3GPP TSG-RAN WG2 Meeting #118 Electronic R2-22XXXXX

Elbonia, 09 – 20 May 2022

**Agenda item: 6.8.1 Organizational**

**Source: Huawei (Rapporteur)**

**Title: Report of [AT118-e][240][Slicing] Finalizing RRC for RAN slicing (Huawei)**

**WID/SID: NR\_slice-Core**

**Document for: Discussion and Decision**

# 1 Introduction

This document is the report of the following email discussion:

* [AT118-e][240][Slicing] Finalizing RRC for RAN slicing (Huawei)

      Scope: Finalize RRC CR for RAN slicing based on meeting decisions.

Intended outcome: Discussion report in [R2-220xxxx](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_118-e/Docs/R2-220xxxx.zip) and agreeable CR in [R2-2206172](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_118-e/Docs/R2-2206172.zip).

Deadline: Deadline 5

**Deadline 5 (discussions for 2nd week Thu/Fri online):**

* **Comment deadline:** Wednesday W2, 0400 UTC (for collecting views)
* **Rapporteur proposals:** Wednesday W2, 0800 UTC (proposed resolution of issues)
* **Document deadline:** Wednesday W2, 1600 UTC (report or agreed CRs)
  + No extensions to this deadline for regular discussions. Discussions handling CRs may continue to short post-meeting email (based on chair decision).

# 2 Contact Points

Respondents to the email discussion are kindly asked to fill in the following table.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Company | | Name | | Email Address | |
| Huawei, HiSilicon | | Jun Chen | | jun.chen@huawei.com | |
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| Apple | | Yuqin Chen | | yuqin\_chen@apple.com | |
| NEC | | Yuhua Chen | | Yuhua.chen@emea.nec.com | |
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|  | |  | |  | |

# 3 Discussion

Based on [1], RAN2 agreed to continue discussing open RILs in this email discussion. The details of these RILs can be found in [2][3], and the sections below just show the information from the excel file in [1].

In the following tables, the column TDoc has been updated by adding the relevant RIL contributions.

## 3.1 H502

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **TDoc** | **Description** | **Proposed Change** |
| H502 | R2-2205495, R2-2205737 | In section 6.2.2 (RRCRelease message), the slice info (i.e. freqPriorityListNRSlicing-r17) was introduced. RAN2#113b-e agreed that UE is only configured with either the existing dedicated priority configuration or the slice info in RRC Release. However, there is no such definition in ASN1. | It is proposed to add some clarifications in the field descriptions. For example: - for freqPriorityListEUTRA/freqPriorityListNR, it is configured only if freqPriorityListNRSlicing is not configured - for freqPriorityListNRSlicing, it is configured only if freqPriorityListEUTRA/freqPriorityListNR is not configured |

**Question 1: Do companies agree with H502?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Huawei, HiSilicon | Yes | The intention of this RIL is to make sure that the previous RAN2 agreement has been correctly captured in specs, and we are open for improving the wording. |
| Lenovo | No | We would indeed request RAN2 to re-discuss to see if there’s any value in restricting the network to configure either the existing dedicated priority configuration or the slice info in RRC Release. |
| Xiaomi | See comments | The need code of both legacy priorities and slice priorities configuration are NEED M, thus, to avoid UE maintaining both priorities configuration and confused on how to use it,  we prefer to have rewording that UE is only configured with either the existing dedicated priority configuration *(i.e. freqPriorityListEUTRA/freqPriorityListNR)* or the slice info *(i.e.freqPriorityListNRSlicing)* in *RRCRelease* |
| Apple | No strong views | Though we had agreements on not having both slice specific frequencies and legacy frequencies in RRCRelease message, it seems we didn't have strong motivations for that agreement. So we are fine to re-visit this issue as proposed in the two Tdoc(s). |
| NEC | Not now | There are few proposals to revisit this agreement. NEC is also with opinion to not restrict network configuration unnecessarily, moreover this is relevant to the question how the priorities information provided in RRCRelease overrides information from SIBs this is discussed in email discussion 242.  So we propose to wait for further progress |
| Samsung | See comments | As we proposed in [[R2-2205616](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_118-e/Docs/R2-2205616.zip)],  **Proposal 2: Inter-RAT cell reselection priorities can be included independently from dedicated signaling of slice information.**  we shouldn’t block inter-RAT cell reselection due to slicing. Hence freqPriorityListEUTRA is needed. freqPriorityListNRSlicing and *freqPriorityListNR* needn’t be configured together. |
| OPPO | Yes, but | We slightly prefer the wording suggestion from Xiaomi.  In addition, the issue on inter-RAT cell reselection due to slicing should be resolved, e.g. the UE can consider inter-RAT cell reselection information in SIB and the slice-specific reselection information in *RRCRelease* if only slice-specific info is included in *RRCRelease.*(Please see P3 in our paper R2-2204762). |
| Nokia | No | There is technical discussion on this issue in [242]. We see no reason for such a restriction. |
| Qualcomm | Not now | There is technical discussion on this issue in [242]. We see no reason for such a restriction. |
| CMCC | Yes, but | We also slightly prefer the rewording by Xiaomi. |
| Spreadtrum | Yes | Agree with the clarification to capture the previous RAN2 agreement. |
| CATT | Yes | If we stick to the previous agreements, we think the description is needed. We also prefer the rewording suggestion from Xiaomi. As this issue is still on discussion in [242], we can wait for the conclusion of [242]. |
| Intel | See comments | This is a topic of discussion for this meeting. We should update based on agreements in this meeting. |
| ZTE | No | With the latest progress in GTW session that “RRCRelease can contain both legacy and slice-specific reselection priorities”, such limitation is not needed anymore. |

## 3.2 B003

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| **ID** | **TDoc** | **Description** | **Proposed Change** |
| B003 | None | Extension marker should not be used in list elements if they are broadcast in SIB since it costs approx. 3 bytes overhead per list element. Future extensions should be introduced using parallel lists (same approach as used in SIB3/SIB4). | Remove extension marker from IE SliceInfo-r17. |

**Question 2: Do companies agree with B003?**

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| --- | --- | --- | --- | --- | --- |
| Company | | Yes/No | | Comments | |
| Huawei, HiSilicon | |  | | No strong opinon on the extension marker in FreqPriorityNRSlicing-r17. For the extension marker in SliceInfo-r17, we think it may be beneficial to keep it as it will be easy to add some slice group specific info later. | |
| Lenovo | |  | | Here we can use the general principle that would be accepted for other work items as well. | |
| Xiaomi | |  | | We are fine to remove the extension marker. | |
| Apple | | Yes | | It was agreed in ASN.1 review that the extension marker is not used in list elements. It would be good to be consistent. | |
| NEC | | No strong opinion | | There seems have equal motivation to have extension marker(high extension possibility) and motivation to not have it | |
| Samsung | | Yes | |  | |
| OPPO | | Tend to Yes | |  | |
| Nokia | |  | | No strong view. An empty extension marker is only a single bit. | |
| CMCC | | No strong view | | We share the similar view with Huawei that it may be beneficial to keep it for adding additional slice group info in future. | |
| Spreadtrum | | No strong view | |  | |
| CATT | | No strong view | | We can follow the basic principles in RRC. | |
| Ericsson | | Yes | | This principle we try to have in RRC. | |
| Intel | | Yes | | We agree to remove the extension marker. Though it is true that is adds overhead only when used, it is quite likely to get used if it exists. There are more efficient mechanisms to extend lists and we should use them in SIB. | |
| ZTE | | Yes | |  | |

## 3.3 N033

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| **ID** | **TDoc** | **Description** | **Proposed Change** |
| N033 | R2-2205494 | FreqPriorityListNRSlicing field descriptions: in the field description fields from other IEs are described, separate table for SliceInfo would be required. | As this IE is expected to be changed at RAN2#118 due to open issues, it is proposed to handle this issue at the RAN2#118 with a separate tdoc in the slicing WI session. |

**Question 3: Do companies agree with N033?**

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| --- | --- | --- | --- | --- | --- |
| Company | | Yes/No | | Comments | |
| Huawei, HiSilicon | |  | | No strong views. | |
| Lenovo | | Yes | |  | |
| Xiaomi | |  | | No strong views to add the separate table for SliceInfo. | |
| Apple | |  | | Fine to have separate table for SliceInfo. But seems the contribution is addressing much more. | |
| NEC | | Yes | | We prefer separate table in general | |
| Samsung | |  | | No strong view but fine to have a separate table for SliceInfo | |
| OPPO | |  | | No strong view on adding a separate table. And, if this RIL is agreed, the details of the table may need to be revisited based on our latest agreements. | |
| Nokia | | Yes | | See R2-2205494 | |
| Qualcomm | |  | | No strong view but fine to have a separate table for SliceInfo | |
| CMCC | |  | | No strong view. | |
| Spreadtrum | |  | | No strong view to have separate table for SliceInfo. If agreed, the content of the table should be revised. | |
| CATT | | Yes | | We are OK with that. | |
| Ericsson | | Yes | | We should follow the RRC principles. | |
| Intel | | Yes | | Follow RRC specification conventions | |
| ZTE | | Yes | |  | |
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## 3.4 E140

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| **ID** | **TDoc** | **Description** | **Proposed Change** |
| E140 | R2-2205972 | Freq list in SIB16 for slicing | The freq list with sliceinfo in SIB16 should preferably have 1-1 mapping (list size and indexes of entries) to the InterFreqCarrierFreqList in SIB4. Should avoid current skewed linking between SIB4 and SIB16 lists. Slice info for the current freq should have separate fields outside the freq list. List size 0 should not be used, see no reason. Max list size maxfreq (8) will be correct, currently 1+8=9 would be needed? Further (editorial comment), text that describes IE FreqPriorityListNRSlicing should be placed under the IE section header, not among FreqPriorityListNRSlicing field descriptions |

**Question 4: Do companies agree with E140?**

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| --- | --- | --- | --- | --- | --- |
| Company | | Yes/No | | Comments | |
| Huawei, HiSilicon | | Yes for P1, P2 and P3 in R2-2205972 | | For P4, we think it is simple that SIB16 can contain information of the current frequency, otherwise, we need to impact some legacy SIBs.  **P4: RAN2 to discuss whether FreqPriorityListNRSlicing should contain information for the current frequency or not.** | |
| Lenovo | |  | | We think the existing IE FreqPriorityListNRSlicing is fine with the clarification that the first entry/ element (for ‘0’) applies to serving frequency. | |
| Xiaomi | |  | | We agree that the slice info of the current frequency should be contained.  We are open to indicate that in the entry (e.g. ‘0’) or separate field. | |
| Apple | | P1/P2/P3 are fine | | For P4, we think current frequency should be contained. As we explained in [Pre118-e][202][Slicing] 38331 CR and rapporteur resolutions (Huawei), serving frequency’s priority and PCI lists are essential. | |
| NEC | | Yes to P1-P3 | | We are fine with first three proposals  For P4, we did not see much motivation to separate the serving frequency out into another IE | |
| Samsung | | Yes for P1/P2/P3. See comments for P4 | | For P4, we need to keep serving frequency information (priorities) in FreqPriorityListNRSlicing.  We prefer the changes from S[254] for this. | |
| OPPO | | Yes for P1/P2/P3 | | P4: We are OK to include the slice info of the serving frequency in *FreqPriorityListNRSlicing*. | |
| Nokia | | Yes | | The issue of IE section header is also addressed in R2-2205494 | |
| Qualcomm | | Yes to P1-P3 | | For P4, it is useful to include the slice info of the serving frequency, especially in case that the serving frequency was not included in the *FreqPriorityListNRSlicing* in the previous cell. | |
| CMCC | | Yes for P1/P2/P3 | | For P4, we think the slice info of the serving frequency should be included. | |
| Spreadtrum | | Yes for P1/P2/P3 | | We prefer to keep serving frequency in *FreqPriorityListNRSlicing-r17* like other companies mentioned. | |
| CATT | | Yes for P1/P2/P3 | | For P3, as we analysis in R2-2205972 that the field name ***cellReselectionPriority-17*** in *SliceInfo-r17* may cause the misunderstanding in TS38.304. We agree to rename ***cellReselectionPriority*.** As in *SliceInfo-r17,* the sliceGroupID-r17 may be changed to “NSAGID-17”, we prefer to rename ” ***cellReselectionPriority-17***”to “*nsag-cellReselectionPriority-r17*” as proposed inP3.  For P4, we agree the serving frequency should be included. | |
| Ericsson | | Yes (proponent) | | On P4, ok to include serving freq in the freq list, if majority view. | |
| Intel | | Yes | | We agree with the proposals.  P4: The exact proposal and corresponding ASN.1 is not clear to us. | |
| ZTE | | Yes | | Agree with P1/2/3. | |
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## 3.5 Z325

For the RIL Z325, the proposed change is included in the description.

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| **ID** | **TDoc** | **Description** | **Proposed Change** |
| Z325 | R2-2205568 | The FreqPriorityListNRSlicing is used to configure cell reselection priorities for slicing in SIB16 and RRCRelease message. But it is not clear whether the cell reselection priorities for slicing in SIB16 and RRCRelease message can only configured for frequencies listed in SIB2 and SIB4. For example, in the existing cell reselection priority configuration, the “network may assign dedicated cell reselection priorities for frequencies not configured by system information.” If network is allowed to configure cell reselection priorities for slicing for frequencies not listed in SIB2 and SIB4, we understand the frequency band indicator should be provided. |  |

**Question 5: Do companies agree with Z325?**

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| Company | | Yes/No | | Comments | |
| Huawei, HiSilicon | |  | | In our opinion, RAN2 did not discuss the scenario before, and S254 seems to be related to this RIL (from solution’s point of view).It would be helpful to check operators’ views on this scenario. | |
| Lenovo | | Partially | | This can be allowed for RRCRelease message only. | |
| Xiaomi | |  | | From our view, the SIB2 and SIB4 include all NR inter-frequencies needs to be considers for cell reselection, and the RRCRelease can only configured the priorities for frequencies in SIB rather than the frequency itself. Thus, we think the SIB16 and RRCRelease only needs to provide the priorities for the frequencies in SIB2 and SIB4.  However, as not all frequencies supporting slices, we prefer to use the frequency band indication to provide flexible solution, common for both SIB16 and RRCRelease. | |
| Apple | |  | | It might be possible that the frequencies for slicing may not be the same as legacy frequencies. Operators’ views would help a lot on making decisions. | |
| NEC | |  | | We are open to discuss the scenario. | |
| Samsung | |  | | As we explained for S254, indexing can’t work in RRCRelease since connected UE’s are not required to read/keep updated version for SIB4 and UE may move to another frequency after RRCRelease. So the solution from S254 could be adopted.  Regarding whether to allow additional frequencies that are not present in SIB can be discussed separately in RAN2. | |
| OPPO | |  | | In our understanding, the frequencies for slicing in *RRCRelease* may be possible as part of the ones for slicing in SIB. For SIB16, such a configuration(i.e. the mapping between SIB16 and SIB4) may also be possible. The operator’s view helps to check the validation of the scenario. | |
| Nokia | | YES | | We also think that in RRCRelease additional frequencies could be allowed. Most probably the structure of the used IEs should be reconsidered to address this issue | |
| Qualcomm | |  | | It should be firstly discussed whether there is such deployment case that slice specific frequencies are not aligned with legacy frequencies. | |
| CMCC | | Not necessary | | For us, SIB4 always lists all the supported NR frequencies. The frequencies listed in the RRCRelease are usually subset of frequencies in SIB, which is used for purpose of load balancing. So the frequency band in RRCRelease seems not so necessary to us.  In addition, for the text “*network may assign dedicated cell reselection priorities for frequencies not configured by system information*”, we understand that this means the network may assign dedicated cell reselection priority for frequencies which are not configured with legacy cell reselection priority in SIB, but not for the frequencies which are not listed in system information. | |
| Spreadtrum | |  | | One issue is that RRCRelease may only provide priority for part of frequencies in SIB. In this way, the entry or frequency index may helpful as proposed in S254.  Another issue is whether new frequency will be provided in RRCRelease which not broadcast in SIB. The scenario may aim at providing UE with slice groups info that not suitable to broadcast. Anyway, this scenario can be further checked. | |
| CATT | | Yes at least for RRCRelease | | As the clarification by CMCC, **the frequencies listed in the RRCRelease are usually subset of frequencies in SIB**. In this case, the number of frequencies in RRCRelease is smaller than the number of frequencies in SIB4, the sliceinfo in RRCRelease cannot map with the frequencies in SIB correctly. So we think the frequency band may be useful. | |
| Ericsson | | No, see comment | | First some recap on how cell re-selection priorities in “legacy RRCRelease” works.  -RRCRelease contains CellReselectionPriorities, where the NR frequencies are identified with ARFCN-ValueNR, not e.g. relative frequency order in SIB4   1. TS38304 has this note: “NOTE 3: The network may assign dedicated cell reselection priorities for frequencies not configured by system information.”   This allows that UE receives RRCRelease in a cell that does not present all frequencies that are deployed by the new op in SIB in each cell – all freqs do not provide coverage everywhere   1. TS38.304 states “The UE shall only perform cell reselection evaluation for NR frequencies and inter-RAT frequencies that are given in system information and for which the UE has a priority provided.”   This allows the UE, camped on a cell with certain inter-freqs included in SIB4 to measure only on frequencies that provide coverage.  -RRCRelease contains CellReselectionPriorities, where the NR frequencies are identified with ARFCN-ValueNR, not e.g. relative frequency order in SIB4  From this, we understand SIB16 can identify Inter-freqs in the order of frequencies in SIB4. But in RRCRelease, the frequencies with slice-specific re-selection pririties should be identified with explicit ARFCN-ValueNR.  We should (same as in “legay” have different IEs in RRCRelease and in SIB16, tailored for each usage. We do not agree to the CHOICE structure in the TP. | |
| Intel | | See comment | | We agree with the proposal that RRC Release should use ARFCN as in legacy.  RRC Release should not normally include frequencies outside of SIBs – though not precluded but with AFRCN, that aspect can be discussed separately. | |
| ZTE | | Yes | | In SIB16, we understand network is allowed to configure slice specific information for frequencies not listed in SIB4.  In RRCRelease message, we have the following note to allow NW configure frequencies not configured by system information.  *NOTE 3: The network may assign dedicated cell reselection priorities for frequencies not configured by system information.*  For the slice info in RRCRelease message, we understand the same principle applies and NW is allowed to configure slice info for frequencies not configured by system information. | |
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## 3.6 S252, S253

S252 and S253 are about intra-frequency PCI list for RAN slicing purpose. During the email discussion **[Pre118-e][202][Slicing] 38331 CR and rapporteur resolutions (Huawei)**, some companies provided technical comments directly in their emails and companies can also check them.

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| **ID** | **TDoc** | **Description** | **Proposed Change** |
| S252 | None | We should restrict that sliceAllowCellListNR is provided only for inter-frequency cells to be inline with 5.2.4.5 of TS 38.304; UE checks whether the cell supports slicegroup only during inter-frequency cell reselection. | Indicates the list of allow-listed neighbouring cells for slicing. If present, cells not listed in this list do not support the corresponding sliceGroup-frequency pair. gNB includes only inter-frequency cells in sliceAllowCellListNR. |
| S253 | None | We should restrict that sliceExcludeCellListNR is provided only for inter-frequency cells to be inline with 5.2.4.5 of TS 38.304; UE checks whether the cell supports slicegroup only during inter-frequency cell reselection. | Indicates the list of exclude-listed neighbouring cells for slicing. If present, cells not listed in this list do not support the corresponding slice sliceGroup-frequency pair. gNB includes only inter-frequency cells in sliceExcludeCellListNR. |

**Question 6: Do companies agree with S252 and S253?**

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| --- | --- | --- | --- | --- | --- |
| Company | | Yes/No | | Comments | |
| Huawei, HiSilicon | | No | | In our paper, we support to allow including the PCI list for the serving frequency, and we share similar view as Apple’s comments in the email discussion [Pre118-e][202][Slicing] 38331 CR and rapporteur resolutions (Huawei).  However, if majority view is to disallow including the PCI list for the serving frequency, we can be fine. | |
| Lenovo | | No | | The cell list for serving frequency is also important as the UE would need to compare what (slice group) is supported by the best serving cell Vs. what slice groups are supported by neighbouring frequencies. | |
| Xiaomi | | No | | We think that the PCI-list for the serving frequency is necessary to make UE get aware of the supported slice group of the serving cell and avoid to reselect a cell not supporting the slice groups. | |
| Apple | | No | | As I commented in [Pre118-e][202][Slicing] 38331 CR and rapporteur resolutions (Huawei), the priority of serving frequency is the base for UE to determine which frequency has higher priority and which frequency has lower priority. The created frequency list looks like {F1, serving freq, F2}. UE performs measurement on F1 meeting the requirement defined for higher priority and on F2 meeting the requirement of lower priority. During cell re-selection, if UE finds the best cell on F1 does not support the interested slice, the priority of F1 is re-assigned according to the slices actually supported by the best cell. A unified behavior at is UE should also determine if the best cell (which is not the camping cell) on serving frequency supports the interested slice or not. If not, UE should deprioritize serving frequency as well, and try with F2 (the best cell principle is kept). If the PCI list on serving frequency is not provisioned, UE would have no way to know whether the best cell on serving frequency supports the slice. That would lead to two kinds of UE behavior for inter-freq and intra-freq respectively. | |
| NEC | | No | | we tend to agree with Apple | |
| Samsung | | See comment. | | First of all, we think that intrafrequency cell reselection shouldn’t consider the slice support as agreed. There shouldn’t be any attempt to change this agreement as such a change can even affect other UEs in the cell due to interference issues.  Now the question is whether the serving frequency’s priority which will be used for inter-frequency cell reselection should be according to the best intra frequency neighbour cell. This can be helpful in a corner case when both inter and intra frequency neighbours satisfy cell reselection criteria at the same time, which is really a corner case. (If only intra frequency neighbour satisfies the cell reselection criteria, there is no impact on changing the priority of serving frequency, as the UE will reselect to intra-frequency neighbour cell irrespective of priority).We also note that serving frequency’s priority will be the one broadcasted in sliceInfoList without considering the slice availability in all the cases except the corner case where both intra and interfrequency neighbours satisfy the cell reselection criteria at the same time. Considering this, we prefer not to include PCI list for serving frequency, but can accept if majority wants it provided that this doesn’t affect the agreement intra frequency cell reselection doesn’t consider supported slices.  We also note that there will be some corrections needed in 38.304 as current version adjusts only interfrequency priority when best cell doesn’t support the highest priority slice. | |
| OPPO | | No | | Similar view as Lenovo and Apple. | |
| Nokia | | No | | Note there is IntraFreqExcludedCellList and IntraFreqAllowedCellList in SIB3. | |
| Qualcomm | |  | | Firstly, we want to clarify slice group priority does not trigger intra-frequency cell reselection, and for intra-frequency, the best ranked cell rule is applied.  One benefit to include PCI list for the serving frequency will be that UE can re-derive the serving frequency priority in case best ranked cell changes. We are fine to include PCI list if majority companies agree. | |
| CMCC | | No | | We share the similar view with Apple and QC that the UE can re-derive the serving frequency priority if the best ranked cell doesn’t support the selected slice group. | |
| Spreadtrum | | No | | Prefer to include the PCI list for the serving frequency. And share similar view with Apple. | |
| CATT | | No | | Same view as other companies and the serving frequency priority is also needed. | |
| Ericsson | | No | | We agree with Samsung. There is no need to allow configuration of PCI list for the serving frequency. UE should apply the “best cell” principle on the serving frequency. PCI list for serving frequency would only cover a potential corner case, as mentioned by Samsung.  So we cannot really see the motivation for the nw op to configure PCI-lists for serving frequency.  But we can accept majority view or the sake of progress. | |
| Intel | | No strong view | | We do not see it essential to provide the intra-frequency cell list. UE has to follow the best cell principle. Providing the list could help UE select the right frequency a bit faster without first reselecting the intra-frequency cell and reading the SIB to determine the supported slices. | |
| ZTE | | No strong view | | We do not see it essential to provide the intra-frequency cell list. UE has to follow the best cell principle for intra-frequency case.  We can also accept the intra-frequency cell list if the majority want it. | |
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## 3.7 H505

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| **ID** | **TDoc** | **Description** | **Proposed Change** |
| H505 | R2-2206097,  R2-2205495, R2-2205693 | There is one FFS: FFS if the field can be provided in RRCRelease. | This should be addressed in a separate TDOC |

Based

* Option 1: Cell lists (Allow and Exclude) for RAN slicing can not be provided in RRCRelease message (R2-2206097, R2-2205693)
* Option 2: Cell lists (Allow and Exclude) for RAN slicing can be provided in RRCRelease message (R2-2205495)
  + **Proposal 2.1: The *RRCRelease* message can contain the same type of PCI lists for slice aware cell reselection as a SIB message.**
  + **Proposal 2.2 Only the PCI lists provided *RRCRelease* message are used when priorities from the *RRCRelease* message is used for slice aware cell reselection.**

**Question 7: For H505, which of options is preferred? E.g. option 1, option 2, or others if any.**

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| --- | --- | --- | --- | --- | --- |
| Company | | Preferred options | | Comments | |
| Huawei, HiSilicon | | Option 1 | | In the current RRCRelease message, the network only provides priorities values for cell reselection purpose, and there are no PCI lists in the message.  Besides, the UE can retain the PCI lists provided in SIB16 and then use it even receiving RRCRelease message. Hence, we prefer Option 1. | |
| Lenovo | | Option 1 | | We do not expect that there could be any “UE-specific cell list” and therefore we do not see the need to include cell lists in RRCRelease message. Additionally, it is clear that the broadcast must include such cell list (if any) to enable slice based cell reselection for UEs that entered in the cell in the Idle state. So, a double signalling of cell lists can be and should be avoided. | |
| Xiaomi | | Option 1 | | As the PCI-lists is not the UE-specific configuration, we should avoid the redundant configuration in RRCRelease. For the slice based cell reselection configured by RRCRelease, the PCI-list provided in SIB can be reused. | |
| Apple | | No strong view | | Both can work. We can go with majority view. | |
| NEC | | Option 2 | | we prefer to keep the optional PCI lists IEs in RRCRlease and leave to network to configure it or not in RRCRelease.  we see several venders support to have it. it is possible that PCI list is not provided in SIB but in RRCRelease due to size limitation and big RA.  Not sure what option 2.1 means  Option 2.2 is right if PCI lists are provided in RRCRelease following the general principle of overriding | |
| Samsung | | Option 1 | | RRCRelease doesn’t broadcast PCI lists for the legacy cell reselection, and we think that we should follow the same principle for slice based cell reselection.  Additionally, we also observe that there is no real need for including PCI Lists in RRCRelease as this information will be similar to the PCI list in broadcast signaling. Moreover, it is not practically feasible to include the PCI list in RRCRelease as the gNB sending RRCRelease may not be aware of the PCI list of all cells where the reselection can happen while T320 is running. gNB knows its neighbors but T320 can be upto even 3 hrs and thus the cells included in the list need not be only neigbhors of gNB sending RRCRelease. Additionally, there may be other cells with same PCI than the one considered by the gNB which send RRCRelease since T320 can be upto 3 hours. In other words, it is very difficult to ensure the sanity of PCI list in RRCRelease. | |
| OPPO | | Option 1 | | In legacy, we use a similar rule for cell reselection. That means the UE can use the PCI list in SIB when dedicated frequency priority is provided and applied. If such rule is reused here, no TA border issue exists for slicing. | |
| Nokia | | Option 2 | | Nothing prevents to enable the option of UE specific cell lists in *RRCRelase*. | |
| Qualcomm | |  | | Firstly, we need to clarify whether the frequencies provided in RRCRelease can be different with those provided in SIB16. If yes, then a PCI list can be provided for these specific frequencies in Release message. For those frequencies provided in SIB16, then can reuse the PCI list in SIB16. | |
| CMCC | | Option 1 | | We suggest to follow legacy principle that the PCI list in SIB is considered valid even if the UE receives the dedicated priorities in *RRCRelease* for slice-based cell reselection. | |
| Spreadtrum | | Option 2 | | Support that PCI list “**can be**” provided in *RRCRelease*. In our view, it is part of slice info, so if slice info is provided in *RRCRelease*, there should be no limitation to prevent putting PCI list together with slice-specific frequency priority. | |
| CATT | | Option1 | | We think the cell list has been signalled in system information. It is not necessary to be included in the RRCRelease. | |
| Ericsson | | Option 1 | | See our comment on 3.5/Z325. This leads us to Option 1. The PCI lists from SIB16 shall be used by UE. The PCI lists are cell-specific. | |
| Intel | | No strong view | | We see pros and cons with both approach. | |
| ZTE | | Option 1 | | Based on the latest progress that “No PCI - list in the RRCRelease message for slice-specific reselection priorities in Rel-17 (similar as in legacy). UE uses PCI list from SIB (if received).” | |
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## 3.8 X802, X804

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| **ID** | **TDoc** | **Description** | **Proposed Change** |
| X802 | R2-2205365 | The applicable RACH configuration of this parameter is still under discussion. | Problem: We can note that parameters in RACH-configCommon can also be reused to apply for AdditionalRACH-ConfigCommon-r17( including the slice-specific RACH configuration), which means that the ra-PrioritzationForSlicing-r17 can be applied for legacy 4-step RACH configuration and 4-step slice-specific RACH configuration. However, in last meeting, RAN slicing only agreed that this parameter can work with RACH partition independently, but how to work is still under discussion, in other words, we have not decided this parametes can be applied for legacy RACH configuration or slice-specific RACH configuration or both. Solution: Add an Editor’Note as follows: Editor’Note: FFS on which RACH configuration (i.e. legacy RACH configuration or slice-specific RACH configuration or both) the ra-PrioritizationForSlicing can be applied for. |
| X804 | R2-2205365 | The applicable RACH configuration of this parameter is still under discussion. | Problem: We can note that parameters in RACH-configCommonTwoStepRA can also be reused to apply for AdditionalRACH-ConfigCommon-r17( including the slice-specific RACH configuration), which means that the ra-PrioritzationForSlicing-r17 can be applied for legacy 2-step RACH configuration and 2-step slice-specific RACH configuration. However, in last meeting, RAN slicing only agreed that this parameter can work with RACH partition independently, but how to work is still under discussion, in other words, we have not decided this parametes can be applied for legacy RACH configuration or slice-specific RACH configuration or both. Solution: Add an Editor’Note as follows: Editor’Note: FFS on which RACH configuration (i.e. legacy RACH configuration or slice-specific RACH configuration or both) the ra-PrioritizationForSlicing can be applied for. |

Since the Tdoc R2-2205365 is for RILs X802 and X804, it is proposed to discuss the following proposals:

**Proposal 1: As baseline, the slice-specific RA prioritization parameters can be applied for the legacy RACH resource without associated with any feature combination.**

**Proposal 2: The necessary to configure the additional slice-specific RA prioritization parameters on the basis of slice-specific RACH resource needs to be further confirmed.**

**Proposal 3: Considering the payload size of SIB1, the additional slice-specific RA prioritization parameters on the basis of slice-specific RACH resource should be avoided if there is not too much benefits.**

**Proposal 4: There is no need to configure the slice-specific RA prioritization parameters with feature combination specific RACH resource without the same slice group info.**

**Question 8: For the RILs X802 and X804, do companies agree with P1, P2, P3 and P4 in R2-2205365?**

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| --- | --- | --- | --- | --- | --- |
| Company | | Yes/No | | Comments | |
| Huawei, HiSilicon | | Yes | | We think that there is no need to restrict the association between slice-specific RA prioritization and slice-specific RACH resource. If all proposals above are agreeable, we think it is just network implementation and thus there should be no specification impacts. | |
| Xiaomi | | Yes | | As if the network has prioritised one slice group by configuring (more) slice-specific RACH resource, we should avoid the redundant configuration of slice specific RA prioritization parameters, especially it is included in SIB1.  For the restriction, as we agreed in the RACH common session as follows, when UE selects the specific RACH partitions, UE still applies the parameters in the legacy RACH configuration if it is not configured for the feature combination partition in shared RO case.   * If a parameter is not provided for a specific RACH partition (feature combination), then the parameter from RACH-ConfigCommon of the corresponding RACH configuration should be used for this feature combination.   So if we agree that, we think we should add the restriction in the field description to make it clear the parameters is only applied when the legacy RACH resource is selected. Otherwise, UE behaviour will be conflict with our intention. | |
| Apple | | See comments | | Though we can see the logic in the contribution, is that really necessary to put the restriction? Is there a possibility that multiple NSAG(s) are allocated with one RACH resource, while different RA prioritization are applied respectively to each NSAG? | |
| Samsung | | See comments | | We think these are network implementation aspects and no specification impacts. | |
| OPPO | | See comments | | For P1, we think it is already agreed according to the agreement in RAN2#117e. And no spec change is needed.  For P2/3/4, we understand that there is no need to have this restriction, i.e. it can rely on the gNB implementation. We would like to leave some room for the network flexibility. (BTW: Not sure P4 is in the RAN slicing scope) | |
| Nokia | | Yes | | RACH prioritization has been agreed to work independently from partitioning, thus the current signalling serves the purpose. However, nothing prevents the NW to configure both: RA partitioning and RA prioritization,  The association to a slice specific preamble can be avoided due to SIB1 payload. | |
| Qualcomm | | See comments | | Slice-specific RACH prioritization and RACH partitioning can be supported and configured independently. For these proposes, we need to see whether there is any specification impact and what it looks like if any. | |
| CMCC | | See comments | | In RAN2#117-e, RAN2 confirms that RA prioritization and RA partitioning work independently. We think this can be up to network implementation. | |
| Spreadtrum | | See comments | | P1 serves for the agreement achieved in RAN2#117e that RA prioritization and RA partitioning work independently. As for the restriction, it may not be needed and can leave to NW implementation. | |
| CATT | | Yes | | We the slice group info is included in slice-specific RA prioritization  RA-PrioritizationSliceInfo-r17 ::= SEQUENCE {  sliceGroupIDList-r17 SEQUENCE (SIZE (1..maxSliceInfo-r17)) OF SliceGroupID-r17,  ra-Prioritization-r17 RA-Prioritization,  ...  }  So, we think the slice-specific RA prioritization has linked to the slice group ID. If there is no RA resource for the linked slice group, P1 is agreeable.  Regarding P2, even the slice group is configured with dedicated RACH resources, the NW can also configure the dedicated prioritization parameters since the prioritization parameters are related to when the RA attempt fails. So, P2 is agreeable. | |
| Ericsson | | See comments | | We also do not see the impact on existing 38331. | |
| Intel | | See comment | | As commented by others, we have agreed that the RA prioritisation and RA partitioning work independently and rest can be up to implementation. | |
| ZTE | | See comment | | No spec impact. Up to NW implementation. | |
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## 3.9 S254

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| **ID** | **TDoc** | **Description** | **Proposed Change** |
| S254 | R2-2205619 | FreqPriorityNRSlicing is configured related to the position of frequencies in SIB. This is inefficient when slice information list is broadcasted in SIB16. The current structure and description may not be suitable when FreqPriorityListNRSlicing is included in RRC Release. | Include Frequency-index in FreqPriorityNRSlicing to provide the linking between SIB16 list and SIB2/SIB4 list. FreqPriorityListNRforSlicing should not be linked with SIB2/SIB4 in RRC Release. A contribution will be submitted in RAN2#118e. |

**Question 9: Do companies agree with S254?**

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| --- | --- | --- | --- | --- | --- |
| Company | | Yes/No | | Comments | |
| Huawei, HiSilicon | | Yes | | Considering the case that the UE in RRC\_IDLE or RRC\_INACTIVE selects an inter-frequency cell to camp on, the frequencies provided in RRCRelease message may be inconsistent with the SIB4 for the current cell, the above RIL and the TP in R2-2205619 are reasonable. | |
| Lenovo | | No | | The UE can always remember and store the index values (i.e., the ARFCN-ValueNR) from the source cell. | |
| Xiaomi | | No | | As we replied to the Z325, we prefer to use the frequency band indication to provide flexible solution, common for both SIB16 and RRCRelease. | |
| Apple | | P1 is fine;  See comment for P2 | | On one hand, regarding the motivation mentioned in the contribution, the SIB4 should come from the cell where UE received RRCRelease message, not from the current camping cell when UE moves around. Thus there should be no ambiguity?  On the other hand, if we consider the issue raised up in Z325, if the slicing specific frequencies are not the same as legacy frequencies, it seems cleaner to have explicit indication on the carrier, rather than referring to SIB4. | |
| NEC | | P1: Y  P2: not sure | | Agree with Apple that a UE shall determine the linked frequency based the SIB2/4 of the cell where the UE received the information, not the cell where the UE is redirect or reselect to.  For the case that UE does not have valid SIB2/SIB4, the case still can happen with the text proposal. Maybe UE should then discard received information if it cannot determine the linked frequencies.  Z325 can be addressed separately by discussing if the scenario is valid or not first | |
| Samsung | | Yes | | 1. We can’t refer to the current cell’s SIB4 since the UE may reselect to a different frequency. 2. A connected UE is not guaranteed to keep the updated version of SIB4. So UE can’t map the frequency index to the SIB4 of the cell which send RRC Release as the UE may move to a new cell after leaving RRC Connected. Thus there is no guarantee that the index will work, by referring to the cell that send RRCRelease.   From the above 2, it is clear that current spec doesn’t work with RRC Release. Hence the changes are needed. | |
| OPPO | | P1 is fine;  P2: See comments | | Another way is that the UE always stores/uses the index values (i.e., the ARFCN-ValueNR) from the cell in which it receives the RRCRelase, as indicated by Lenovo. But we are open to discussing this issue. | |
| Nokia | | Yes | | We think that this is related to Z325. If we agree that RRCRelease may contain information about frequencies that are not listed in SIB of the current cell, then this type of change is needed. | |
| Qualcomm | | Open | | Open for discussion. We need to discuss whether it is possible to provide frequencies different with those in SIB2/4 for slice based cell reselection. | |
| CMCC | | P1 is fine | | We are fine with P1 since this signalling design looks efficient than current structure as analysed in the contribution. | |
| Spreadtrum | | P1 is fine | | P1 is beneficial for frequency mapping, if *RRCRelease* only provides part of frequencies in SIB. We are open to P2, it needs to be checked firstly that new frequency may be provided in *RRCRelease*. | |
| CATT | | Yes | | We see the necessity to introduce frequency info in system information as well as in RRCRelease. | |
| Ericsson | | See comment | | Related to 3.5/Z325, see our comments above.  We should design separate IEs for SIB16 and RRCRelease. | |
| Intel | | Yes | | We agree with the use of ARFCN for RRC Release. | |
| ZTE | | Yes for P2. | | We agree with the use of ARFCN for RRCRelease. | |
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## 3.10 C154

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| **ID** | **TDoc** | **Description** | **Proposed Change** |
| C154 | R2-2205468 | The SliceGroupID appears in multiple IEs in the specification. So it is needed to create a new IE for SliceGroupID. | Creat a new IE for SliceGroupID. A contribution will be submitted in RAN2#118e. |

**Question 10: Do companies agree with C154?**

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| --- | --- | --- | --- | --- | --- |
| Company | | Yes/No | | Comments | |
| Huawei, HiSilicon | | Yes | | We are ok with the RIL.  In addition, in the SA2 LS R2-2204526, they are using NSAG (Network Slice AS Group), and the terminology may be utilized in RRC specs for the alignments. This wording improvement could be discussed during the CR discussion, if needed. | |
| Lenovo | | No | | Does not seem necessary. | |
| Xiaomi | | No | | Does not seem necessary. | |
| Apple | | No strong view | |  | |
| NEC | | See comment | | It seems a valid concern of overhead. We understand that the concern is the SliceGroupID may appear once per frequencies, then maybe we can swap the frequency and SliceGroupID in the ASN.1 structure , because frequencies could be index with less bits. | |
| Samsung | | Yes | |  | |
| OPPO | | No strong view | |  | |
| Nokia | | Yes | | We propose to introduce NSAG-ID to make clear the definition of slice groups. | |
| Qualcomm | | No strong view | | Terminology should be consistent within all the specifications. | |
| CMCC | | No strong view | |  | |
| Spreadtrum | | No strong view | |  | |
| CATT | | Yes | | This makes the ASN.1 clear and improves the readability of the spec.  And we also agree the HW to consider the terminology using NSAG. | |
| Ericsson | | Yes | |  | |
| Intel | | Yes | | This is normal convention we use in RRC | |
| ZTE | | Yes | |  | |
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## 3.11 B206

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| **ID** | **TDoc** | **Description** | **Proposed Change** |
| B206 | R2-2205615 | 32 PCIs might be repeated in at least 16\*8 entries (based on the assumption now, which may grow depending on the length of total Slice Group and size of max cells for any slice). This is hugely signalling inefficient. | A new structure that utilizes ordinal signalling needs to be used. A TP for affecting this change will be submitted. |

The TP in R2-2205615 shows more details.

**Question 11: Do companies agree with B206?**

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| --- | --- | --- | --- | --- | --- |
| Company | | Yes/No | | Comments | |
| Huawei, HiSilicon | | No | | We should just follow the structure of *interFreqExcludedCellList* IE in SIB4. And currently the the slice cell list is using PCI-Range which can also reduce the signalling overhead.  SliceCellListNR-r17 ::= SEQUENCE (SIZE (1..maxCellSlice-r17)) OF PCI-Range | |
| Lenovo | | Yes | | We think repetition of PCIs should be avoided as this does not bring any gains but only overhead.  The PCI-Range is not suited for this purpose as it is highly unlikely that cells supporting the same slice (across different frequencies) will be allocated PCIs in an increasing order. | |
| Xiaomi | | No | | We are fine with current signalling structure. | |
| Apple | | Tends to no | | I have to say readability is also important. Let’s keep the conventional way. | |
| NEC | |  | | Not clear how to understand the text proposal, or we miss something | |
| Samsung | | Yes, with modifications | | Normally we prefer not to take up optimisations at this point. But we note that even many operators have concern on the message size of SIB16. Hence We agree with the intention of the proposals.  But we think that replacing PCI range with an index to the PCIs may be counter productive, especially since PCI-Range is more efficient and PCI repetition across different frequencies is possible.  We might consider an index to PCI-range rather than an index to PCI as mentioned in the paper.  SliceCellListNR-r17 ::=           SEQUENCE (SIZE (1..maxCellSlice-r17)) OF PCI-RangeElement2-r17  PCI-RangeElement2-r17            SEQUENCE {      Pci-RangeIndex                  PCI-RangeIndex,      Pci-Range                       PCI-Range                                             OPTIONAL,  -- Need X  }  We also think that it could be even more efficient to provide index to a list of PCI ranges rather than a PCI-Range. This is because due to slice homogeneity principle, all the PCI in the same TA support same slices. So all these PCI in the same TA has same availability behaviour (ie. Either all of them will be present or all of them will be absent) for all the NSAGs. So index to the PCI range can reduce the size of PCI list by up to the number of slice group times (ie. even eight fold reduction in the size of SIB16 in best case)      sliceCellListNR-r17               CHOICE {          sliceAllowCellListNR-r17          SEQUENCE (SIZE (1..maxCellSlice-r17)) OF SlicePCIListNR-r17,          sliceExcludeCellListNR-r17        SEQUENCE (SIZE (1..maxCellSlice-r17)) OF SlicePCIListNR-r17,      }                                                                                                     OPTIONAL,  -- Need R      ...  }  SlicePCIListNR-r17  SEQUENCE { slicePCI-RangeListIndex slicePCI-RangeListIndex OPTIONAL,  --Need R SlicepCI-RangeList SlicePCI-RangeList  OPTIONAL   --Need R }  SlicePCI-RangeList ::=              SEQUENCE (SIZE (1..maxCellSlice-r17)) OF PCI-Range | |
| OPPO | | No | | We slightly prefer the conventional way to avoid the potential discussion or issue. | |
| Nokia | | No | | We can follow current encoding in SIB3 and SIB4 and using PCI-Ranges | |
| Qualcomm | | No | | The conventional way is preferable. | |
| CMCC | | No | | We are fine with the current structure. | |
| Spreadtrum | | No | | OK with current signalling structure. | |
| CATT | | No | | We prefer to stick to the current structure. | |
| Ericsson | | No | | Could consider to share PCI lists among all slice groups on a frequency, since those are supposed to reflect TA border. | |
| Intel | | No | | These cell lists are “exception” lists – cells that do not support the slices that are supported at the frequency. We don’t expect this cell list to be long, especially now that we have two cell lists – the supported slices is only different at TA border cells and typically due to non-overlapping cells across frequencies. | |
| ZTE | | No | | The conventional way is preferable. | |
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## 3.12 B205

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| **ID** | **TDoc** | **Description** | **Proposed Change** |
| B205 | R2-2205693 | It needs to be added that “Slice Group supported by any cell on a frequency is included in the SliceInfoList for that frequency.” Otherwise UE is not sure if it has an exhaustive list or if it needs to read SI of the highest priority neighbouring cell. | Add the said text in the description field “Slice Group supported by any cell on a frequency is included in the SliceInfoList for that frequency.” |

**Question 12: Do companies agree with B205?**

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| --- | --- | --- | --- | --- | --- |
| Company | | Yes/No | | Comments | |
| Huawei, HiSilicon | |  | | Not very clear about the issue. In our understanding, for a specific frequency and a specific slice group, if PCI list is not included, it means all cells on this frequency should support the slice group. Otherwise, the network can send PCI list to indicate some of cells for supporting the slice group. | |
| Lenovo | | Yes | | The current procedure in section 5.2.4.5 (please see below) assumes that a UE knows slice group(s) supported by “this” cell say cell C1 on frequency f1), however since the signalling from the network (RRCRelease or broadcast) is from “slice perspective”, the UE either needs to acquire SI of cell C1 or, put together the already available information.    We think acquiring SI of a neighbour cell is not acceptable, as RAN2 confirmed before. The main question is if the network provided slice information for a frequency is really exhaustive? Or are there slice groups supported by C1 but not by other cells on f1? We think, for this to work, network needs to ensure that slice information is really exhaustive, to the extent possible. | |
| Xiaomi | |  | | In our understanding, the intention is to clarify that the supported slice group list of that frequency should include all supported slice groups of each cell rather than part of that, e.g. only include the supported slice groups of serving cell for the serving frequency.  If our understanding is right, we are fine to clarify it. And in this case, the PCI list for the serving frequency should also be consider to make UE get aware of the supported slice groups of the serving cell. | |
| Apple | |  | | We share the intention and think PCI list for the NSAG availability is critical to guarantee the slicing mechanism work.  And, it would be also nice to capture the comment from Huawei: if PCI list is not included, it means all cells on this frequency should support the slice group. | |
| NEC | | No | | we understand text proposal seems force network to broadcast all slice groups supported by any cell of the frequency, but this is not true, a slice group may be supported by a frequency, but network may not want to do this slice group specific cell reselection control, hance no need to broadcast this slice group. | |
| Samsung | | No | | Same view as Huawei | |
| OPPO | |  | | We share the intention and the UE needs not to read/acquire SI of a neighbour cell. We understand the network needs to provide cell-level information, i.e. *sliceCellListNR*, if it has. If such a PCI list is not included, all cells on that frequency should support the slice group. Maybe the “no provision of PCI list” case can be clarified. | |
| Nokia | | No | | The use of the PCI lists is specified in 38.304, we see no reason for additional specification or clarification. | |
| Qualcomm | | No strong view | |  | |
| CMCC | |  | | We share the similar view with Huawei. | |
| Spreadtrum | |  | | We understand the intention that if only part of cells support slice group, then all of these cells should be included in allowed cell list.  However, as proposed by HW, we can also don’t provide any cell list info, if all the cells on the frequency support the slice group. | |
| CATT | |  | | We agree with HW that the UE can derive the slice info of the neighbour cell by considering sliceAllowCellListNR/ sliceExcludeCellListNR. | |
| Ericsson | | No | |  | |
| Intel | | Not Needed | | We believe this change might be stating the obvious. There is no requirement for the UE to read the neighbour cell SI. Then the UE has to go with the list from the current cell – that is, UE should assume that it is the exhaustive list by default. | |
| ZTE | | No | |  | |
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# 4 Conclusion

TBD.

# 5 References

[1] R2-2205082 Discussion on RIL list for RAN slicing Huawei, HiSilicon discussion Rel-17 NR\_slice-Core Late

[2] R2-2205969 NR Rel-17 ASN1 review file Ericsson discussion Rel-17 TEI17 Late

[3] R2-2205970 NR Re-17 RIL list Ericsson discussion Rel-17 TEI17 Late