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| **Company** | **Comments** |
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# PHASE II: Convergence of PH1

# References

1. R3-224357 Discussion on the interference mitigation (Huawei) Discussion
2. R3-224379 Interference mitigation for mobile IAB (Nokia, Nokia Shanghai Bell) Discussion
3. R3-224432 Interference mitigation of mobile IAB-node mobility (Lenovo) Discussion
4. R3-224499 Mitigation of Interference and Reference Signal Collisions for Mobile IAB-Nodes (Ericsson) Discussion
5. R3-224506 PCI collision avoidance for mobile IAB (Qualcomm Inc.) Discussion
6. R3-224707 Avoidance of resource collisions due to IAB-node mobility (Fujitsu) Discussion
7. R3-224714 Discussion on mitigation of interference in mobile IAB scenario (ZTE) Discussion
8. R3-224769 Discussion on mitigation of interference (Xiaomi) Discussion
9. R3-224828 Discussion on mitigation of interference (samsung) Discussion