3GPP TSG-RAN WG2 Meeting #109bis R2-20xxxxx

emeeting, ??April 2020

**Agenda item: x.x.x**

**Source: Nokia (Rapporteur)**

**Title: Report from email discussion [Post109e#18][PRN] Remaining open issues**

**WID/SID: WI\_CODE - Release XX**

**Document for: Discussion and Decision**

# 1 Introduction

This document is the report about the following email discussion

* [Post109e#18][PRN] Remaining open issues (Nokia)

Intended outcome: Discuss and resolve the remaining PRN open issues (Deadline 2020-04-08 23:59 Pacific Time).

Intended outcome 2: Open Issues list with RRC impact (April 1)

Phase 1: This phase is to collect open issues (outcome 2). Deadline is April 1.

Phase 2: This phase is to conclude the discussions on the solution of the open issues. Deadline: 2020-04-08 23:59 Pacific Time

# 2 List of Open Issues

The following table lists the open issues and clarifies their impacts for RRC specifications.

The following types of handling are proposed for topics that has 38.331 impacts:

* TYPE A: No technical discussion is needed, to be handled during ASN.1 review.
* TYPE B: Work item specific technical discussion is needed to make a decision, but the actual change is small enough to be introduced during ASN.1 review.
* TYPE C: Work item specific technical discussion is needed, and the actual changes are captured in the work item specific running RRC CR.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Open Issue | Impacted spec(s) | Details on RRC impacts (if any) | type |
| **1** | Emergency sessions from CAG-only cell with non-NPN-capable Rel-16 UEs.  Whether a Non-NPN-capable Rel-16 UE treats a cell with cellReservedForOtherUse=true as acceptable cell or as barred cell. | 38.304  38.331 | Definition of NPN-only cell, and handling of NPN only cells (number of impacts) | C |
| **2** | Role of manually selected CAG ID (pending response to [R2-2002417](http://3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs/R2-2002417.zip))  FFS if the UE shall prioritize it during cell reselection  FFS if it has a role in Connected mode mobility  FFS if the UE should send it during Resume procedure | 38.304 |  |  |
| **3** | Whether it is sufficient to broadcast the Unified Access Control (UAC) parameters per PLMN (assuming that using the operator-defined access categories with access category criteria type set to the S-NSSAI used for PNI-NPN is sufficient to provide CAG specific UAC) or there is need to enable the broadcast of CAG ID specific configuration of UAC parameters? (pending response to [R2-2002417](http://3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs/R2-2002417.zip)) | 38.331  38.304? | No ASN.1 change, but changes in the description of UAC procedure | C |
| **4** | In PLMN selection in Table 4.2-1 of 38.304: FFS whether the above needs to capture the condition that the cell is “not reserved for operator use for UEs not belonging to AC 11 or 15 | 38.304 |  |  |
| **5** | In clause 4.5 of 38.304: FFS whether the above needs to be updated to consider manually selected CAG ID | 38.304 |  |  |
| **6** | The UE behaviour in SNPN AM in licensed bands is FFS when the highest ranked cell or best cell according to absolute priority reselection rules is a cell which is not suitable due to not broadcasting the registered or selected SNPN ID | 38.304 |  |  |
| **7** | How to document the following agreement: *“For unlicensed spectrum and for a UE with non-empty allowed CAG list, if the highest ranked cell or best cell according to absolute priority reselection rules is a cell which is not suitable due to not broadcasting the selected/registered/equivalent PLMN, the UE with no empty allowed CAG list shall behave according to NR-U agreement.”* | 38.304 |  |  |
| **8** | The UE behaviour in unlicensed band is FFS when the cell belongs to the correct operator but it’s not a CAG member cell. | 38.304 |  |  |
| **9** | FFS whether PCI values for CAGs are signalled per PLMN per frequency or no new ASN.1 IEs are introduced in Rel-16 for signalling of PCI values for CAGs | 38.304  38.331 | SIB extension may be needed | C |
| **10** | Whether the selected PLMN-Identity can refer to a NPN in the description of RRCResumeComplete messages and the relevant procedures | 38.331 | No ASN.1 change, but changes may be needed in the description of RRC resume | C |
| **11** | It is FFS if all Rel-16 UEs are required to be able to report the npn-IdentityInfoList | 38.331 | No ASN.1 change, but changes in description | C |
| **12** | A definition of network indexing for NPNs is FFS | 38.331 | No ASN.1 change, but changes in the description | C |
| **13** | The size of NID is to be aligned with latest CT4 agreements | 38.331 | ASN.1 impact within *NPN-Identity* definition | A |
| **14** | Whether *trackingAreaCode* is optional or mandatory within *NPN-IdentityInfoList* | 38.331 | ASN.1 impact within *NPN-IdentityInfoList* | B |
| **15** | Maximum Length of HRNNs *(maxHRNN-Len-r16* is FFS) | 38.331 | ASN.1 impact within 6.4 | B |
| **16** | UE capabilities | 38.331  38.306 |  | C |
| **17** | Manual CAG selection indication (ongoing CT1 discussion) | 38.331 | ASN.1 impact in SIB1 | C |
| **18** | Whether the field *intraFreqReselection* in MIB message can be ignored in unlicensed bands by the UE | 38.304 |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

# 3 Discussion of the open issues

This section is to discuss and find proposals for the open issues listed in section 2.

## 3.1 Issue 1: Emergency sessions from CAG-only cell for non-NPN Rel-16 UEs

**Open issue description:** Emergency sessions from CAG-only cell with non-NPN-capable Rel-16 UEs. Whether a Non-NPN-capable Rel-16 UE treats a cell with cellReservedForOtherUse=true as acceptable cell or as barred cell.

Earlier agreements in this area:

* At RAN2#107 as an answer to LS in S2-1906814   
  (E2: SA2 could not conclude whether Rel-16 UEs not supporting the CAG feature should be allowed to camp in a CAG cell in limited service state. There is no SA2 consensus to support this scenario.)

2 (Regarding question E2) Rel-16 UEs not supporting the CAG feature can camp on a CAG cell as an acceptable cell to obtain limited service

* At RAN#108

1. Access attempts by Rel-15 UEs for emergency services on CAG cell could be allowed based on operator's preference
2. cellReservedForOtherUse is used to prevent Rel-15 UEs to access the cell.

3 A CAG cell which is not considered as suitable can be an acceptable cell for a Rel-16 UE not in SNPN AM.

* AT RAN#109

1. Clarify in Stage 2 that a Rel-15 UE considers a CAG-only cell as acceptable cell if the cell is not barred to Rel-15 UEs, and if a PLMN ID without CAG list is broadcast and that PLMN is "not allowed" (e.g. by use of PLMN ID for which all registration attempts are rejected such that the PLMN ID becomes not allowed). Discuss wording as part of the Stage 2 discussion

At RAN2#109 there was an email ([AT109e][117][PRN] Cell Selection and selection aspects) discussion with the following question without a conclusion:

**Question 3c: For non-CAG-capable Rel-16 UE, can emergency calls in a CAG-only cell be supported by setting *cellReservedForOtherUse=true* and allowing the Rel-16 UEs to override this flag and access the PLMNs in the NPN list in limited service state?**

**Question 1:** As the decision on the above question requires technical discussion, companies are requested to provide their short technical views on this issue.

|  |  |
| --- | --- |
| **Company** | **Technical view** |
| Ericsson | Disagree. We normally do not require UEs to parse and act on SI for features they do not support. So a non-CAG-capable Rel-16 UEs should behave as a Rel-15 UE wrt the *cellReservedForOtherUse* flag. |
| Vodafone | No. If a Release 16 UE is not able to access the Closed Access Cells in normal operation, then the UE should revert back to the wider PLMN cell for emergency calls |
| Huawei | No. We prefer to use the same way as for R15 UEs:   * by setting *cellReservedForOtherUse* = *false* and broadcasting a dummy PLMN in the legacy PLMN list.   If we goes for the same way as for R16 CAG-capable UEs (i.e., setting *cellReservedForOtherUse=true* and allowing the Rel-16 UEs to override this flag and access the PLMNs in the NPN list), there is no distinction between R16 CAG-capable UEs and R16 non-CAG-capable UEs in terms of emergency services. It is possible that the operator wants to provide emergency service in a CAG-only cell **only** to R16 CAG capable UEs, not to R16 non-CAG-capable UEs, so the behaviour of non-CAG-capable UEs should be the same as R15 UEs. |
| Intel | Following agreement has already been made in RAN2#109e for Rel-15 UE in CAG only cell for emergency services in limited service state:   1. Clarify in Stage 2 that a Rel-15 UE considers a CAG-only cell as acceptable cell if the cell is not barred to Rel-15 UEs, and if a PLMN ID without CAG list is broadcast and that PLMN is "not allowed" (e.g. by use of PLMN ID for which all registration attempts are rejected such that the PLMN ID becomes not allowed). Discuss wording as part of the Stage 2 discussion   The above means that with the cellReservedForOtherUse not set to ‘True’ and the IMS flag set to ‘True’ for a cell, a Rel-15 UE is allowed to camp on the cell as acceptable cell to make emergency call in limited service state even if the PLMN is forbidden.  One way for non-CAG capable Rel-16 UE is to follow the above Rel-15 UE behaviour. Alternatively, it is to follow the CAG capable Rel-16 UE as agreed in the last meeting below:  For CAG-capable Rel-16 UE, emergency calls in a CAG-only cell can be supported by setting *cellReservedForOtherUse=true* and allowing the Rel-16 UEs to ignore this flag and access the PLMNs in the NPN list in limited service state.  However, with following the CAG capable Rel-16 UE approach, it would require the non-CAG capable UE to not just know the presence of the NPN info list but also process the IE within the list (e.g. IMS flag is set to true as well as selecting a PLMN). This is normally not required for non-CAG capable Rel-16 UE to do so.  Hence our view is that non-CAG Rel-16 UE should follow the Rel-15 UE behaviour as follow (i.e. we do not agree to the proposal on Question 3c):  For non-CAG-capable Rel-16 UE, emergency calls in a CAG-only cell can be supported by setting *cellReservedForOtherUse=false* and allowing the Rel-16 UE to access the cell broadcasting PLMN ID without CAG list and that PLMN is "not allowed" in limited service state. |
| Sony | We slightly favour of not introducing two different interpretations of the same IE in broadcast based on different UE capabilities. |
| Futurewei | No, it’d be better to align the behaviour of Rel-16 non-CAG-capable UE with Rel-15 UE behaviour, when it comes to CAG-only cell. This also spares Rel-16 non-CAG-capable UE from reading and parsing NPN related SIB. |
| CATT | Disagree. non-CAG-capable Rel-16 UE should behave the same as REL15 UE |
| Lenovo | No. We prefer same behaviour of Rel-15 UEs and Rel-16 non-CAG capable UEs. |
| Qualcomm | Needs more discussion.  Though we also prefer to avoid extra feature development on Rel-16 non-CAG capable UE, we think this issue needs more careful consideration. There are three types of UEs we are dealing with   1. Rel-16 non-CAG-capable UE 2. Rel-16 CAG capable UE that is not a member of the CAG broadcasted by CAG-only cell 3. Rel-16 CAG capable UE that is a member of the CAG broadcasted by CAG-only cell   RAN2 has already agreed that the UEs in class (b) and (c) can make emergency calls by processing the CAGs broadcasted by CAG-only cells. We want to make sure operators are okay for category (a) and (b) to have different behaviours. We would rather do the extra work now than hear about complaints in the field later (particularly because the issue relates to emergency calls).  Note that LTE allows emergency calling on CSG cells by *all* UEs irrespective of CSG feature support.  We have one question for companies who are answering “no”. Other than reducing UE implementation complexity, is there any other justification for the answer? |
| ZTE | Disagree. We prefer the non-CAG-capable Rel-16 UE to behave the same as Rel-15 UE on interpretation of the *cellReservedForOtherUse* flag. |
| Samsung | The meaning of the *cellReservedForOtherUse* flag should not be changed for non-CAG capable Rel-16 UEs i.e. if the *cellReservedForOtherUse* flag is set true then cell access is not allowed. This is also the meaning for Rel-15 UEs.  As pointed out by Intel, the ims-EmergencySupport flag which is Rel-15 field in SIB1, when set to true then the cell supports IMS emergency bearer services for UEs in limited service mode. If absent, IMS emergency call is not supported by the network in the cell for UEs in limited service mode.  This Rel-15 field is understood by both non-CAG capable Rel-16 UEs as well as Rel-15 UEs.  In that sense one can argue that a uniform behavior can be defined for both non-CAG capable Rel-16 UEs and Rel-15 UEs. One approach to achieve that is what Intel mentioned that the *cellReservedForOtherUse* flag is NOT set true and the the ims-EmergencySupport flag is set true, then emergency call can be supported for both non-CAG capable Rel-16 UEs as well as Rel-15 UEs. However, not setting the *cellReservedForOtherUse* flag as true also means access is allowed for such UEs, which is not the intention on CAG only cells.  Then another approach, when the *cellReservedForOtherUse* flag is set true and the ims-EmergencySupport flag is set true, then the non-CAG capable Rel-16 UEs treats the cell as acceptable for emergency calls but treat cell as barred for normal service. If the ims-EmergencySupport flag is set NOT true the cell is not acceptable for emergency calls. Specifying this UE behaviour in Rel-16 specifications is possible for non CAG capable Rel-16 UEs. The question is whether this UE behaviour can also be specified for Rel-15 UEs. In our view it is possible to introduce this behaviour in Rel-15 specification but existing Rel-15 UEs in the field do not benefit. RAN2 to discuss whether this could be an acceptable way forward for all companies. |
| docomo | We think for emergency service, the UE behavior is preferred to be consistent i.e. for a CAG-only cell when the *cellReservedForOtherUse* flag is set false and the ims-EmergencySupport flag is set true, the UEs shown below treat the cell as acceptable for emergency calls.   1. Rel-16 non-CAG-capable UE 2. Rel-15 UE |
| LG | We prefer that the interpretation of cellReservationForOtherUse should be the same for R15 and R16 non-non-capable UEs. |
| Nokia | Agree.  If a non-CAG-capable Rel-16 UE cannot ignore the cellReservedForOtherUse=true for starting emergency session, then emergency session for non-CAG-capable Rel-16 UE will only be supported by the deployment workaround described for Rel-15 UEs. This deployment work around means the cell is deployed as a cell shared between a “dummy PLMN” (using a “dummy PLMN ID”) and NPNs  The drawback of the deployment-based solution are the followings:   1. Non-CAG capable UEs may still try to access to cell with the “dummy PLMN ID”, as the cell is not barred and the PLMN ID will become a forbidden PLMN ID after the rejection. The list of forbidden PLMN IDs are reset after time, therefore time to time a UE in the area may try to access the cell. This means that the deployment workaround does not meet the SA1 requirement that the non-CAG UEs shall not even perform access attempts with a CAG-only cell. 2. It is not clear (and 3GPP cannot specify) what is the “dummy PLMN ID” that can be used. It is left for operators to find out which PLMN ID is good for them. The selection of dummy PLMN ID may not be easy as it should be a PLMN ID that is very low priority in PLMN selection to minimize false attempts, but it should be a PLMN ID that is usable in the PLMN during emergency sessions, as the PLMN ID is used in creating a lot of identifiers (5G-S-TMSI, CGI, TAI) in the network. 3. It would decrease the maximum number of supported NPNs to 11 |
| NEC | Disagree. Non-CAG capable Rel 16 UEs should behave as Rel 15 UEs when it comes to NPNs |
| vivo | Disagree. If we goes for the same way as for R16 CAG-capable UEs, the Non-CAG capable Rel 16 UEs needs to check if NPN info list exists and then determine whether ignore cellReservedForOtherUse=true or not, which complicates the UE behavior. Thus, we prefer to have same behavior as Rel 15 UEs on the cellReservedForOtherUse IE. |

**Summary**

TBA

**Proposal**

TBA

## 3.2 Issue 2: Role of manually selected CAG ID

**Open issue description:** What is the role of the manually selected CAG ID; only used during initial cell selection or it is used later during cell reselection and connected mode mobility.

* FFS if the UE shall prioritize it during cell reselection
* FFS if it has a role in Connected mode mobility
* FFS if the UE should send it during Resume procedure

An LS in [R2-2002417](http://3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs/R2-2002417.zip) was sent with the following questions:

**Question 1.1; TO: SA2; CC: CT1:**   
If a UE performs manual CAG selection and a successful registration, then whether the UE shall stay on cells supporting the manually selected CAG ID in RRC\_CONNECTED state especially in the case when after registration the Allowed CAG List in the UE does not contain the manually selected CAG ID?

**Question 1.2; TO: SA2; CC: CT1**Shall a UE prioritize for cell reselection the cells supporting the manually selected CAG ID over other suitable cells that do not support the manually selected CAG ID after a successful registration?

**Question 1.3; TO: CT1:**It is RAN2 understanding that the UE NAS provide the manually selected CAG ID to UE AS. Is the manually selected CAG ID provided as part of the allowed CAG list, or as a separate element?

**It is proposed to postpone the discussion of this topic until responses are received from other WGs.**

## 3.3 Issue 3: Granularity of advertised UAC parameters

**Open issue description:** Whether it is sufficient to broadcast the Unified Access Control (UAC) parameters per PLMN (assuming that using the operator-defined access categories with access category criteria type set to the S-NSSAI used for PNI-NPN is sufficient to provide CAG specific UAC) or there is need to enable the broadcast of CAG ID specific configuration of UAC parameters?

An LS in [R2-2002417](http://3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs/R2-2002417.zip) was sent with the following questions:

**Question 2.1; TO: SA1:**Is there a requirement to enable PNI-NPN (CAG ID) specific access control in cells that are shared among PNI-NPNs belonging to the same PLMN?

**Question 2.2; TO: CT1, SA1:**If there is a requirement to enable PNI-NPN (CAG ID) specific access control in cells that are shared among PNI-NPNs belonging to the same PLMN, then is it sufficient to broadcast the Unified Access Control (UAC) parameters per PLMN (assuming that using the operator-defined access categories with access category criteria type set to the S-NSSAI used for PNI-NPN is sufficient to provide CAG specific UAC) or there is need to enable the broadcast of CAG ID specific configuration of UAC parameters?

**It is proposed to postpone the discussion of this topic until responses are received from other WGs.**

## 3.4 Issue 4: EN in In PLMN selection in Table 4.2-1 of 38.304

**Open issue description:** In PLMN selection in Table 4.2-1 of 38.304: FFS whether the above needs to capture the condition that the cell is “not reserved for operator use for UEs not belonging to AC 11 or 15

Table 4.2-1 of 38.304 on PLMN selection contains the followings:

|  |  |  |
| --- | --- | --- |
| PLMN Selection | **For a UE not operating in SNPN access mode, perform the following:**  Maintain a list of PLMNs in priority order according to TS 23.122 [9]. Select a PLMN using automatic or manual mode as specified in TS 23.122 [9] and request AS to select a cell belonging to this PLMN. For each PLMN, associated RAT(s) may be set.  Evaluate reports of available PLMNs and any associated CAG-IDs from AS for PLMN selection.  Maintain a list of equivalent PLMN identities.  To support manual CAG selection, provide request to search for available CAGs and evaluate reports of available CAGs from AS for CAG selection.  **For a UE operating in SNPN access mode, perform the following:**  Maintain a list of SNPNs according to TS 23.122 [9]. Select a SNPN using automatic or manual mode as specified in TS 23.122 [9] and request AS to select a cell belonging to this SNPN.  Evaluate reports of available SNPNs from AS for SNPN selection. | For a UE not operating in SNPN access mode, search for available PLMNs.  If associated RAT(s) is (are) set for the PLMN, search in this (these) RAT(s) and other RAT(s) for that PLMN as specified in TS 23.122 [9].  For a UE operating in SNPN access mode, search for available SNPNs only consider NR cells.  Perform measurements to support PLMN/SNPN selection.  Synchronise to a broadcast channel to identify found PLMNs/SNPNs.  Report available PLMNs and any associated CAG-IDs with associated RAT(s) to NAS on request from NAS or autonomously.  For a UE operating in SNPN access mode, report available SNPNs to NAS autonomously.  **To support manual CAG selection, perform the following:**  Search for cells broadcasting a CAG-ID.  Read the HRNN (if broadcast) for each CAG-ID if a cell broadcasting a CAG-ID is found.  Report CAG-ID(s) of found cell(s) broadcasting a CAG ID together with the associated HRNN and PLMN to NAS.  On selection of a CAG by NAS, select any acceptable or suitable cell belonging to the selected CAG and give an indication to NAS that access is possible (for the registration procedure)  Editor’s note: It is FFS whether the above needs to capture the condition that the cell is “not reserved for operator use for UEs not belonging to AC 11 or 15”  To support manual SNPN selection, report available SNPNs together with associated HRNNs (if available) to NAS on request from NAS. |

**Question 4:** Do you agree to capture the condition that the cell is “not reserved for operator use for UEs not belonging to AC 11 or 15 in the above table.

|  |  |  |
| --- | --- | --- |
| **Company** | **Answer** | **Comment** |
| Ericsson | No | Disagree. The text in the table says “select any acceptable or suitable cell belonging to the selected CAG”. But if   * the cell is reserved for operator use; and * the UE does not belong to AC 11 or 15   the cell would be barred according to section 5.3.1, and hence it would be neither suitable nor acceptable. So the criteria seems to already be covered by the existing text. |
| Huawei | No | Agree with Ericsson. |
| Intel | No |  |
| Sony | No |  |
| Futurewei | No |  |
| CATT | No | Disagree. Agree with Ericsson. No need to repeat it again as it has been covered by the Criteria of acceptable or suitable cell |
| Lenovo | No |  |
| Qualcomm | No | Agree with Ericsson’s reasoning |
| ZTE | No |  |
| Samsung | No |  |
| Docomo | No |  |
| LG | No |  |
| Nokia | No | Agree with Ericsson, that the suitable cell criteria cover this. |
| NEC | No | We agree with Ericsson |
| vivo | No |  |

**Summary**

TBA

**Proposal**

TBA

## 3.5 Issue 5: Manual CAG ID considerations in 4.5 of 38.304

**Open issue description:** In clause 4.5 of 38.304: FFS whether the above needs to be updated to consider manually selected CAG ID.

**As the use of manually selected CAG ID is not clear (see issue 2), it is proposed to postpone the discussion until issue 2 is resolved.**

## 3.6 Issue 6: UE behaviour in SNPN AM in licensed bands

**Open issue description:** The UE behaviour in SNPN AM in licensed bands is FFS when the highest ranked cell or best cell according to absolute priority reselection rules is a cell which is not suitable due to not broadcasting the registered or selected SNPN ID

At RAN2#109 there was an email ([AT109e][117][PRN] Cell Selection and selection aspects) discussion with the following question without a conclusion:

**Question 4b: Do you agree with the following for licensed spectrum:**

**For a UE in SNPN AM, if the highest ranked cell or best cell according to absolute priority reselection rules is a cell which is not suitable due to not broadcasting the registered or selected SNPN ID, the UE shall not consider this cell as candidate for cell reselection but should continue to consider other cells on the same frequency for cell reselection.**

**Question 6:** As the decision on the above question requires technical discussion, companies are requested to provide their short technical views on this issue.

|  |  |
| --- | --- |
| **Company** | **Technical view** |
| Ericsson | Disagree. It would be better to follow the same behaviour as we have for PLMNs, i.e. the UE does not consider any cell on the frequency for 300s if the highest ranked or best cell is unsuitable. Deviating from this principle would result in that the UE camps on a non-strongest cell within a frequency which would cause inter-cell interference and a reduction in data rate for the UE. |
| Vodafone | Partially agree with Ericsson’s comment: if the highest ranking cell is not available (due to not broadcasting the ID) then UE can return and scan this cell again after 300s, however this may be waste of UEs’ battery and will tie the UE in unnecessary scanning for this cell. In normal operation if a cell is not broadcasting the right ID then from the network perspective there is a good reason for this. Therefore in balance to save UE’s power and in order not to tie the UE down unnecessarily, it is better to walk away from this cell. |
| Huawei | For licensed spectrum, cells on a specific frequency are deployed by the same operator.  The main concern for still considering other cells on the same frequencies is that there could be PLMN cells on this frequency. If “UEs in SNPN AM switches to PLMN AM” is not considered in this context, then we think it is reasonable to exclude other cells |
| Intel | Yes, we agree with the proposal below:  **For a UE in SNPN AM, if the highest ranked cell or best cell according to absolute priority reselection rules is a cell which is not suitable due to not broadcasting the registered or selected SNPN ID, the UE shall not consider this cell as candidate for cell reselection but should continue to consider other cells on the same frequency for cell reselection.**  We also suggest that the above is extended also to frequency common to CAG with PLMN and/or SNPN.  The reason is given below:  In the case of NPN and with RAN sharing among PLMN, SNPN and CAG network in a frequency, it is quite likely that the NPN coverage occurs in a small area (e.g. a factory floor or a residential compound etc.) and the NPN UE may move in and out of the NPN coverage quite frequently to/from normal PLMN coverage in the same frequency. The following are some such scenarios in Figure (i) and (ii):    Figure (i) A cell broadcast PLMN#2, CAG+PLMN#1 and SNPN#A and another cell in the same frequency broadcasting only PLMN#2; A UE registered with SNPN#A or PLMN#1 with CAG selected moves between the 2 cells;    Figure (ii) A cell broadcast CAG#C+PLMN#1 and SNPN#A and another cell in the same frequency broadcasting CAG#D+PLMN#1 and SNPN#B; A UE registered with SNPN#A or PLMN#1 with CAG#C selected moves between a cell  In TS36.304, it addresses the case for CSG cell (related to Figure (ii) above) with the following text:  *If the highest ranked cell or best cell according to absolute priority reselection rules is a CSG cell which is not suitable due to not being a CSG member cell, the UE shall not consider this cell as candidate for cell reselection but shall continue considering other cells on the same frequency for cell reselection.*  However, this is not sufficient for the NPN in the RAN sharing case where the deployment may be that SNPN and CAG cells are RAN sharing in the same frequency with PLMN cells.  **Observation#1:** TS36.304 addressing the case for CSG cell is not sufficient for NPN in the RAN sharing case where the deployment may be that SNPN and CAG cells are RAN sharing in the same frequency with PLMN cells.  In the last e-meeting, RAN2 agreed for the case of unlicensed operation, if the highest ranked cell or best cell is not suitable due to not broadcasting the registered/selected SNPN ID or PLMN ID with CAG list, UE follows the NR-u behaviour (i.e. only the concerned cell is not cell reselection candidate but other cells in the same frequency of the concerned cell should still be considered for cell reselection/selection):   * *For unlicensed spectrum and a UE in SNPN AM, if the highest ranked cell or best cell according to absolute priority reselection rules is a cell which is not suitable due to not broadcasting the registered or selected SNPN ID, the UE shall not consider this cell as candidate for cell reselection but should continue to consider other cells on the same frequency for cell reselection.* * *For unlicensed spectrum and for a UE with non-empty allowed CAG list, if the highest ranked cell or best cell according to absolute priority reselection rules is a cell which is not suitable due to not broadcasting the selected/registered/equivalent PLMN, the UE with no empty allowed CAG list shall behave according to NR-U agreement. FFS how to handle the case when the cell belongs to the correct operator but it’s not a CAG member cell. (We might come back to this if serious concerns / problems are found with this)*   For unlicensed operation, different SNPN or PLMN operators may share the same frequency and hence RAN2 agreed that there is a need to relax the Rel-15 UE behaviour. Such sharing of the same frequency by different SNPN and CAG also occurs in the RAN sharing case.  **Observation#2:** RAN2 agreed to relax the Rel-15 UE behaviour for operators sharing the same frequency for the unlicensed operation. This is the same as the RAN sharing case for licensed operations and the relax behaviour should be extended.  The main concern for allowing UE to continue in the same frequency is that UE will camp on non-best cell. Since this is operator-controlled scenarios, we think that there can be coordination between the best cell and the non-best cell and hence the interference issue can be mitigated via coordination of resources between the best cells and non-best cell.  One way to solve this is to leave it to the UE implementation for UE in SNPN access mode or UE with non-empty CAG allowed list to decide on whether to continue monitoring that frequency (based on its knowledge of whether the frequency is for RAN sharing) by having a ‘should’ for the other cells in the same frequency as in the proposal in Question 4b. |
| Sony | Agree with the proposal. It is likely that one frequency is shared by many SNPNs. So, if such deployment exists then the UE should be able to camp on its SNPN cell even if it is the second-best cell. However, network may control such behaviour if UE shall always respect the best cell criteria. |
| Futurewei | No, UE in SNPN AM should behave more like normal UE on a PLMN on a licensed spectrum, as cells within an area on this licensed spectrum are deployed by the same operator. |
| CATT | Agree. Considering the scenario that there is a spot where PLMN cell is the strongest cell on the frequency but SNPN cells are the non-strongest cells. From the SNPN AM UE point of view, the strongest PLMN cell should never be considered.it is reasonable to consider the “strongest SNPN cell” on the frequency. |
| Lenovo | No. Our understanding is that UE operation in SNPN AM should be same as what has been specified for PLMN. Not following the legacy principle would result in degradation of UE battery consumption and cell reselection performance. |
| Qualcomm | There are good arguments made on both sides. One option would be to let the UE behaviour be controlled by the IFRI indicator from the best cell, to decide if the UE considers other cells on the same frequency.  We would also like to note that for FR2, the interference concern noted by Ericsson would be negligible, while for FR1 the interference concern could be more serious. |
| ZTE | Agree. In our understanding, it is possible that different SNPN cells are deployed on the same frequency. Allowing UE to continue considering other cells on the same frequency for cell reselection when the strongest cell is not suitable gives more chance for UE to find a suitable SNPN cell. |
| Samsung | Since this is licensed spectrum we would prefer to follow the same behavior like for PLMN |
| Docomo | We think UE behavior should be aligned with PLMN (re)-selection i.e. the UE shall not consider this cell and other cells on the same frequency, as candidates for reselection for a maximum of 300 seconds. |
| LG | Since this is for licensed band operations, we think it should be sufficient to apply the same behaviors as for normal PLMN case, i.e., if the highest ranked SNPN cell on a licensed band is not suitable for the concerned reason, UE shall not consider intra-frequency neighbor cells for a *maximum* of 300s.  One may have some concern that excluding intra-frequency neighbor cells for max 300s from reselection candidate would lower the chance to select other suitable SNPN cells on the same frequency. However, given the assumption that SNPN would be normally deployed on a clustered manner where neighbor cells on the same frequency is likely to be the homogeneous SNPN cells, we see that excluding intra-frequency neighbor cells would effectively result in marginal loss of such chance to select a suitable cell on the same frequency.  We note that currently the duration to exclude cells on the same frequency from reselection candidate is upper *bounded* by 300s, i.e. the duration is not a constant value of 300s. This means the UE is allowed to camp on another suitable cell that must be best ranked, if found, on that frequency before reaching 300s. |
| Nokia | Disagree. There is no reason not to apply the principles used for PLMNs. Selecting the non-best cell may cause very high inter-cell interference. An operator may use black and white lists to exclude neighbouring cells of other operators from cell reselection if needed. |
| NEC | Disagree, but.  We think that selecting a non-highest ranked cell could cause high interference and a best cell should be considered instead, as is the case for legacy PLMN. This is especially true if the different cells are located in a similar location (e.g. sharing a tower and a frequency).  However, in the context of RAN sharing for SNPNs, we agree with the observation that the most suitable cell may indeed be located in a frequency where it is not the highest ranked cell. Furthermore, the two cells may not be physically close, and the interference could be small. Such interference could be further reduced by allowing inter-cell collaboration and indicating to the UE when it may or may not select a non-highest ranked cell.  Another option would be to relax the constraint on the 300s and allow the UE to consider other cells in the same frequency sooner if no suitable highest ranked cell is found in other frequencies.  Overall, we believe that we need further discussion to clarify the scenario where this would be needed |
| vivo | No. For licensed spectrum, we prefer to follow the same behaviour as we have for PLMNs. |

**Summary**

TBA

**Proposal**

TBA

## 3.7 Issue 7: Documentation of NR-U agreements for CAG case

**Open issue description:** How to document the following agreement: *“For unlicensed spectrum and for a UE with non-empty allowed CAG list, if the highest ranked cell or best cell according to absolute priority reselection rules is a cell which is not suitable due to not broadcasting the selected/registered/equivalent PLMN, the UE with no empty allowed CAG list shall behave according to NR-U agreement.”*

TBA when the new version of 38.304 is available

## 3.8 Issue 8: UE behaviour in unlicensed band with non-CAG member cell

**Open issue description:** The UE behaviour in unlicensed band is FFS when the cell belongs to the correct operator but it’s not a CAG member cell.

At RAN2#109 the following was agreed:

For unlicensed spectrum and for a UE with non-empty allowed CAG list, if the highest ranked cell or best cell according to absolute priority reselection rules is a cell which is not suitable due to not broadcasting the selected/registered/equivalent PLMN, the UE with no empty allowed CAG list shall behave according to NR-U agreement. FFS how to handle the case when the cell belongs to the correct operator but it’s not a CAG member cell. (We might come back to this if serious concerns / problems are found with this)

The relevant NR-U agreement is captured in the following way in 38.304:

“For operation with shared spectrum channel access, if the second highest ranked cell on this frequency also does not have a PLMN being equivalent to the registered PLMN, the UE may consider this frequency to be the lowest priority for a maximum of 300 seconds.”

**Question 8:** Do you agree that in unlicensed band to handle case when the highest ranked cell or best cell is not suitable due belonging to the correct operator, but it is not a CAG member cell in the same way as the cell does not belong to the correct operator in unlicensed band?

|  |  |  |
| --- | --- | --- |
| **Company** | **Answer** | **Comment** |
| Ericsson | Yes | For unlicensed bands we want to ensure that the UE camps on the strongest cell among the cells that belongs to the same operator to reduce inter-cell interference. Basically, the behaviour should be the same as for licensed bands if we imagine that the cells belonging to other operators on the frequency are removed. |
| Vodafone | Yes | UEs should camp on the strongest cell as in conventional license band operation |
| Huawei | Yes | For unlicensed spectrum, the behaviour in the two scenarios shall be the same.   1. If the best cell is not suitable due to not belonging to the correct operator:   Other cells should not be excluded, because they could belong to the correct operator.   1. If the best cell is not suitable due to not belonging to the allowed CAG list:   Other cells should not be excluded, because they could belong to the allowed CAG list. Note that this is also in line with the legacy CSG behaviour. |
| Intel | Yes (i.e. it should follow non-best cell approach as in NR-u) | Yes, we agree that when the highest ranked cell or best cell is not suitable due belonging to the correct operator, but it is not a CAG member cell, the UE shall only consider the cell not candidate for cell reselection but other cell in the same frequency as the best cell should still be considered as candidate for cell reselection. |
| Sony | Yes | Agree with Huawei even though I am bit confused by the text above. The relevant NR-U agreement from 38.304 mentions “the second highest ranked cell” and if this cell also does not belong to the “registered PLMN”. It seems that the UE can select the second highest ranked cell if it belongs to the registered PLMN.  Whereas the question 8 above refers to “the highest ranked cell or best cell” belonging to the registered PLMN but not in the CAG list and not the second best or ranked cell? |
| Futurewei | Yes | In general, a non-CAG member cell on unlicensed band, whether belonging to the correct operator or not, should be treated the same way as not belonging to the correct operator in NR-U. |
| CATT | Yes | No strong view. We are OK to follow the majority view |
| Lenovo | Yes | But to be clear: The UE then **may consider** cells on the concerned frequency to be the lowest priority for a maximum of 300 seconds. |
| Qualcomm | Yes |  |
| ZTE | Yes | When the highest ranked cell belongs to the correct operator but it’s not a CAG member cell, UE should also behave according to NR-U agreement. |
| Samsung | Yes |  |
| Docomo | Yes |  |
| LG | Yes | Two cases should be treated in the same way, i.e. to apply the behaviors for NR-U. |
| Nokia | Yes | When the cell is not suitable due to not being a CAG member cell means that the cell does not belong to the “selected/registered network”. Therefore, our view is that it should be handled in the same way as a cell does not belong to the selected/registered (e)PLMN. |
| NEC | Yes |  |
| vivo | Yes |  |

**Summary**

TBA

**Proposal**

TBA

## 3.9 Issue 9: PCI values for CAGs

**Open issue description:** FFS whether PCI values for CAGs are signalled per PLMN per frequency or no new ASN.1 IEs are introduced in Rel-16 for signalling of PCI values for CAGs

At RAN2#109 there was an email ([AT109e][117][PRN] Cell Selection and selection aspects) discussion with the following question without a conclusion:

**Question 1: Please indicate preferred option for signalling of PCI range for CAGs:**

1. **Signal PCI range(s) for all CAGs. Number of ranges FFS.**
2. **Signal PCI range(s) per PLMN per frequency. Number of ranges FFS.**
3. **Signal PCI range(s) per CAG ID per frequency. Number of ranges FFS.**
4. **CAG PCI range is introduced as a list of blacklisted/whitelisted cells (no changes required to ASN.1 and NR-U CRs are the baseline).**

**Question 9:** As the decision on the above options requires technical discussion, companies are requested to provide their short technical views on this issue.

|  |  |
| --- | --- |
| **Company** | **Technical view** |
| Ericsson | In our view there is very limited gain of broadcasting PCI ranges so we should not introduce a complex solution. Option 4 seems to be good enough. |
| Vodafone | Option 3, We would require as much granular cell identification as possible as for example on a country wide PLMN, with different operating frequencies, we would require different closed access groups for different customers and services. |
| Huawei | Slightly prefer option 3. Option 2 is also acceptable to us.  The reserved PCIs could be different across different CAGs, thus it is useful to also include CAG IDs. |
| Intel | The signalling of the PCI range is useful for the UE with CAG only indication to save on UE power. Hence we think Option 2 is a good compromise between UE power vs signalling overhead.  However, we are also fine to go with Option 4 (i.e. do nothing further than NR-u) |
| Sony | We prefer option 4 considering the limited time left. |
| Futurewei | Option 3. The effectiveness of PCI value signalling depends on the deployment scenario of CAG, and Option 3 is more suitable for the use case envisioned by Vodafone. |
| CATT | Option2 and Option 3.NPN-cable UE can choose the matched cells to be measured in cell reselection based on the PCI range and associated PLMN ID and CAG ID.it is beneficial for UE power consumption and measurement delay reduction. |
| Lenovo | Option 4. That means up to 16 PCI ranges may be signalled per frequency (1x intra + 8x inter). |
| Qualcomm | Prefer 2, but can live with 4 if clarified better (see below).   * For option 4, we understand the whitelist part being used from NR-U, but we don’t understand what role blacklist can play. A PLMN cell cannot blacklist the CAG PCIs (as that would prevent CAG member UEs from finding them), and a CAG cell cannot blacklist PLMC PCIs (as that would prevent UEs allowed to access PLMN from access).   We have significant concerns with option 3 as the management overhead will be quite high to get each PLMN cell to broadcast CAG specific information. If option 3 is adopted, we still want the signalling to be designed to permit some form of CAG wildcard that allows operators to fall-back to option 2. |
| ZTE | lightly prefer option3. Option 1 and 2 are also acceptable to us. Proving the PCI range of CAG cells is helpful for CAG-only UE to fasten the cell reselection procedure to find a suitable CAG cell. |
| Samsung | Prefer Option 2 |
| Docomo | We prefer Option2, which has lower signaling overhead compared with option3. |
| LG | Prefer Option2.  Regarding Option4, we do not understand how option4 can work. In our view, PCI range of CAG list has nothing to do with black/whitelist. |
| Nokia | We prefer option 4.  Blacklist have been introduced by Rel-15, and whitelist introduced within NR-U work in Rel-16. These lists can be band specific. There are no separate PLMN specific lists neither in NR nor in LTE for RAN sharing scenarios. Therefore, we do not think that PLMN or PNI-NPN specific lists should be introduced. |
| NEC | Option 4 is sufficient, a too complex solution is not required. |
| vivo | No strong view, but we slight prefer option2 in consideration of the signalling overhead if option 4 is excluded. |

**Summary**

TBA

**Proposal**

TBA

## 3.10 Issue 10: Selected PLMN-Identity in RRCResumeComplete

**Open issue description:** Whether the selected PLMN-Identity can refer to a NPN in the description of RRCResumeComplete messages and the relevant procedures

According to clause 5.3.13.4 the selected PLMN-Identity may need to added into *RRCResumeComplete*

1> set the content of the of *RRCResumeComplete* message as follows:

2> if the upper layer provides NAS PDU, set the *dedicatedNAS-Message* to include the information received from upper layers;

2> if the upper layer provides a PLMN, set the *selectedPLMN-Identity* to PLMN selected by upper layers (TS 24.501 [23]) from the PLMN(s) included in the *plmn-IdentityList* in *SIB1;*

**Question 10a:** Do you see a case when the selected SNPN ID should be added to the *RRCResumeComplete* message?

**Question 10b:** Do you see a case when the selected CAG ID should be added to the *RRCResumeComplete* message?

|  |  |  |  |
| --- | --- | --- | --- |
| **Company** | **Answer 10a** | **Answer 10b** | **Comment** |
| Ericsspn | No | Yes | For SNPN: Equivalent SNPNs not supported in Rel-16 so there is no need to indicate SNPN ID during resume.  For CAG: The UE may resume in a cell belonging to an equivalent PLMN so the PLMN ID may need to be indicated. |
| Vodafone | 10a: No | 10b:Yes | 10a: if the UE is in a standalone network after Resume it is very likely that the UE will remain in the standalone cell/network  10b: The UE may have moved between the CAG cell and PLMN ID needs to be sent again in a Resume message |
| Huawei | No | No | For SNPN, the UE could only perform resume in the same SNPN because UE needs to enter Idle mode and perform cell reselection if it chooses another SNPN.  For CAG, it was agreed in RAN2 #109e that:  5. There is no need to include CAG ID in RRCResumeComplete message for UE in automatic CAG selection mode. |
| Intel | No | Wait for response from SA2 and CT1 | For Q10a:  UE context is still known to the network and there is no equivalent SNPN  For Q10b:  This depends on the response from SA2 and CT1 on whether selected CAG ID will become part of allowed CAG list for manual CAG selection |
| Sony | No | No |  |
| Futurewei | No | No | For SNPN, UE can resume only from cell of the same PLMN.  Is there use case that UE context can be forwarded between cells belonging to different CAG? |
| CATT | No | Depends | For Q10b:  There is no need to include CAG ID in RRCResumeComplete message for UE in automatic CAG selection mode.  For the necessity of including CAG ID in RRCResumeComplete message in manual CAG selection mode. It depends on the LS response from SA2 and CT1 about the role of manually selected CAG ID |
| Lenovo | No | Yes |  |
| Qualcomm | No | Partial Yes | 10b: No need to indicate selected CAG ID, but it should be possible to indicate the PLMN. |
| ZTE | No | Wait for response from SA2 and CT1 | For Q10b:  This is related to the LS we sent to SA2 and CT1 on the role of the manually selected CAG ID.  If SA2 requires that UE shall stay on cells supporting the manually selected CAG ID in RRC\_CONNECTED state especially in the case when after registration the Allowed CAG List in the UE does not contain the manually selected CAG ID, the network should be aware of the selected CAG to keep UE in the same CAG as much as possible during mobility. |
| Samsung | No | Yes | 10b: It should be possible to indicate the PLMN ID. |
| Docomo | No | Partial Yes | 10b: PLMN ID may be needed when UE resume to an equivalent PLMN. |
| LG | No | No | There is no requirement enforced to RAN2 to include selected SNPN ID or selected CAG ID in RRCResumeComplete message. For CAG case, PLMN can be included. |
| Nokia | No | Yes | The case when upper layers provide the selected PLMN identity is when a new ePLMN is selected and RAN sharing is deployed in the selected cell.  In SNPN there is no concept of equivalent SNPNs, therefore the answer for 10a is NO.  In case of PNI-NPNs it is possible the an ePLMN is selected, and thus our answer the 10b is YES. Note that the allowed CAG ID list could also be changed in that case. |
| NEC | No | Wait for response from SA2 and CT1 | We agree that the scenario where the UE context can be forwarded between cells belonging to different CAG seems unlikely, but we prefer waiting for a formal decision from SA2/CT1 |
| vivo | No | No | RAN2 has agreed “*There is no need to include CAG ID in RRCResumeComplete message for UE in automatic CAG selection mode*”. but PLMN ID needs to be included in RRCResumeComplete. |

**Summary**

TBA

**Proposal**

TBA

## 3.11 Issue 11: Optionality to support reporting about the npn-IdentityInfoList

**Open issue description:** It is FFS if all Rel-16 are required to be able to report the *npn-IdentityInfoList*

At RAN2#109e the following was agreed

4.1: Extend the current measurement reporting procedures to include NPN information to support ANR. (It is FFS if it is mandatory for all Rel-16 UEs to support it.)

4.2: The CAG ID/SNPN NID information shall be added into the CGI-InfoNR. (It is FFS if it is mandatory for all Rel-16 UEs to support it.)

**Question 11:** Which option do you prefer?

* Option A: Reporting about the *npn-IdentityInfoList* is mandatory for all Rel-16 UEs
* Option B: Reporting about the *npn-IdentityInfoList* is mandatory for all NPN-capable UEs, but optional for non-NPN capable UEs (separate capability indication)
* Option C: Reporting about the *npn-IdentityInfoList* is mandatory for all NPN-capable UEs, and not supported by non-NPN capable UEs

|  |  |  |
| --- | --- | --- |
| **Company** | **Answer** | **Comment** |
| Ericsson | B or C | Same comment as for Q1 (support of emergency calls in NPN-only cells). We normally do not require UEs to parse or act on SI for features which they don’t support.  We are not sure we understand the difference between option B and C correctly. By separate capability do you mean that we will introduce a UE capability for the support of NPN (this is most likely needed) or do you mean that we will introduce a UE capability for the support of CGI reporting for NPN (this is probably not needed)? |
| Vodafone | C | Option C is more logical.  For Option B it is unclear why the identity list is transmitted to UEs which do not have the CAG capability, this looks like a waste of network resources. |
| Huawei | C | Note that the existing CGI related capabilities (without NPN involved) in 38.306 are mandatory with signalling, which is basically equal to optional.  To make sure we are on the same page, the “mandatory” for NPN-capable UEs in the given options means: **if the UE supports CGI reporting**, reporting *npn-IdentityInfoList* is mandatory; if the UE does not support CGI reporting of PLMN cells, then reporting *npn-IdentityInfoList* is not supported. With this understanding, we think Option C is reasonable. Also, there is no need to introduce extra UE capability signalling. |
| Intel | C | It is not needed for non-NPN capable UEs to be able to decode and provide the NPN list |
| Sony | A or B | ANR parameters are anyway best effort to report |
| Futurewei | C | It is overkill for non-NPN-capable UE to read and parse NPN SI just for ANR reporting. |
| CATT | C | It is unreasonable for non-NPN-capable UE to read and act on NPN specific SI. Beside,The conclusion of Question 11 will determine the necessity “Issue 16: UE capabilities” |
| Lenovo | C or B | Option A is a too strong requirement for non-NPN capable UEs. |
| Qualcomm | A | A macro cell would need to learn about a small-cell based CAG deployed under its coverage so it can avoid handovers of non-CAG UEs to the CAG. This holds true even if all the CAG member UEs stay indoors and never connect to the macro cell. If ANR is not allowed, then the deployment would have to resort to old-fashioned manual configuration.  For a CAG-only cell (or to be specific a cell with reservedForOtherUse=’true’) the Rel-15 SIB1 fields may not have any meaningful information, making the ANR report containing only Rel-15 SIB1 fields non-usable by the gNB.  38.300/15.3.3.2 has the following statement “ When the UE has found out the new cell's NCGI(s) /ECGI(s), the UE reports all the broadcast NCGI(s)/ECGI(s) to the serving cell NG-RAN node”  Omitting by the UE of ECGI(s) contained in the NPN part of SIB1 would violate this UE requirement.  We are okay with the following compromise:   * All R16 UEs will support reporting of NPN information. * For the ANR request, the network can configure the UE to perform Rel-15 ANR (UE does not send NPN info) or Rel-16 ANR (UE includes NPN info).   Note that ANR for LTE included CSG-ID even for CSG non-capable UEs. From a UE perspective, we believe the concerns about UE complexity are not the most important aspect here. Successful and efficient CAG operation should be the criteria to make the decision. |
| ZTE | C | In our understanding, there is no need for a non-NPN R16 UE to parse or act on the *npn-IdentityInfoList.* Also, there is no need to introduce extra UE capability signaling for the support of CGI reporting for NPN, a NPN UE who supports CGI report for NR shall report the *npn-IdentityInfoList* when configured to do so. |
| Samsung | C | There is no reason for non-NPN capable UEs to support this. |
| docomo | A or B | For ANR, reporting is preferable done by all UEs. |
| LG | C | We would like to request CGI reporting for NPN ANR only towards NPN-capable UEs.  For NPN-capable UEs, the capability of SNPN information reporting can go together with the capability of CAG information reporting, rather than separate capabilities. |
| Nokia | A (or B) | Non-NPN capable UEs shall also be able to report about NPN information to the network.  If the conclusion of issue 1 is that all Rel-16 shall be able to read NPN information for emergency sessions, then it is safe to assume that all Rel-16 UE is able to report about NPN information.  If it is decided that reporting is an optional feature, then a separate reporting capability indication is needed at AS level, as the network shall know whether NPN information is missing from the report because it is not there, or because the UE is not able to report about it. |
| NEC | C | We do not see why non-NPN capable UEs would need to decode NPN SI and transmit identity list |
| vivo | C | In our understanding, non-NPN capable UE is no need to parse NPN related information, thus is no need to report. |

**Summary**

TBA

**Proposal**

TBA

## 3.12 Issue 12: Network indexing for NPNs

**Open issue description:** A definition of network indexing for NPNs is FFS

In RRC signalling PLMN index is used to optimize RRC signalling. PLMN index defined in the following way:

The PLMN index is defined as *b1+b2+…+b(n-1)+i* for the PLMN included at the *n*-th entry of *PLMN-IdentityInfoList* and the *i*-th entry of its corresponding *PLMN-IdentityInfo*, where *b(j)* is the number of *PLMN-Identity* entries in each *PLMN-IdentityInfo*, respectively, the use of the PLMNs

At RAN2#190e it was agreed to introduce NPN indexing in a similar way, and the followings were agreed:

2.1 There is no need to create any order between SNPNs and PNI-NPNs during the indexing.

* 1. For cells shared between PLMNs and NPNs, NPN capable UEs use the first PLMN ID in the Rel-15 PLMN list.

3.1 The selectedPLMN-Identity can refer to a NPN (a SNPN or a PNI-NPN) or set of PNI-NPNs having the same PLMN ID (in case CAG ID is not sent in the RRC message) in the description of RRCSetupComplete message and the relevant procedures.

However, the details of NPN indexing have been left open, more specifically it is open whether PNI-NPNs belonging to the same PLMN will have separate index or not.

The current specification only contains the following:

The NPN index is defined as B+FFS, where B is the index used for the last PLMN in the *PLMNIdentittyInfoList*. In NPN-only cells B is considered 0.

**Question 12:** Which option do you prefer?

* Option A: PNI-NPNs belonging to the same PLMN have a common index value
* Option B: All PNI-NPNs have its own index value

Note that Option A makes very cumbersome the support of broadcasting UAC parameters per PNI-NPN, therefore the selection of Option A can only happen after an agreement on Issue 3.

|  |  |  |
| --- | --- | --- |
| **Company** | **Answer** | **Comment** |
| Ericsson | Option A | We only need to indicate the PLMN ID. As the rapporteur mentioned though the question is dependent on the outcome of issue 3. |
| Vodafone | Option A | A common index value is preferred |
| Huawei | Both are ok, with some concerns | **Option A:**  If Option A is adopted, another indication is needed in MSG5 to tell the gNB whether the UE is accessing through PLMN or CAG. The reason is as follows:  As agreed in R3-197776, the gNB transmits the supported CAG List of the selected PLMN of the selected cell via the Initial UE Message to AMF for further admission control. However, there is no need for the gNB to transmit the supported CAG List to AMF when the UE (e.g., PLMN UE) is not requesting to access via CAG cell.  **Option B:**  For security reasons, RAN2 has agreed that CAG ID is not included in MSG5. So if Option B is adopted, RAN2 needs to clarify that when including the selected network in MSG5, UE only considers the PLMN part (e.g., UE can report whichever of #7 and #8 for CAG 1/2 in the following example) and the gNB only detects the PLMN part of the network index). |
| Intel | Option A if SA2 response to the LS is that slice based UAC is sufficient  Option B if SA2 response to the LS is that CAGID specific UAC is needed | This is related to the UAC issue. We should wait for the response from SA2 and CT1 whether the slice based UAC configuration is sufficient. |
| Sony |  | Wait for SA/CT1 response |
| Futurewei | Wait | Wait for SA1/CT1 response on UAC for CAG |
| CATT |  | Wait for SA/CT1 response |
| Lenovo |  | We should wait for SA1/CT1 response |
| Qualcomm | Option A | Question to moderator: Could you clarify why Option A makes the design more cumbersome, in the case issue 3 is resolved to require per CAG UAC parameters? |
| ZTE | Wait | Wait for SA1/CT1 response on UAC for CAG. |
| Samsung | Option A | Can be decided after response from SA2/CT1 |
| Docomo |  | Wait response from SA2/CT1 whether CAG ID specific UAC is needed or not |
| Nokia | Option B | Option B can work independently from the outcome of issue 3, and it provides full flexibility for the future. Note there is solution that ensures that the selected CAG ID in RRC signalling is not revealed. Option A can only be agreed after a conclusion on issue 3. |
| NEC | Wait | Option B is only useful if SA2 replies that CAG ID specific UAC is needed. But choosing Option A now would add burden in the future if SA2 replies that it is |
| vivo | Option A | The selected CAG ID is not sent to NW due to privacy issue. We have concern that the selected CAG ID will be implicitly exposed when UE reports the selected PLMN to NW if the Option B is adopted. |

**Summary**

TBA

**Proposal**

TBA

## 3.13 Issue 13: Size of NID

**Open issue description:** The size of NID is to be aligned with latest CT4 agreements

CT4 agreed that NID size is 44 bits (**[C4-200337](http://www.3gpp.org/ftp/tsg_ct/WG4_protocollars_ex-CN4/TSGCT4_96e_meeting/Docs/C4-200337.zip)**).

**Question 13:** Do you agree to follow CT4 agreements (NID size is 44 bits)?

|  |  |  |
| --- | --- | --- |
| **Company** | **Answer** | **Comment** |
| Ericsson | Yes |  |
| Vodafone | Yes |  |
| Huawei | Yes |  |
| Intel | Yes |  |
| Sony | Yes |  |
| Futurewei | Yes |  |
| CATT | Yes |  |
| Lenovo | Yes |  |
| Qualcomm | Yes |  |
| ZTE | Yes |  |
| Samsung | Yes |  |
| Docomo | Yes |  |
| LG | Yes |  |
| Nokia | Yes | CT4 new agreement is based on RAN2’s request. |
| NEC | Yes |  |
| vivo | Yes |  |

**Summary**

TBA

**Proposal**

TBA

## 3.14 Issue 14: Optionality of TAC in NPN-IdentityInfoList

**Open issue description:** Whether *trackingAreaCode* is optional or mandatory within *NPN-IdentityInfoList*

The TAC is not needed for cells that are only used as secondary cells; therefore, the TAC is optional in *PLMN-IdentityInfoList*. It was agreed that EN-DC is not supported with NPNs. It is not clear whether an optional TAC is beneficial for NR-DC that is supported with NPNs.

**Question 14:** Do you agree that *trackingAreaCode* is optional or mandatory within *NPN-IdentityInfoList*?

|  |  |  |
| --- | --- | --- |
| **Company** | **Answer** | **Comment** |
| Ericsson | Mandatory | Don’t see the need to have it optional considering that NSA operation (EN-DC) is not supported for NPNs. |
| Vodafone | Mandatory | Operator need to know where the UE is and which cell it is registered to and EN-~Dc scenario is no exception. |
| Huawei | mandatory | In R15, the absence of TAC is used to indicate that the cell only supports PSCell/SCell functionality.  Since RAN2 already agreed in #109e that “EN-DC is not supported for NPN”, there is no reason that a network shall not broadcast TAC. |
| Intel | Mandatory | We can’t see why an NPN node will become a pure SN where it is not used as standalone |
| Sony | mandatory |  |
| Futurewei | Mandatory | Making TAC optional in NPN-IdentityInfoList seems to be an optimization of signalling for NPN cell in non-standalone scenario. |
| CATT | Mandatory | EN-DC is not supported in NPN, and an optional TAC is not beneficial also for NR-DC as there is no NR cell only supports PSCell/SCell functionality in NR-DC. |
| Lenovo | Mandatory |  |
| Qualcomm | Mandatory |  |
| ZTE | / | Making the TAC mandatory means an NPN node cannot be a pure SN.  We made the agreement last meeting that EN-DC is not supported for NPNs mainly because NPN is not supported in EPC.  However, for MR-DC with 5GC, especially NR-DC, no agreement has been made yet and we still think it is possible that a NPN node can be added as a pure SN.  If companies are concerned about the limited time left and do not want further discussion on the MR-DC for NPN, we are also fine to follow the majority’s view to have TAC mandatory in R16. |
| Samsung | Mandatory |  |
| Docomo | Mandatory |  |
| LG | Mandatory | We do not identify clear use case to use NPN node as pure SN. |
| Nokia | Optional | TAC can also be option in NR-DC case if the cell can only be used as secondary cell. |
| NEC | Mandatory |  |
| vivo | Mandatory |  |

**Summary**

TBA

**Proposal**

TBA

## 3.15 Issue 15: Maximum Length of HRNNs

**Open issue description:** Maximum Length of HRNNs *(maxHRNN-Len-r16* is FFS)

A background information is that the maximum NR SIB size is 2976 bits (31\*12 octets).

**Question 15a:** Do you agree that interpedently from the maximum size all HRNNs shall be fit in a single SIB?

**Question 15b:** Which option do you prefer as the maximum Length of HRNNs

* Option A: 24 octets
* Option B: 32 octets (maximum length of Wi-Fi SSIDs)
* Option C: 48 octets (maximum length of Home eNB name)
* Option D: Other?

|  |  |  |  |
| --- | --- | --- | --- |
| **Company** | **Answer 15a** | **Answer 15b** | **Comment** |
| Ericsson | Yes | C |  |
| Vodafone | Yes | C |  |
| Huawei | Yes | A or B | If there are 12 networks, each with an HRNN of maximum length, then only Option A is within the limitation of SIB size, and Option B is quite close. Considering that it is not likely that all HRNNs will use up the maximum length, we think Option B is also acceptable. |
| Intel | Yes | C |  |
| Sony | Yes | C |  |
| Futurewei | Yes | A/B/C | No strong view – given HRNN is selected by operators, all options should be fine. |
| CATT | Yes | A or B | Agreed with Huawei |
| Lenovo | Yes | C | Since the HRNN length is variable in the range (1..48) octets, the network can adjust the size of HRNN SIB if it reaches the max SIB size of 2976 bits. |
| Qualcomm | Yes | B/C | 32/48 both look ok. Note that the 32/48 octets should be UTF-8 encoded (LTE used UTF-8). Something to be addressed as part of ASN.1 improvements … |
| ZTE | Yes | C |  |
| Samsung | Yes | A/B/C | No strong view |
| Docomo | Yes | C |  |
| LG | Yes | C | Fine to follow HeNB name. |
| Nokia | Yes | B | This has similar role as SSIDs in Wi-Fi. The drawback of option C is that it in case of long names it can easily lead to SIB size issues, as in case of 12 networks, the average size of HRNNs could not be longer than 30 octets. HRNNs in Option A seem too short. |
| NEC | Yes | A or B/C | As noted by Huawei, 12 HRNN might exceed SIB size in case of B or C so A would be the only option that would always work. However, if the network can appropriately reduce HRNN sizes, then B or C is fine |
| vivo | Yes | A/B/C | No strong view. |

**Summary**

TBA

**Proposal**

TBA

## 3.16 Issue 16: UE capabilities

**Open issue description:** Views on UE NPN feature support and necessary capabilities.

NPN support in Rel-16 UEs is optional, but there has not been any discussion whether AS level capability indication is needed that the UE supports NPN.

NAS already has a capability for CAG, 24.501/9.11.3.1 (network provides CAG member list via NAS only if the UE supports this capability). The SNPN mode selection is a UE autonomous procedure.

**Question 18:** Do you agree that AS level capability indication is needed for NPN support? If yes, then please also provide some proposals on the capabilities to be indicated.

|  |  |  |
| --- | --- | --- |
| **Company** | **Answer** | **Comment** |
| Ericsson | Yes | Two separate UE level capabilities for support of PNI-NPN and SNPN. Using separate capabilities makes it possible to implement and test each type of NPN independently. |
| Samsung | No | For CAG, NAS level capability is sufficient. For SNPN, since this is an autonomous feature AS capability is not needed |
| Lenovo | No | For SNPN UE:   * The support of SNPN is subscription-based, e.g. stored on an SNPN USIM. So, when an SNPN-enabled UE is configured with subscriber identifier and credentials for each subscribed SNPN, and SNPN access mode is activated (this is left to UE implementation) then it has to support all AS functionalities for SNPN operation.   For CAG UE:   * The support of CAG is signalled by UE over NAS by setting the CAG bit to "CAG Supported" in the 5GMM capability IE of the REGISTRATION REQUEST message, see TS 24.501. We think that this NAS signalling is sufficient.   So, although no UE AS capabilities need to be defined it might be good to have a description on the mandatory AS functionalities for UEs supporting SNPN/CAG, e.g. in a normative annex in 38.306 similar to what has been specified for CSG in 36.331, annex B.2. |
| CATT | No | We do not see there is a need for NG-RAN to know the UE capability for NPN support. |
| LG | Yes | Don’t we need to signal the capability of CGI-reporting for SNPN? |
| Huawei | No |  |
| Sony |  | No strong opinion but slightly prefer having separate capabilities for AS and NAS |
| Futurewei | No | NAS level capability suffices for PNI-NPN, and subscription/UE provisioning is good for SNPN. |
| Qualcomm | No |  |
| Nokia | No, but depends on issue 11 | The SNPN Access Mode is selected by the UE autonomously, there is no reason for the network to know it in advance.  As the AMF does not send allowed CAG list to gNB when the UE does not support PNI-NPNs (information provided at NAS level), there is no reason to introduce AS level capability for PNI-NPNs.  If not all Rel-16 shall be able to report about NPN information (see issue 11) then an AS level capability is needed about NPN information reporting. |
| vivo | No | For SNPN, whether adopt SNPN access mode or PLMN access mode is up to UE implementation.  For CAG, RAN can know that a UE is CAG capable UE by receiving CAG related mobility restriction from CN.  There is no reason to introduce AS level capability. |
| ZTE | No | For CAG, the NAS level capability is sufficient.  For SNPN, there is no need for network to know whether UE support it or not in advance. |

**Summary**

TBA

**Proposal**

TBA

## 3.17 Issue 17: Manual CAG selection indication

**Open issue description:** There is an ongoing CT1 discussion that the network should indicate whether it can be selected during manual CAG selection.

**It is proposed to postpone the discussion until CT1 concludes the issue.**

## 3.18 Issue 18: Handing of intraFreqReselection in unlicensed bands

**Open issue description:** Whether the field *intraFreqReselection* in MIB message can be ignored in unlicensed bands by the UE.

At the last meeting the decision on this issue was postponed based on the following proposals of R2-2001697:

Proposal 4.4: Postpone the discussion of the following: should the field *intraFreqReselection* in MIB message broadcast by a SNPN cell not in licensed spectrum be ignored or not by a UE in SNPN AM?

Proposal 5.3: Postpone the discussion of the following: should the field *intraFreqReselection* in MIB message broadcast by a CAG cell not in licensed spectrum be ignored or not by a UE not in SNPN AM?

NR-U agreement on handling this field is the following:

If a cell is barred in NR-U, due to the registered PLMN or selected PLMN does not match one of the PLMN IDs in SIB1, “IntraFreqReselection” shall be always interpreted as “allowed”.

**Question 18:** Do you agree that the UE handles the field *intraFreqReselection* in MIB message broadcast by NPNs in unlicensed bands in the same way as agreed in NR-U for PLMNs?

|  |  |  |
| --- | --- | --- |
| **Company** | **Answer** | **Comment** |
| Ericsson | Yes | The *intraFreqReselection* flag is followed whenever the barred cell belongs to the selected/registered network, otherwise it is ignored. More specifically:  For SNPNs: The *intraFreqReselection* flag is ignored (i.e. the UE behaves as if the flag is set to “allowed”) if the barred cell does not belong to the registered/selected SNPN. If the barred cell belongs to the selected SNPN then the UE follows the value of the *intraFreqReselection* flag in MIB.  For CAG: The *intraFreqReselection* flag is ignored (i.e. the UE behaves as if the flag is set to “allowed”) if the barred cell does not belong to the registered/selected PLMN. If the barred cell belongs to the registered/selected PLMN then the UE follows the value of the *intraFreqReselection* flag in MIB. The CAG ID is not used in the evaluation since different CAG IDs do not represent different networks. |
| Samsung | Yes | Follow NR-U agreements for PLMN. No reason to deviate. |
| Lenovo | In-principleyes, but | In-principle we agree with the UE behaviour as described by Ericsson. However, there is a little detail to consider. Having looked at the NR-U 38.304 CR0149r2 in R2-2002385, the “UE may select” was specified if the barred cell does not belong to the registered/selected PLMN, i.e. it’s up to UE whether to follow the value of the intraFreqReselection flag in MIB or not.  - If the field *intraFreqReselection* in *MIB* message is set to "not allowed":  - If the cell operates in licensed spectrum or if this cell belongs to a PLMN which is indicated as being equivalent to the registered PLMN:  - the UE shall not re-select a cell on the same frequency as the barred cell.  - else:  - the UE may select to another cell on the same frequency if reselection criteria are fulfilled.  - The UE shall exclude the barred cell and, if the cell operates in licensed spectrum or if this cell belongs to a PLMN which is indicated as being equivalent to the registered PLMN, also the cells on the same frequency as a candidate for cell selection/reselection for 300 seconds. |
| CATT | Yes | It is reasonable to follow NR-U agreement for PLMNs |
| LG | Yes | We think Lenovo’s comment is valid. In NR-U CR, it is indeed up to UE to ignore or follow IFRI in the concerned case. Our intention here should be to exactly follow NR-U behaviours. |
| Huawei | Yes | For unlicensed spectrum, there could be multiple operators on one frequency. It is unreasonable that one of the operator forbids the UE from selecting other operators by setting *intraFreqReselection* to "not allowed". |
| Sony | Yes | Agree with Ericsson |
| Futurewei | Yes | NR-U approach can be taken. |
| Qualcomm | Yes |  |
| Nokia | Yes | Follow NR-U agreements. When the cell belongs to the selected/registered (e)PLMN, but not suitable due to unsupported CAG IDs, it should also be considered as the case when the cell belongs to the selected/registered (e)PLMN. |
| NEC | Yes | We agree to follow NR-U agreements |
| vivo | Yes | We prefer to follow NR-U agreements. |
| ZTE | Yes | For unlicensed spectrum, it is not realistic for operators to coordinate with each other on setting of the *intraFreqReselection*, it is better for UE to always treat it as allowed. |

**Summary**

TBA

**Proposal**

TBA

## 3.1X Issue 1X:

**Open issue description:**

# 4 Conclusions