**3GPP TSG RAN WG2 Meeting #120R2-22xxxxx**

**Toulouse, 14 - 18 Nov, 2022**

**Source:** Huawei, HiSilicon

**Title:** Report of [POST119bis][304][NES] TP on cell selection/reselection and SSB/SIB-less (Huawei)

**Agenda Item:** xxx

**WID/SID:** FS\_Netw\_Energy\_NR– Release 18

**Document for:** Discussion and decision

# 1 Introduction

This document is the report of the following discussion:

* [POST119bis][304][NES] TP on cell selection/reselection and SSB/SIB-less (Huawei)

- Provide TP for the solutions discussed as per agreements in these meeting for cell/selection reselection and SSB and SIB-less. The TP should be detailed enough describing the solutions and highlight some of the agreements/impacts.

- Identify remaining questions/details/RAN2 impacts that are required to be discussed for next meeting to conclude the SI. These will be from the rapporteur point of view and can be used for information purposes to guide contributions to next meeting

 Deadline: Friday Nov. 3rd, 2022 for TP

 Deadline: Friday Oct. 28th, 20220 for open issues (NOTE this is on top of inactive week, so discussions are not expected).

Please provide your comments on the open issue list before the end of Friday 2022-10-21 if it is not convenient for you to reply during the inactive period. The rapporteur will anyway collect all comments provided before Oct 28th.

Please provide your comments to the TP before Tuesday 2022-11-02 08:00 UTC. Thanks!

# 2 Draft TR

Based on below agreements RAN2 made online, we provide a draft TR on cell (reselection) and SSB/SIB-less in the [folder](https://www.3gpp.org/ftp/Email_Discussions/RAN2/%5BRAN2%23119bis-e%5D/%5BPOST119bis%5D%5B304%5D%5BNES%5D%20TP%20on%20cell%20selection%EF%BC%8Freselection%20and%20SSB%EF%BC%8FSIB-less%20%20%28Huawei%29).

**Agreements:**

1. There is a need to allow NES cells to prevent legacy UEs from camping. FFS the definition of NES cells.
2. Whether to bar legacy UEs is configurable by NES cells in Idle/Inactive mode and the network should be able to allow NES-capable UEs to camp on the NES cell. Options to bar UEs to be considered are 1) UseIntra/InterFreqExcludedCellList (FFS on the exact mechanism and spec impact) and 2) use cellBarred or cell reservation fields in MIB/SIB.
3. The network should be able to configure NES capable UEs to (de)prioritize NES cells. mechanism such as can be considered for both frequency and cell levels cell selection/reselection (de)prioritization. FFS on whether the existing mechanism is sufficient.
4. For SSB/SIB-less solution, RAN2 starts with multi-carrier case
5. RAN2 assumes that the SSB-less solution for inter-band CA in connected mode we can consider to use the intra-band CA mechanism as a baseline/starting point. FFS whether there are other impacts for RAN2 according to other WGs discussion
6. For SIB-less/SSB-less, capture the solutions in more details over the email discussion and clarify the definition on anchor cell. (e.g. 1) non-anchor NES cell doesn’t transmit SSB and SI 2) non-anchor cell doesn’t transmit SIB) FFS for paging in both mechanisms.

**Please do not insert / make comments in the TR document, which will be hard for Rapporteur to track and respond your comments.**

**Q1: Companies are invited to share their detailed comments on the draft TR for cell (re)selection in the table below.**

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| **Company** | **Detailed comments** | **Rapporteur response** |
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**Q2: Companies are invited to share their detailed comments on the draft TR for SIB-less and SIB-less in the table below.**

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| **Company** | **Detailed comments** | **Rapporteur response** |
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# 3 Remaining issues

### 3.1 Cell selection and reselection

According to the discussion during this RAN2 meeting, the agreements and FFSes are captured as below:

1. There is a need to allow NES cells to prevent legacy UEs from camping. FFS the definition of NES cells.
2. Whether to bar legacy UEs is configurable by NES cells in Idle/Inactive mode and the network should be able to allow NES-capable UEs to camp on the NES cell. Options to bar UEs to be considered are 1) UseIntra/InterFreqExcludedCellList (FFS on the exact mechanism and spec impact) and 2) use cellBarred or cell reservation fields in MIB/SIB.
3. The network should be able to configure NES capable UEs to (de)prioritize NES cells. mechanism such as can be considered for both frequency and cell levels cell selection/reselection (de)prioritization. FFS on whether the existing mechanism is sufficient.

Rapporteur identifies the following issues to be further addressed at next RAN2 meeting accordingly:

1. General aspects:
	1. The definition of NES cells need to be further discussed, which may have impacts on the barring mechanism and access for NES-capable UES.
2. How to bar the legacy UEs, there are two options on the table:
	1. Use Intra/InterFreqExcludedCellList
	2. Use cellBarred or cell reservation fields in MIB/SIB

For both solutions, it needs to further discuss the detailed solutions and the potential specification impacts. For a), the gap with existing mechanism should be further clarified; for b), whether to use the existing IAB like solution, or NPN like solution, can also be discussed.

1. (de)prioritize NES cells by NES capable UEs
	1. Whether de-prioritization is sufficient for NES cells, or even prioritization of NES cells need to be supported
	2. The gap with existing mechanism, e.g. frequency priorities, cell offset to (de)prioritize cells
	3. Potential new mechanism description, and potential specification impacts

**Q3: Do companies agree to the above observation?**

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| **Company** | **Yes/No** | **Comments** |
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### 3.2 SSB-less and SIB-less

Regarding SSB-less, which is used for inter-band CA case by allowing SCell without transmitting SSB, the corresponding agreement is as below:

1. For SSB/SIB-less solution, RAN2 starts with multi-carrier case
2. RAN2 assumes that the SSB-less solution for inter-band CA in connected mode we can consider to use the intra-band CA mechanism as a baseline/starting point. FFS whether there are other impacts for RAN2 according to other WGs discussion

As discussed online, without more inputs from other WGs, there is no need to continue discussing this at next RAN2 meeting. It will only be triggered if other WGs clearly indicated there is a need for RAN2 to investigate more. Therefore for this part, the rapporteur would not set any questions for the moment, but may be updated according to the progress from other WGs.

Regarding SIB-less/SSB-less, the agreements are as below:

1. For SIB-less/SSB-less, capture the solutions in more details over the email discussion and clarify the definition on anchor cell. (e.g. 1) non-anchor NES cell doesn’t transmit SSB and SI 2) non-anchor cell doesn’t transmit SIB) FFS for paging in both mechanisms.

There are two directions on the table, one is for NES cells to omit transmission of both SSB and SIs, and the other is to maintain SSB transmission but not SIs.

From rapporteur’s observation, these two directions may have different energy saving gains, due to different amount of common signals transmission; on the other hand, different directions may be supported under different conditions, e.g. the UE needs to support CA etc. according to the agreement from SSB-less. In addition, quite a few companies mentioned NB-IoT solution of supporting multiple carrier. To ensure every company has the common understanding, it is better that in the next meeting, proponent companies could briefly describe the NB-IoT multi-carrier solution, and provide more detailed technical analysis on what is the common and different parts for SSB/SIB-less compared with NB-IoT solution.

Therefore, the rapporteur summarized the two directions as below with the aspects to be addressed summarized together:

1. The anchor cell transmit SIs for NES cells, and NES cells transmit neither SSBs nor SIs;
2. The anchor cell transmit SIs for NES cells, and NES cells transmit SSBs but not SIs.

Aspects to be addressed:

* the detailed solution and potential specification impacts for each direction;
* the benefits for energy saving and constraints for each direction;
* impact on the UE behaviour, e.g. whether the UE always camp on the anchor cell, or can also camp on the NES cells (this is rather dependent on specific directions), how the UE will determine which cell to perform RACH; the applicable RRC state, e.g. whether it only applies to idle mode, or also applies to connected mode;
* the gap with existing solutions, e.g. how much we can reuse from NB-IoT solution and what needs to be enhanced compared with NB-IoT

**Q4: Do companies agree to the above observation on SSB-less/SIB-less on the above two directions?**

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| **Company** | **Yes/No** | **Comments** |
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In addition to the above, it is also an open question on how to handle paging. To study paging, the rapporteur understands the major question is whether paging can be omitted in the NES cell and only sends in the anchor cell, which can further omit transmission from NES cells. It is worth mentioning that if these two cells are already within one RNA, this seems already possible. The question should also be addressed that in such a scenario, how to justify whether the UE camps on an anchor cell or an NES cell.

The above discussion may result in a few combinations of different components, e.g. whether SSB-less is combined with SIB-less, whether paging enhancements is conditioned with SIB-less. From rapporteur’s observation, it would be good whether the most reasonable combination needs to be considered, otherwise this may result in too many fragmented sub-directions.

In summary, the aspects to be addressed include:

* detailed solution description, benefits and potential specification impact;
* impact on UE behaviour on cell camping;
* gap with existing solutions
* potential relation with SSB-less and/or SIB-less solutions

**Q5: Do companies agree to the above observation on aspects to be address for potential paging enhancements?**

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| **Company** | **Yes/No** | **Comments** |
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# 4 Conclusion

To be completed