**3GPP TSG-RAN WG2 Meeting #109bis-e R2-2003907**

**Electronic, 20 – 30 April 2020**

**Agenda item: 6.18.2**

**Source: Nokia (Rapporteur)**

**Title: Offline discussion 105: PRN open issues - third round**

**WID/SID: NG\_RAN\_PRN-Core - Release 16**

**Document for: Discussion and Decision**

# 1 Introduction

This document is the report about the 3rd round of the following email discussion

**[AT109bis-e][105][PRN] Open issues (Nokia)**

Initial scope: Continue the discussion on PRN open issues, based on [R2-2002659](file:///C%3A%5CData%5C3GPP%5CExtracts%5CR2-2002659-Post109e-18-PRN-OpenIssues.docx)

Initial intended outcome: Set of proposals with full consensus agreeable via email, based on

the list in Section 4.1 of [R2-2002659](file:///C%3A%5CData%5C3GPP%5CExtracts%5CR2-2002659-Post109e-18-PRN-OpenIssues.docx) (final list to be reflected in [R2-2003895](file:///C%3A%5CData%5C3GPP%5CRAN2%5CInbox%5CR2-2003895.zip))

Initial intermediate deadline (for companies' feedback): Tuesday 2020-04-21 09:00 UTC

Updated scope:

  for open issue 8: discuss the possibility to introduce an indication in SIB1 to allow UEs to search other cells on the same frequency

  for open issue 9: discuss the possibility to signal PCI range(s) per PLMN per frequency vs just per frequency

  continue the discussion on open issues 11 and 16

Updated intended outcome: summary of the offline discussion with e.g.:

  Set of proposals with full consensus, if any (agreeable over email)

  Set of proposals to discuss in the follow up conference call

Second intermediate deadline (for companies' feedback): Friday 2020-04-24 06:00 UTC

Second intermediate deadline (for rapporteur's summary in [R2-2003896](file:///C%3A%5CData%5C3GPP%5CRAN2%5CInbox%5CR2-2003896.zip)):  Friday 2020-04-24 10:00 UTC

Final scope: discuss whether PCI ranges can be optionally broadcast by all cells (both public cells and private cells) and the PCI range validity time

Final intended outcome: summary of the offline discussion with e.g.:

  Set of proposals with full consensus, if any (agreeable over email)

  Set of proposals to postpone to after the meeting

Final deadline (for companies' feedback): Wednesday 2020-04-29 10:00 UTC

Final deadline (for rapporteur's summary in R2-2003907):  Wednesday 2020-04-29 16:00 UTC

Proposed agreements in R2-2003907 indicated for email agreement and not challenged until Thursday 2020-04-30 06:00 UTC will be declared as agreed by the session chair. For the other ones, the discussion will continue after the meeting.

# 2 Discussion

## 2.1 Broadcasting PCI ranges for CAGs by all cells

**Open issue description:** It is FFS whether any cells including PLMN cells that do not support CAG IDs can optionally broadcast the PCI ranges for CAG cells.

**Background:** During the RAN2#109bis online session the following was agreed

The PCI range(s) can be optionally signalled per PLMN and per frequency when the CAG cell is shared among different PLMNs

**Question 1a:** Do you agree that a PLMN cell that is not a shared cell and supports CAGs can optionally broadcast PCI ranges for CAGs per frequency as agreed for CAG cells that are shared among different PLMNs?

**Question 1b:** Do you agree that a PLMN cell that does not support CAGs can optionally broadcast PCI ranges for CAG cells per PLMN and per frequency as agreed for CAG cells that are shared among different PLMNs?

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| **Company** | **Q1a** | **Q1b** | **Comment** |
| Ericsson | Y | N?(Does not seem needed) | We assume the PCI range will contain the PCIs used by CAG cells and the PCIs outside the range will be used by the public cells. The PCI range will then be used like this:* A CAG UE w/ CAG only indication only need to consider cells inside the PCI range when it searches for cells.
* A CAG UE w/o CAG only indication considers all cells since it camp on both public and CAG cells.
* A non-CAG UE considers all cells since some of the cells within the PCI range may be “hybrid” cells (hybrid cells are not supported in Rel-16 but we may want to support it in the future)

If no PCI range information is configured the UE does not make any assumption whether a cell is a public or CAG cell based on PCI, i.e. all cells need to be considered during the cell search regardless of whether the UE is a CAG or non-CAG UE or whether the CAG only indication is set or not.Based on the above analysis it seems the PCI range information only provide a benefit for the CAG UEs w/ CAG only indication. But these UEs would never camp on a public cell (except for emergency) so it doesn’t seem necessary to broadcast PCI range information in such cells.  |
| Intel | Yes | Yes | We do not see why there is a need of restriction to provide such information by a cell. It is basically just providing a neighbour cell list to assist the CAG capable UE with non-empty allowed CAG list to find CAG cells. UE should still follow best and highest rank cell concept in cell reselection. |
| Nokia | Yes | No? | We also think that PCI range for CAG cells are only beneficial for CAG UEs with CAG only indication, but this type of UEs will never camp on a PLMN cell that does not support CAGs. Therefore, advertising PCI ranges for CAG cells do not seem necessary. |
| Sony | Yes | Yes | Agree with Intel.We also wonder how would the CAG PCI range be used by non-CAG UEs. We don’t see a need for a hybrid cell’s PCI, if and when introduced in the later release, to be included in the CAG PCI range as normal cell selection/reselection rules should apply for a hybrid cell for both member and non member UEs. |
| Qualcomm | Yes | Yes | It is okay for the CAG PCI range to be broadcasted by both CAG and non-CAG cells.Regarding how the UEs use it, it is used by CAG-capable UEs to optimize the implementation dependent function for CAG cell search.The non-CAG UEs (non-capable or empty Allowed list) don’t need to use the CAG PCI list, because they are required to rank every cell (as opposed to LTE, where the strongest cell could be omitted from ranking if it was a CSG cell). |
| Futurewei | Yes | Yes | PCI range can provide information of PCIs used by a CAG in the neighbouring area. It helps CAG-capable UE to search suitable CAG cells for cell reselection. |
| China Telecom | Yes | Yes | We think PCI range is useful for a CAG-capable UE no matter whether it is with CAG-only indication. Since this is an optional choice, we are ok to not broadcast PCI range in a PLMN cell that does not support CAGs for signalling reduction. |
| ZTE | Yes | Yes | In LTE, the CSG PCI range is mandatory present in SIB4 broadcast from a CSG cell but optional for non-CSG cells.We do not see strong motivation to make CAG PCI range mandatory present in system information from a CAG cell and prefers to make it optional.For a PLMN cell that does not support CAGs, it can broadcast the CAG PCI range if it has such information. Even though a CAG UE w/ CAG only indication cannot camp on a non-CAG cell as a suitable, UE can still read the CAG PCI range broadcast from a non-CAG cell to assist cell reselection. |
| Huawei | Yes | Yes | UEs with CAG-only indication can still camp on a PLMN cell for emergency service.Besides, if a UE is CAG capable, even if the CAG-only indication is not set to true for the moment, it is useful for the UE to acquire reserved PCI information from a PLMN cell for later cell selection/reselection.Considering the reserved list is optional, we think having a consistent agreement for all cell types is the easiest way to go. |
| CATT | Yes | Yes | **Answer to Q1b is Yes but we disagree the assumption mentioned by Ericsson that the PCI range will contain the PCIs used by CAG cells and the PCIs outside the range will be used by the public cells.** With this assumption, It will only beneficial for the CAG UE w/ CAG only indication only set to TRUE. All the other UEs including CAG capable UE and non-CAG capable UE cannot use it. The benefit is very limited as we are wondering how many UE will be configured with CAG only indication only set to TRUE.We understand that PCI range will contain the PCIs used by CAG-only cells.Then it will be beneficial for all the UEs.1. CAG capable UE should not measure the cells in the PCI range with PLMN ID is not equivalent to the registered PLMN during cell reselection. 2. Non-CAG capable UE should exclude the cells indicated by PCI range for measurement during cell reselection. |
| Lenovo | Yes | Yes | To Q1b: If CAG-only indication is not set in the CAG UE, then it may camp and be serviced on a public cell. Due to ANR reporting by CAG and non-CAG UEs the public cell may be aware of available CAG cells in the vicinity. To assist the CAG UEs to reselect to suitable CAG cells, the public cell may decide to broadcast PCI ranges for CAG cells. |
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**Summary:**

## 2.2 Validity time of PCI ranges for CAGs

**Open issue description:** The validity time for PCI ranges for CAGs are FFS.

**Background:**

During the RAN2#109bis online session the following was agreed

The PCI range(s) can be optionally signalled per PLMN and per frequency when the CAG cell is shared among different PLMNs

There was no conclusion on the validity time of the PCI ranges for CAGs. Proposal 2 of R2-2002745 is the following: “The PCI range is valid among the whole frequency within the same PLMN for 24 hours”. During the discussion some companies’ view was that the generally used 3-hour validity is enough.

**Question 2:** Which option do you prefer for the validity time for PCI ranges advertised for CAGs?

* **Option A:** 24 hours (as for CSG)
* **Option B:** 3 hours (as for other SIB parameters)

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| **Company** | **Preference** | **Comment** |
| Ericsson | B | The UE will use the PCI range information broadcasted by its serving cell when it searches for other cells. It should therefore be possible to use the same time limit for the PCI range information as we use for other SIB parameters. |
| Intel | Option A | We have a slight preference for Option A as it does not seem logical for cell that does not support CAG to always provide the PCI range, considering that the SIBs of a cell is cell scope and the PCI range is supposed to be used for a frequency by the UE with applicability of the PCI range wider than a cell (in view that CAG concept can be applied to both enterprise and residential deployment). It would be good to keep the PCI range for longer than 3hrs. |
| Nokia | B | We see no use-case when longer storage is needed. If the UE can use PCI ranges for CAGs longer than other information, then the network cannot know which information the UEs will use during cell reselection.  |
| Sony | B |  |
| Qualcomm | B | 3 hours seems enough, and reduces chance of error as the UE moves to different areas of the network. |
| Futurewei | B | Keeping a consistent validity time for all SIBs may help to avoid any unforeseen complexity.  |
| China Telecom | B | We prefer to align with other SIB parameters for validity time. |
| ZTE | A | We share the same understanding with Intel and slightly prefers option A. UE will always use the PCI range information broadcast by its serving cell when it searches for other cells. However, we do not assume the PCI range information will always be broadcast according to the comments under Question 1. For the case when PCI range is not broadcast, allowing UE to store the received PCI range for a longer time and use it in cell reselection would be helpful.As mentioned by one operator during the online discussion, they may update the PCI range every 24 hours, which means such information will not change frequently. |
| Huawei | Prefer A | We slightly prefer Option A because we don’t think the reserved PCI range will be changed so frequently. But Option B is also acceptable if companies want a simple UE implementation. |
| CATT | B | We do not see any justification to deviate from the validity time for all SIBs |
| Lenovo | Option B | The use-case for LTE CSG is different. In LTE CSG the broadcast of the PCI value range is mandatory for CSG cells. Furthermore, so far we know the validity of the broadcast PCI value range was extended to 24 hours to address the case of a portable home eNB, where it may be moved and switched on a different location (and that may take more than 3 hours). |
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**Summary:**

# 3 Conclusions