**3GPP TSG RAN WG1 Meeting #101-e                     R1-200xxxx**

**e-Meeting, May 25 – June 5, 2020**

**Agenda Item: 7.2.2.2.2**

**Source: Charter Communications**

**Title: Draft [101-e-NR-unlic-NRU-InitAccessProc-02]**

**Document for: Discussion and Decision**

# Introduction

Four email discussions have been sanctioned in RAN1#101-e on initial access procedures for NR-U based on contributions submitted to this meeting [1]-[13]. This second discussion that aims to converge by 5/29 has the following scope:

[101-e-NR-unlic-NRU-InitAccessProc-02] Email discussion/approval on the following issues from R1-2003306 until 5/29; if necessary endorse associated TPs by 6/4 – Amitav (Charter)

* (#3.2) For the minimum value N of the MsgA PRACH-PUSCH gap in NR-U, select one of the alternatives in RAN1 #101-e:
  + Alt 1: N=2 (same as licensed operation)
  + Alt 2: N can be smaller than 2 for identified cases, and N=2 for the rest
    - For example, N = [0 or 1] when MsgA PUSCH has the same SCS and bandwith as MsgA PRACH
    - Note: it can be further discussed whether existing CP extension scheme can be applicable for the identified cases

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

# Company views

It is proposed to first converge on either Alt. 1 or Alt. 2 before discussing TPs.

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| **Company** | **Views** |
| Samsung | Support Alt. 1  Alt.2 can be beneficial over Alt.1 only when all the following conditions are satisfied:   * Single beam operation or PRACH format B4 with particular RACH configuration (not more than 50%) * Same SCS and bandwidth of PRACH and PUSCH * LBT for PRACH succeeds but LBT for PUSCH fails in Alt.1   From our perspective, the chance of all the above conditions being satisfied is very low, so Alt.2 is just an enhancement for a corner case, which is not essential at this stage. Also note that Alt.2 introduces bias of SSBs in the case of multiple ROs in a slot, and leads to different operation on licensed and unlicensed spectrum (an implementation change comparing to licensed spectrum), with the only benefit of single LBT procedure.  More detailed reasoning can be found in our contribution R1-2003861. |
| ZTE | We slightly prefer Alt2.  Alt2 does provide some benefits to NRU of single LBT although the configuration choice is limited. Actually, from my understanding, limited configuration doesn’t mean limited use cases, gNB could always use such preamble configurations for NRU if applicable. Besides, for Format B4, there is only one RO in a slot, so there is no such bias of SSBs. In addition, with the condition that SCS and bandwidth of PRACH and PUSCH are the same, the UE implementation complexity could be further reduced. |
| Nokia, NSB | We prefer Alt2 and support ZTE’s views. In particular we believe that the use of CP extension may be beneficial on top of Alt1. |
| Qualcomm | We prefer Alt 1 for consist behavior with licensed, and very limited use case for Alt 2. |
| MediaTek | We support Alt 1. We share a similar view with Samsung that Alt 2 only benefits under very limited scenarios.  Instead of applying Alt 2 to optimize very limited PRACH configurations, we think applying a Cat-2 LBT for MsgA PUSCH when the MsgA PUSCH is within the same COT acquired by the UE for MsgA PRACH transmission would be a more general and better solution. |
| Huawei, HiSilicon | We support Alt 1. The usage of such configuration is limited considering RO configuration. The benefit of reduced gap is not significant compared with the complexity in implementation. |
| LG | We prefer Alt 2 with existing CP extension even if it could be allowed conditionally.  Fundamentally, it would be quite desirable to reduce UE’s LBT trial for single MsgA transmission if possible, in terms of avoiding the increase of fallback RARs as well as the waste of reserved MsgA PUSCH resource. Furthermore, since the CP extension has been already introduced/specified as one of NR-U UE feature, extended use of the feature for RACH case should not be considered to cause additional complexity/implemenation. |
| vivo | Support Alt 1 since the benefit is very limited. |
| Ericsson | We support Alt-2 with N = 0. We concur with ZTE's view. Just because the number of configurations options is limited, it doesn't mean the use case is limited. Preamble format B4 (single RO in a slot) is common in licensed operation, and there is no reason why it cannot be used in unlicensed. With this configuration, the gap to the end of the slot is less than 16 us, hence, it is not necessary to perform LBT in between PRACH and PUSCH. Furthermore, this configuration can be used even if CP extension is not agreed. If, additionally, CP extension was agreed, then this would enable an additional set of configuration options to avoid LBT in between PRACH and PUCCH. |
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# References

1. R1-2003371 Remaining issues on initial access procedure for NR-U vivo
2. R1-2003451 Remaining issues on the initial access procedure for NR-U ZTE, Sanechips
3. R1-2003513 Maintenance on the initial access procedures Huawei, HiSilicon
4. R1-2003657 Remaining issues on initial access procedure for NR-U operation MediaTek Inc.
5. R1-2003729 Enhancements to initial access and mobility for NR-unlicensed Intel Corporation
6. R1-2003844 Enhancements to initial access procedures Ericsson
7. R1-2003861 Initial access procedures for NR-U Samsung
8. R1-2003973 Remaining issues on initial access procedure for NR-U ETRI
9. R1-2004001 Remaining issues on initial access procedure Spreadtrum Communications
10. R1-2004014 Remaining issues of initial access and mobility for NR-U LG Electronics
11. R1-2004086 Discussion on the remaining issues of enhancements to initial access procedure OPPO
12. R1-2004444 TP for Initial access and mobility procedures for NR-U Qualcomm Incorporated
13. R1-2004526 On Enhancements to Initial Access Procedure for NR-U Nokia, Nokia Shanghai Bell
14. R1-2003306 Feature lead summary on for initial access procedures enhancements Charter Communications