3GPP TSG-RAN WG2 Meeting #116bis-e R2-220xxxx

Online, Jan 17 – Jan 25, 2022

**Agenda item:**8.1.3.1

**Source:** CATT

**Title:** Report of [AT116bis-e][022][MBS] Cell reselection Prioritization

**WI code:** NR\_MBS-Core

**Document for:** Discussion and Decision

# 1 Introduction

This document aims at gathering and summarizing companies’ views for the following offline discussion:

* [AT116bis-e][022][MBS] Cell reselection Prioritization (CATT)

 Scope: Address remaining open issues (ref green-marked Open issues R2-2200022), Whether to/how to apply target cell conditions (presence of SIBx) for prioritization, Need for additional neighbor cell info (ref provided tdocs). Which info the UE uses to determine what to prioritize: SIB info vs USD info vs MCCH info (ref provided tdocs),

 Intended outcome: Report

 Deadline: Friday W1 for online CB

# 2 Contact details

|  |  |
| --- | --- |
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| Spreadtrum | lifeng.han@unisoc.com |

# 3 Discussion

Even though the basic functions on frequency prioritization during cell reselection have been agreed and are captured in the 38.304 CR [1], there are still some open issues which need to be addressed further, as captured by the following FFS points:

1. FFS how to determine whether the reselection candidate cell is providing SIBx (e.g. if UE can determine whether the reselection candidate cell is providing SIBx based on whether the scheduling info of SIBx is present in SIB1).
2. When the conditions for frequency prioritization are no longer met, the UE should stop prioritizing the frequency of this cell (e.g. when the cell reselected by the UE due to frequency prioritization for MBS stops providing SIBx etc.). FFS whether there is additional TS impact.
3. FFS whether frequency can be provided in USD, depending on SA2 conclusion. If it exists, FFS whether the UE can prioritize the frequency indicated in USD when SIBy is broadcast but does not provide the mapping for the concerned service.

## How to determine whether the reselection candidate cell is providing SIBx

In RAN2#115e meeting, it has been agreed that SIBx should be provided by the reselection candidate cell when performing the frequency prioritization, according to [2],

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| --- |
| * The UE is allowed to prioritize the MBS frequency of interest when the cell of the MBS frequency provides MBS SIB carrying the MCCH configuration, as LTE SC-PTM.
 |

But it is not decided yet how to determine whether the reselection candidate cell is providing SIBx.

So, the agreement is captured in 304 CR [1] with an EN as below,

|  |
| --- |
| 1) The reselection candidate cell is providing SIBx, or the cell reselected by the UE due to frequency prioritization for MBS is providing SIBx;Editor’s note: SIBx is the MBS SIB carrying the MCCH configuration. The name of SIBx will be updated to align with other RAN2 specs later.Editor’s note: FFS how to determine whether the reselection candidate cell is providing SIBx (e.g. if UE can determine whether the reselection candidate cell is providing SIBx based on whether the scheduling info of SIBx is present in SIB1). |

This issue is also discussed in companies’ contributions for this meeting,

|  |  |  |
| --- | --- | --- |
| TDoc | Company name | Proposals |
| R2-2200234 | CATT, CBN | Proposal 1: To perform frequency prioritization, UE should verify the availability of SIBx for reselection candidate cell based on the scheduling information in SIB1 of the reselection candidate cell.  |
| R2-2200532 | Qualcomm | Proposal 1. During frequency prioritization for broadcast service continuity in RRC\_IDLE/INACTIVE state, UE is not required to read target candidate cell’s SIB1 or SIBx to make decision of frequency prioritization. |
| R2-2200540 | Futurewei | Proposal 1: In R17, RAN2 adopt the Alternative 1: priority reselection based on serving cell SIBx and SIBy.Proposal 2: RAN2 do not request UE to read into the SIB1 of the neighbouring cell(s) for priority reselection. It could be left to UE implementation.Proposal 3: The Alternative 3 of providing neighbouring SIBx information in serving SIBy could be considered in R18. |
| R2-2201118 | Apple | Proposal 5: When determining the reselection candidate cells for MBS reception, UE is not required to acquire the SIBx in the candidate cell before camping on it. |
| R2-2201245 | Kyocera | Proposal 1 RAN2 should agree that “when the cell of the MBS frequency provides MBS SIB” in their agreement means that the MBS SIB is able to be provided by the cell, regardless of whether it’s “broadcasted” or “not broadcasted” due to On-demand SI. |
| R2-2201258 | vivo | Proposal 13: UE can determine whether the reselection candidate cell is providing SIBx(“MCCH’s scheduling information” MBS SIB) based on whether the scheduling info of SIBx is present in SIB1. |

According to RAN2#115e agreement mentioned at the beginning of the section, to perform frequency prioritization, UE should determine whether the reselection candidate cell is providing SIBx. It is also captured in 38.304 CR [1] as baseline. So the rapporteur understands there is no need to discuss again on whether to verify that the reselection candidate cell is providing SIBx, before performing frequency prioritization.

Regarding how to determine whether the reselection candidate cell is providing SIBx, the rapporteur thinks it makes sense to determine it based on the scheduling info in SIB1 of the reselection candidate cell as SIBx can be available on demand. This issue was also discussed in RAN2#116e meeting and there is clear majority view that the UE should verify that the reselection candidate cell is providing SIBx by reading SIB1 of the candidate cell, before prioritizing a frequency for MBS, according to [4].

Therefore, the rapporteur understands that, to perform frequency prioritization, UE should determine whether the reselection candidate cell is providing SIBx based on the scheduling info in SIB1 of the reselection candidate cell, before performing frequency prioritization.

Companies are then requested to answer the following question,

**Question 1: Do you agree that UE should determine whether the reselection candidate cell is providing SIBx based on the scheduling info in SIB1 of the reselection candidate cell?**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comments / justification** |
| Huawei, HiSilicon | Yes | This is the simplest approach, since as mentioned above, SIBx may be available on demand and hence not always broadcast in the candidate resection cell. |
| CATT | Yes | We think it is not necessary to read SIBx of the candidate cell, but need to check the schedule info in SIB1.Since RAN2 had agreed in last meeting that SIBx can be available on demand, the latency of reading SIBx of the candidate cell is especially large in this case. Furthermore, anyway UE needs to read the content of the essential system information blocks (i.e., MIB and SIB1) to check whether the reselection candidate cell is barred or not before performing cell reselection. So it is reasonable to verify the presence of SIBx based on the IE SI-SchedulingInfo of SIB1. |
| vivo | Yes | We agree with the moderator’s reasoning mentioned above. It is simple and feasible.  |
| Qualcomm | No | UE has to prioritize a freq for idle cell reselection based on contents of service cell SIBy and USD. There is absolutely no need for UE to read candidate cells SIB1 to determine whether to perform idle cell rselection or not. Once UE determines freq prioritization based on serving cell SIBy and USD, UE has to select best cell in that prioritized frequency based on channel conditions only. If reslected cell on prioritized frequency does not broadcast SIBx then UE can just deprioritize that frequency. In a given frequency, there can be more than one candidate cell and UE requiring to read SIB1 of each candidate cell causes significant power consumption as well. |
| MediaTek | Yes | We agree with the moderator |
| Apple | No | Same understanding as QC. UE can acquire the interested broadcast MBS service info from the current serving cell (via MCCH and SIBx1) and USD, so it’s unnecessary to require UE to acquire the candidate cell’s SIB1 and SIBx before UE actually decided to camp on that cell. |
| Kyocera | Yes | As RAN2 already agreed to check SIBx before frequency prioritization and SIBx can be provided on-demand, we think this is the reasonable to check the scheduling info in SIB1 (i.e., regardless of “*broadcasted*” or “*not broadcasted*”).  |
| Spreadtrum | No | UE should perform the frequency prioritization only based on the SIBy and USD. Frequent reading SIB1 of candidate cells will cause significant power consumption.UE can determine whether the target cell can provide SIBx based on the scheduling info in SIB1 like the checking for the cell status and cell reservations during cell reselction. If the target cell can not provide the SIBx, UE will reselect another cell.Providing SIBx information of neighbouring cells in serving cell can be considered in R18. |

## Additional TS impact on stopping frequency prioritization

After frequency prioritization, UE can reselect to a cell belonging to the prioritized frequency. When UE camps on the new serving cell, the conditions for frequency prioritization may be not met anymore (e.g. SIBx is not scheduled on the serving cell (i.e. reselected cell) anymore). It was agreed in last meeting that the UE should stop prioritizing the frequency of this cell in such case, according to [3],

|  |
| --- |
| * When the conditions for frequency prioritization are no longer met, the UE should stop prioritizing the frequency of this cell (e.g. when the cell reselected by the UE due to frequency prioritization for MBS stops providing SIBx etc.). FFS whether there is additional TS impact.
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The above agreement has been captured in the 38.304 CR [1] as follows,

|  |
| --- |
| If the MBS capable UE is receiving or interested to receive an MBS broadcast service(s) and can only receive this MBS broadcast service(s) by camping on a frequency on which it is provided, the UE may consider that frequency to be the highest priority during the MBS broadcast session as specified in TS 38.300 [2] as long as the two following conditions are fulfilled: …1) The reselection candidate cell is providing SIBx, or the cell reselected by the UE due to frequency prioritization for MBS is providing SIBx;…Editor’s note: When the conditions for frequency prioritization are no longer met, the UE should stop prioritizing the frequency of this cell (e.g. when the cell reselected by the UE due to frequency prioritization for MBS stops providing SIBx etc.). FFS whether there is additional TS impact. |

On whether there is additional TS impact for the frequency prioritization stopping case, it is discussed in several contributions from companies for this meeting,

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| --- | --- | --- |
| TDoc | Company name | Proposals |
| R2-2200234 | CATT, CBN | Proposal 2: The TS impact on stopping frequency prioritization has been reflected in the CR, and there is no other additional TS impact. |
| R2-2200980 | Ericsson | Proposal 4 When the UE is no longer interested in the session or the session has stopped, the UE shall re-select to another frequency. |
| R2-2201245 | Kyocera | Proposal 3 RAN2 should specify (or add Note) that the UE should check SIBx of the best cell (or the higher ranked cells, if needed for UE mobility).Proposal 4 RAN2 should agree that the UE should stop prioritizing the frequency if the reselected cell does not provide the MBS service of interest.Proposal 5 RAN2 should add a clarification that “the cell reselected by the UE due to frequency prioritization for MBS” is just the current serving cell from the UE point of view. |

Based on above, in the rapporteur’s view, the wording in the 38.304 running CR has been reviewed by companies during the previous CR discussions, and UE will stop the frequency prioritization when the UE is no longer interested in the session or the session has stopped, according to the previous agreement. So the rapporteur understands that there is no additional TS impact on stopping frequency prioritization

Therefore, companies are then requested to answer the following question,

**Question 2: Do you agree that there is no additional TS impact on stopping frequency prioritization?**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comments / justification** |
| Huawei, HiSilicon | Yes | We think the current specification is correct already as it says “the UE may consider that frequency to be the highest priority during the MBS broadcast session as specified in TS 38.300 [2] as long as the two following conditions are fulfilled:”.However, to avoid any confusion, we have no concerns with adding a NOTE to clarify that the UE should stop prioritizing the frequency when the conditions are no longer met. |
| CATT | Yes | We think the previous agreements have been reflected in the TS and no open issues left.Regarding the two wording terms, i.e., “the reselection candidate cell” and “the cell reselected by the UE”, have well reflected the two cases when performing cell reselection based on broadcast frequency prioritization. The first case refers to that before UE determines to reselect to a cell, firstly it should verify the reselection candidate cell is providing SIBx. While the second case refers to the concern on above FFS. When UE has finished cell reselection based on frequency prioritization, UE will stop prioritization for that frequency of the reselected cell when the new serving cell does not schedule the SIBx anymore.  |
| vivo | Yes | Based on the LTE spec/running CR, we think the frequency prioritization can only be performed when the corresponding conditions are satisfied. In other words, implicitly, UE would not prioritize the frequency if the condition for frequency prioritization is no longer met. Thus, we think there is no need to introduce additional TS impact on stopping frequency prioritization. |
| Qualcomm | **Yes** | the cell reselected by the UE due to frequency prioritization for MBS is providing SIBx;This is already covered. |
| MediaTek | Yes | We agree with CATT |
| Apple | Yes |  |
| Kyocera | No | We think the UE should check SIBx of the best cell before the UE reselects the cell, which may be clarified as NOTE. Also, we think the UE should stop the prioritization when MBS service of interest is no longer provided, which may be an additional condition. We agree with Huawei’s NOTE to clarify the UE should stop prioritizing frequency the frequency when the condition are no longer met.  |
| Spreadtrum | Yes |  |

## Frequency prioritization based on the frequency indicated in USD only

In LTE, in case SIBy is provided in the cell but the related service is not included in SIBy, the UE could not prioritize the frequency included in USD. However, during the previous discussion on 38.304 CR [1], some companies think that for some services which are deployed on the same frequency throughout the whole PLMN, it may make more sense to provide a semi-static frequency configuration in USD directly, while still providing frequencies via SIBy for other services. So the following FFS is captured in the 304 CR [1],

|  |
| --- |
| - SIBy is not broadcast in the serving cell and that frequency is included in the USD of this service. …Editor’s note: FFS whether frequency can be provided in USD, depending on SA2 conclusion. If it exists, FFS whether the UE can prioritize the frequency indicated in USD when SIBy is broadcast but does not provide the mapping for the concerned service. |

In last RAN2 meeting, discussion on this issue was suspended for waiting SA2 decision on whether frequency can be provided in USD. SA2 has already confirmed in LS [5] that the frequency can be provided in USD, therefore we can focus on the second FFS above. Proposals on this issue from Companies’ Contribution for this meeting are as following,

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| --- | --- | --- |
| TDoc | Company name | Proposals |
| R2-2200234 | CATT, CBN | Proposal 3: UE can prioritize the frequency indicated in USD when SIBy exists but does not provide the frequency mapping for the concerned service. |
| R2-2201176 | Intel | Proposal 5: The UE can prioritize the frequency indicated in USD when SIBy is broadcast but does not provide the mapping for the concerned service. |
| R2-2200817 | Huawei, HiSilicon | Proposal 6: The UE can prioritize/de-prioritize a frequency according to the SAI-frequency mapping provided in USD if the corresponding SAI is not configured in SIBX1. |
| R2-2201258 | vivo | Proposal 14: UE can’t prioritize the frequency indicated in USD when SIBy is broadcast but does not provide the mapping for the concerned service. |

In rapporteur’s view, it is beneficial to support such flexible usage of the frequency information in USD.

Companies are then requested to answer the following questions.

**Question 3: Do you agree that the UE should be allowed to prioritize the frequency indicated in USD when SIBy is provided in the cell but does not provide the frequency mapping for the concerned service?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments / justification** |
| Huawei, HiSilicon | Yes | Thanks to this, it would be possible to use information from USD for some services while using information from SIB15 for other services, at the same time. Of course, this all depends on network configuration and the network may decide not to provide frequency information in USD if it wants to avoid the UE to prioritize based on USD only. The issue mentioned in R2-2201258 on UEs gathering on one frequency is the same for USD and SIBx1 based prioritization, but that is the “price” to pay for enabling the UE to receive the broadcast service. |
| CATT | Yes | We think it is beneficial to support such flexibility on frequency prioritization based on USD only. |
| vivo | Comments | We might need to consider this issue case by case. For example, under the specifically mentioned scenario in which the same frequency/frequencies are deployed for some MBS service throughout the PLMN, then the single frequency/frequencies might be provided only in USD. And the answer to this question can be Yes. However, if the service is deployed on multiple frequencies as discussed in Q4, the UE can’t prioritize the frequency indicated in USD when SIBy is broadcast but does not provide the mapping for the concerned service. This is because UE doesn’t know which frequency indicated in USD is actually mapped to the broadcast service. Take one step back, even frequency prioritization is allowed, UEs may simultaneously gather at one given frequency, which leads to an unbalanced load. |
| Qualcomm | **Yes** |  |
| MediaTek | Yes |  |
| Apple  | Yes  |  |
| Kyocera | Yes, but… | We understand some deployments would need this mechanism, while some other deployments may not need it (i.e., same with LTE). So, we think SIB should indicate (i.e., 1-bit) whether the frequency in USD is prioritized.  |
| Spreadtrum | Yes |  |

For the further details on how to perform the frequency prioritization based on USD, there are also proposals from a few companies’ contributions as below,

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| --- | --- | --- |
| TDoc | Company name | Proposals |
| R2-2200234 | CATT, CBN | Proposal 4: If service is deployed on single frequency, UE can prioritize the frequency of the concerned service in USD.Proposal 5: If service is deployed on multiple frequencies, UE cannot prioritize the frequencies of the concerned service in USD. |
| R2-2201245 | Kyocera | Proposal 2 RAN2 should discuss if the UE is indicated (e.g., in SIB) whether it’s allowed to prioritize the frequency of interest in USD, when the frequency is not provided in SIBy. |

The rapporteur understands it is beneficial to make the UE behaviour clear on how to use the frequency in USD. But there are only a few contributions on it, the rapporteur is not sure whether we need to specify it or not.

Companies are then requested to answer the following question,

**Question 4: If your answer to Q3 is yes, do you agree to specify the UE behavior on how to perform the frequency prioritization based on USD?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments / justification** |
| Huawei, HiSilicon | No | We think this can be left up to UE/network implementation in Rel-17. |
| CATT | Yes | We think it is necessary to make the UE behaviour clearFor the case that the broadcast service is deployed on a single frequency throughout the PLMN, UE can prioritize that frequency since there is no confusion from UE perspective. But there may be some cases where UE is confused of which frequency to be prioritized, for example, a broadcast service is deployed on different frequencies of the PLMN in different geographical area, i.e., the service-frequency mapping in USD is not one-to-one mapping, and therefore we should further discuss the UE behaviour on how to perform the frequency prioritization based on USD only. Probably we could limit the use of USD only mode to the case where the service-frequency mapping is one-to-one mapping. |
| vivo | Yes | Only for the same frequency deployment case, we might add a note to clarify that the UE may prioritize the frequency indicated in USD. |
| Qualcomm | **No** | Note can be added. But it should be left upto UE implementation. |
| MediaTek | No | It can be left to UE implementation |
| Apple | No  | It can be left to UE implementation. |
| Kyocera | Yes | We think the UE behaviour should be specified clearly, and we have the same comment as Question 3 above.  |
| Spreadtrum | No | It can be left to UE implementation. |

In case there is majority view on specifying the UE behaviour on using frequency in USD, it can be discussed further.

## Other issues

If companies identify other open issues related to the frequency prioritization, please indicate in below table,

**Question 6: Do you identify any other open issues related to the frequency prioritization?**

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| --- | --- |
| **Company** | **Comments on other issues** |
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# 3 Summary

Based on the discussion, the following is proposed:

# 4 References

1. R2-2111441, 38\_304\_Running\_CR\_for\_MBS\_in\_NR, CATT
2. Report of 3GPP TSG RAN WG2 meeting #115-e
3. Report of 3GPP TSG RAN WG2 meeting #116-e
4. R2-2111510, Report of [AT116-e][051][MBS] CP continuation
5. R2-2200142 LS on MBS broadcast service continuity and MBS session identification (S2-2109187; contact: Huawei) SA2 LS in Rel-17 NR\_MBS-Core, 5MBS To:RAN2 Cc:RAN3
6. R2-2200234 Open Issues on Broadcast Service Continuity CATT, CBN discussion Rel-17 NR\_MBS-Core
7. R2-2200532 NR MBS control signaling aspects Qualcomm Inc discussion Rel-17 NR\_MBS-Core R2-2109899
8. R2-2200540 Discussion on priority reselection based on SIBx of the neighbor cells Futurewei discussion Rel-17 NR\_MBS-Core
9. R2-2200817 MBS service continuity for broadcast Huawei, HiSilicon discussion Rel-17 NR\_MBS-Core
10. R2-2200980 Broadcast Service Continuity Ericsson discussion
11. R2-2201118 Control plane aspects of MBS Apple discussion Rel-17 NR\_MBS-Core
12. R2-2201176 Broadcast service continuity Intel Corporation discussion Rel-17 NR\_MBS-Core
13. R2-2201245 Remaining issues of cell reselection procedure for MBS Kyocera discussion Rel-17 R2-2110206
14. R2-2201258 Mobility for NR MBS vivo discussion Rel-17 NR\_MBS-Core
15. R2-2200577 Service continuity for broadcast mode TD Tech, Chengdu TD Tech discussion Rel-17