**3GPP TSG RAN WG1 Meeting #100b-e                     R1-200xxxx**

**eMeeting, April 20 - 30, 2020**

**Agenda Item: 7.2.2.2.2**

**Source: Moderator (Charter Communications)**

**Title: Draft [100b-e-NR-unlic-NRU-InitAccessProc-01]**

**Document for: Discussion and Decision**

# Introduction

Three email discussions have been sanctioned in RAN1#100b-e on initial access procedures for NR-U. This first discussion that aims to converge by 4/24 has the following scope:

[100b-e-NR-unlic-NRU-InitAccessProc-01] Email discussion/approval on following issues related to SS/PBCH blocks by 4/24; if necessary, followed by endorsing the corresponding TPs by 4/29 – Amitav (Charter)

* Finalize remaining details of parameter Q signalling and interpretation
* Correct the citation of TS 38.104 in TS 38.213 Subclause 4.1 in relation to the definition of L\_max

These issues have been selected based on the preparatory discussion summarized in [14].

# Company views

## Signaling of Q in MIB based on RAN2 LS response

The issue is summarized in [14] with the following proposal:

**Proposal.** Based on LS response from RAN2, the UE interprets ~~ssb~~SubcarrierSpacingCommon (1 bit) and LSB of ssb-SubcarrierOffset (1 bit) of the Rel-15 MIB for providing the value of ssbPositionQCL-Relationship-r16. These changes are reflected in TS 38.213 Clause 4.1.

For example, TP for section 4.1 in 38.213:

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| Table 4-1: Mapping between the combination of subCarrierSpacingCommon and LSB of ssb-SubcarrierOffset to   |  |  |  | | --- | --- | --- | | *subCarrierSpacingCommon* | LSB of *ssb-SubcarrierOffset* |  | | scs15or60 | 0 | 1 | | scs15or60 | 1 | 2 | | scs30or120 | 0 | 4 | | scs30or120 | 1 | 8 | |

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| **Company** | **Views** |
| Samsung | Support the TP. |
| LG Electronics | Support the proposal and corresponding TP. In addition to TP, it would be better to modify the following typo in the paragraph related to this table.   |  | | --- | | For operation with shared spectrum channel access, a UE assumes that SS/PBCH blocks in a serving cell that are within a same discovery burst transmission window or across discovery burst transmission windows are quasi co-located with respect to average gain, QCL-TypeA, and QCL-TypeD properties, when applicable [6, TS 38.214], if a value of is same among the SS/PBCH blocks. is an index of a DM-RS sequence transmitted in a PBCH of a corresponding SS/PBCH block, and is either provided by *ssbPositionQCL-Relationship-r16* or, if *ssbPositionQCL-Relationship-r16* is not provided,obtained from a *MIB* provided by a SS/PBCH block according to Table 4-1. *~~ssbS~~subcarrierSpacingCommon* indicates SCS of RMSI only for the case of "operation without shared spectrum".The UE assumes that within a discovery burst transmission window, a number of transmitted SS/PBCH blocks on a serving cell is not larger than . The UE can determine an SS/PBCH block index according to , or according to where is the candidate SS/PBCH block index. |   By the way, isn’t it necessary to send an LS to RAN2 to inform this proposal (if agreed)? |
| ZTE | Support the TP. |
| Sharp | Support the TP. Agree with the typo fix proposed by LG. |
| Nokia, NSB | Support the TP. Agree with the typo fix proposed by LG.  On the other hand, we don’t think that a Reply LS to RAN2 is needed, as the ACTION from the RAN2 LS does not expect it *(ACTION: RAN2 respectfully asks RAN1 to take the above RAN2 feedback into account)*. |
| Lenovo, Motorola Mobility | Fine with the TP. Unless we change anything compared to RAN2's LS, we don't see a need to reply to RAN2. |
| NTT DOCOMO | We support the TP |
| Huawei, HiSilicon | We support the TP |
| vivo | Support the TP and agree with the typo fix proposed by LG |
| Spreadtrum | Support the TP |
| OPPO | Support the TP |
| Qualcomm | Support the TP |
| Ericsson | Support the TP. Agree with the typo fix proposed by LG. |
| Sony | Support the TP. Agree with the typo fix proposed by LG. |
| MediaTek | Support the TP. Agree with the typo fix proposed by LG. |

## Whether configuration of Q for RRM measurements and SCell/SCG (re)config is mandatory, or a default value of Q=8 can be assumed by UE.

Summary: For RRM measurement configuration from *MeasObjectNR* and *SIB2/SIB4*, down-select one of the following:

* Option 1: Network always provides a common Q value (*ssb-PositionQCL-Common-r16*) per frequency to UE.
* Option 2: If no Q value is provided, UE assumes Q=8.

For SCell addition, SCG addition, and reconfiguration with sync, down-select one of the following:

* Option 1: The Q value of the cell to be added is always provided to UE via dedicated RRC signaling, i.e. ssb-PositionQCL-r16 in *ServingCellConfigCommon*.
* Option 2: If no Q value is provided, UE assumes Q=8.

FL proposal is to discuss the principle before bringing in a TP.

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| **Company** | **Views** |
| Samsung | For both questions, prefer Option 1. No matter which option is agreed, an LS to RAN2 is needed.  If we remember correctly, this issue was discussed offline before, and several companies mentioned Option 1 such that RAN1/RAN2 don’t need to discuss the default RRC parameter value. |
| LG Electronics | Prefer Option 2 for neighbor cell RRM measurement and Option 1 for SCG/SCell addition. |
| ZTE | We prefer Option 2 for both conditions. We have an agreement before to define a default Q=8 for SSB detection during initial cell search, similarly, we think that it’s more natural to define a default value of Q for the above 2 conditions. |
| Sharp | We slightly prefer Option 1. |
| Nokia, NSB | We prefer Option 1 for both. |
| Lenovo, Motorola Mobility | We prefer Option 2 in bith cases, sharing ZTE's motivation. |
| NTT DOCOMO | We prefer Option1 for both. We also think RAN2 announced that the default value for RRC parameter need to be avoided. |
| Huawei, HiSilicon | Option2 is preferred for both scenarios |
| vivo | Prefer Option 1 for both cases. |
| Spreadtrum | We slightly prefer Option 1. |
| OPPO | Option 1 for both cases.  Answer to ZTE: for initial access, the UE has to assume a default Q before the UE reads the MIB, and there is no way the network can indicate Q value to the UE. But for the two mentioned cases, there is a way that the network informs the UE about the accurate Q. Therefore they are different cases. |
| Qualcomm | Option 1 is preferred |
| Ericsson | Option 1 is okay. Agree that an LS to RAN2 is essential, since currently in 38.331 the parameters are optionally configured. RAN2 will need to sort out the Need codes appropriately. |
| Sony | We prefer Option 1 for both. |
| MediaTek | We prefer Option 1 for both cases. And we share the same view with Samsung and Ericsson that we should send an LS to RAN2 and maybe CC RAN4 once we reach agreements.  In addition, we would like to echo OPPO that for all the above scenarios, there are ways either by dedicated or broadcast signaling that gNB can indicate UE a proper Q value. |

## Whether the number of candidate SS/PBCH blocks from the first transmitted SS/PBCH block to the last transmitted SS/PBCH block should not be greater than Q.

Detailed discussion is given in Sec. 4 of [12].

FL proposal is to discuss the principle before bringing in a TP.

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| **Company** | **Views** |
| Samsung | We are OK with the proposal as a clarification. |
| LG Electronics | OK with the proposal in principle. |
| ZTE | We don’t think this proposal is just a clarification issue, it’s also related to LBT failure in some cases.  For example, assume Q=8 and SSB position is 10000001, if there is a LBT failure on candidate index position 8, the next QCLed candidate index will be 16 and the number of candidate SSBs will be larger than Q.  Besides, even for consecutive SSB transmission, if channel access type is Type 2A with 1ms maximum duration, there could be a LBT failure risk to make the number of candidate SSB larger than Q. |
| Sharp | We support the clarification. |
| Nokia, NSB | We do not support this for a similar reason than the one provided by ZTE. In the case e.g. LBT category 2 is used several LBT successes may occur within a single DRS Tx window.  Anyway in our view this topic should be left to gNB implementation. As far as the UE is concerned we have the following RAN1 agreement: *From a UE’s perspective, the number of transmitted SSBs within a DRS transmission window is not larger than Q*, hence no need to limit transmission at gNB side. |
| NTT DOCOMO | We are fine with the proposal. |
| Huawei, HiSilicon | It should be clarified whether this restriction applied for LBE or FBE. For LBE it looks reasonable because gNB will practically transmit SSB contiguously after acquired channel. However, in FBE, the DRS window might be interrupted in the middle of DRS window if the FFP is smaller than DRS window. Such restriction may forbid gNB to continue transmitting SSB in the following FFP in the rest of DRS window. |
| vivo | OK with the proposal |
| Spreadtrum | After initial cell search, UE may only detect and measurement SSB with a specific SSB index, since UE has knowledge of the strongest SSB beam. So, no matter with or without the restriction at gNB as defined by the proposal, UE has to detect and measurement SSB in the candidate SSB positions according to the specific SSB index. But, maybe, if UE detects an SSB successfully, UE can know the last SSB in the current discovery burst transmission window has no gap than Q. It seems beneficial for the case that UE measures multiple SSBs or perform combination. We have no strong position for this proposal. |
| OPPO | OK |
| Qualcomm | We support the proposal, but need to clarify that this is from UE perspective, as in the original agreement |
| Ericsson | OK with the proposal, but agree with Qualcomm that it needs to be written from UE perspective. |
| Sony | We support this proposal to reduce unnecessary UE power consumption. |
| MediaTek | We support this proposal. We do not agree to add “from the UE perspective” to the proposal.  Proposal 8 from R1-2002407: Within a discovery burst transmission window, the number of candidate SS/PBCH blocks from the first transmitted SS/PBCH block and the last transmitted SS/PBCH block should not be greater than Q.  This proposal is to resolve our implementation team’s concern in initial cell search. If a gNB transmits SSBs for a same cell in all candidate SSB positions which can be up to 20, it consumes UE’s capability in cell search. In initial cell search, UE does not know whether the detected SSBs are from the same cell or different cells. Then how can this proposal help if we add “from the UE perspective”?  Question to QC and Ericsson: Can you clarify why it needs to be written “from the UE perspective”? Are you suggesting that it is possible that gNB transmits more than Q SSBs within a DRS window? Or the time span from the first transmitted SSB to the last transmitted SSB can be more than Q from the gNB’s perspective? If so, why would a gNB want to do that?  Response to ZTE:   * In your first example, since gNB has failed LBT in SSB position 8, then it can transmit its first SSB in SSB position 9 at the earliest. Then in SSB position 16, it can transmit its second SSB. The number of SSB positions between the first transmitted SSB and the last transmitted SSB in this case would be 16-9+1=8. The proposal does not cause any problem in this example. * I don’t understand your second example. Are you saying in the example, gNB would transmit more than one 1ms-SSB burst?   Response to Nokia: Are you saying that more than one 1ms-SSB burst can be transmitted within a DRS window? For example, Q=8 with SCS=30kHz, gNB applies Cat-2 LBT (Type 2A) and transmits SSB1 to SSB4 as the first 1ms burst. Then within the same DRS window, gNB applies Cat-2 LBT again and transmit SSB5 to SSB8 as the second 1ms burst?  Response to Huawei: Please do not forget that in FBE, gNB only has to pass a 9us CCA for transmission. I think gNB can avoid the case you mentioned by choosing proper configuration of FFP and Q. |
| Ericsson | @MediaTek  The quick answer to your question is that the spec always is written from the UE perspective :-)  That being said, our intention is that the gNB would behave as you outline in Proposal 8. But how would the UE know what is the first transmitted SSB if it does not detect it? The UE may detect the 2nd, or 3rd SSB, for example. So then how would one write the spec in terms of “what the UE expects,” would it be in terms of the first detected SSB? But maybe that doesn’t cover your intention? |
| MediaTek2 | Thanks all that have responded to my questions above.  To resolve Nokia and ZTE’s concern and take Ericsson’s suggestion into consideration, I revise our proposal as follows:  **Proposal:** UE does not expect to receive two or more SSBs that correspond to the same SSB index within a discovery burst transmission window. |

## Correct the citation of TS 38.104 in TS 38.213 Subclause 4.1 in relation to the definition of L\_max

**Summary**: Correct the citation of TS 38.104 in TS 38.213 Subclause 4.1 in relation to the definition of (applies to both licensed and shared spectrum operation)

Alt. 1: Remove citation

Alt. 2: Point to TS 38.133 instead and notify RAN4 that the word “candidate” should be removed in the paragraph above Table 8.1.1-2 in 38.133 to be consistent with Rel-16 notation.

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| **Company** | **Views** |
| Samsung | Alt 1.  TS 38.133 has no intention to define L\_max in our understanding. It even refers back to TS 38.213 for the value of L\_max, so we don’t think Alt 2 could work. However, in deed the word “candidate” should be removed in TS 38.133. |
| LG Electronics | Agree with Samsung. |
| ZTE | We prefer Alt 1 and the word “candidate” should be removed in the paragraph above Table 8.1.1-2 in 38.133. |
| Sharp | Alt.1. |
| Nokia, NSB | We support Alt 1, i.e. remove citation **and** define in TS 38.213/4.1 (which is the Samsung’s proposal as we understand it).  On the other hand, we agree with Samsung that the “candidate” wording should be removed in 38.133 subclause 8.1.1. This can be left to RAN4 themselves (our preference). |
| Lenovo, Motorola Mobility | Alt 1. |
| NTT DOCOMO | Support Alt.1. |
| Huawei, HiSilicon | Alt 1 |
| vivo | Alt. 1 |
| Spreadtrum | Support Alt.1. |
| Qualcomm | Alt 1 |
| Ericsson | The word “candidate” needs to be removed in 38.133 subclause 8.1.1, and RAN1 should inform RAN4 of this.  Our preference (as in our contribution is Alt-2), since we think that L\_max is already defined in 38.133 via Table 8.1.1.2.  For Alt-1, it is not clear what “correct the citation of TS 38.104” means. We agree that L\_max applies to both licensed and unlicensed, and that correction should be made. However, where and how will L\_max be defined now? We don’t think L\_max definition in terms of frequency ranges (MHz) belongs in 38.213.  What about Section 5 of 38.213 where there is also a reference to 38.104?  It seems like a complete proposal is needed before anything can be agreed. |
| Sony | Support Alt.1 |
| MediaTek | Agree with Samsung |

# References

1. R1-2001535 Maintainance on the initial access procedures Huawei, HiSilicon
2. R1-2001653 Remaining issues on initial access procedure for NR-U vivo
3. R1-2001706 Remaining issues on the initial access procedure for NR-U ZTE, Sanechips
4. R1-2001760 Discussion on the remaining issues of enhancements to initial access procedure OPPO
5. R1-2001936 Remaining issues of initial access and mobility for NR-U LG Electronics
6. R1-2001988 Enhancements to initial access and mobility for NR-unlicensed Intel Corporation
7. R1-2002032 Enhancements to initial access procedures Ericsson
8. R1-2002118 Initial access procedures for NR-U Samsung
9. R1-2002248 Remaining issues on initial access procedure for NR-U ETRI
10. R1-2002263 Remaining issues on initial access procedure Spreadtrum Communications
11. R1-2002278 On Enhancements to Initial Access Procedures for NR-U Nokia, Nokia Shanghai Bell
12. R1-2002407 Remaining issues on initial access procedure for NR-U operation MediaTek Inc.
13. R1-2002531 TP for Initial access and mobility procedures for NR-U Qualcomm Incorporated
14. R1-2001701 FL summary 72222 NRU Charter Communications