**3GPP TSG-RAN2 Meeting #117 Electronic  R2-220xxxx**

**February 21 – March 3, 2022**

**Source: Samsung**

**Title: [Pre117-e][024][ePowSav] Summary of AI 8.9.3.2.2** **PDCCH Skip (Samsung)**

**Document for: Report and Decision**

**Agenda Item: 8.9.3.2.2**

# Introduction

This document summarizes the contributions submitted to agenda item 8.9.3.2.2.

# Discussion

RAN2 has discussed the impact of PDCCH skipping on SR and RA procedure. Following agreements were made in RAN2#116bis-e:

1. UE ignores PDCCH skipping while the SR is pending.
2. If PDCCH skipping is applied to RNTI(s) monitored during RAR/MsgB window, the UE ignores PDCCH skipping during the RAR/MsgB window.
3. UE ignores PDCCH skipping while contention resolution timer is running.

# PDCCH skipping and SR

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| **Source** | **Proposal** |
| Samsung [1] | Proposal : UE ignores PDCCH skipping **on all serving cells** of the corresponding CG while SR is pending.  |

**Proposal (for discussion): UE ignores PDCCH skipping on all serving cells of the corresponding CG while SR is pending.**

# PDCCH skipping and Random Access

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| **Source** | **Proposal** |
| Samsung [1] | Proposal: During RAR/MsgB window, UE ignores PDCCH skipping on SpCell.Proposal: UE ignores PDCCH skipping on SpCell while contention resolution timer is running.  |
| Vivo [2] | Proposal : Clarify the agreements made in RAN2#116bis-e as follows and confirm that there is no impact on RAN2 specification.* From RAN2 point of view, if PDCCH skipping is applied to RNTI(s) monitored during RAR/MsgB window, the UE still monitors the PDCCH which schedules RAR during RAR/MsgB window, while there is no impact on RAN1 behaviour on PDCCH skipping, e.g. there is no need for UE to monitor USS and type-3 CSS;
* From RAN2 point of view, UE still monitors PDCCH which schedules Msg3 or Msg4 while contention resolution timer is running, while there is no impact on RAN1 behaviour on PDCCH skipping, e.g. there is no need for UE to monitor USS and type-3 CSS.

*[Rapporteur’s Comments]: In case of 4 step RA, UE needs to monitor PDCCH addressed to C-RNTI in recovery search space for RA triggered for BFR. In case of 2 step RA UE needs to monitor USS to receive PDCCH addressed to C-RNTI, if C-RNTI was included in MsgA. While contention resolution timer is running, for contention resolution, UE monitor PDCCH addressed to C-RNTI in USS, if C-RNTI was included in Msg3.**RAN2 has also sent an LS (R2-2201960) to RAN1 in last meeting and we do not need to discuss whether there is any RAN1 impact or not. Also if RAN1 decides to capture aspects related to ignoring PDCCH skipping in RAN1 specification, RAN2 specification change is not needed.*  |
| Xaomi [7] | If PDCCH skipping is applied to RNTI(s) monitored during RAR/MsgB window, the UE ignores PDCCH skipping during the RAR/MsgB window on Pcell/Pscell for CA case. |

**Proposal (for discussion): During RAR/MsgB window, UE ignores PDCCH skipping on SpCell.**

**Proposal (for discussion): UE ignores PDCCH skipping on SpCell while contention resolution timer is running.**

# PDCCH skipping and UL HARQ reTx timer

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| **Source** | **Proposal** |
| Vivo [2] | Proposal: It is up to RAN1 to decide whether UE ignore PDCCH skipping (i.e., PDCCH skipping is cancelled) while UL HARQ reTx timer is running.Proposal: PDCCH skipping is transparent to MAC layer. |
| Nokia [3] | Proposal: UE ignores PDCCH skipping (i.e., PDCCH skipping is cancelled) while *drx-RetransmissionTimerUL* is running.Proposal: discuss if to restrict it to only when the PUSCH transmission includes high priority/delay sensitive traffic (i.e. configurable per LCH)/MAC CEs.  |
| Oppo [4] | For dynamic grant, if UE receives PDCCH skipping command after UL HARQ reTx timer is started, UE should follow the network’s command and skip PDCCH monitoring.For configured grant, if UE receives PDCCH skipping command before UL HARQ reTx timer is started, UE should ignore PDCCH skipping.For configured grant, if UE receives PDCCH skipping command after UL HARQ reTx timer is started, UE should follow the network’s command and skip PDCCH monitoring. |
| Huawei [5] | Proposal: The UE ignores the PDCCH skipping if a MAC PDU is transmitted on a configured grant resource and the DRX UL reTx timer is running. |
| Ericsson [6] | Proposal: The PDCCH skipping duration is pre-empted when UE SR is pending, during Random Access and after transmission of CS grant with UL SPS, and CFRA/CBRA during BFR.  |
| Xaomi [7] | UE ignores PDCCH skipping while UL HARQ reTx timer is running |

**Proposal (for discussion): RAN2 to discuss and agree on one of the following:**

* **Option 1: It is up to RAN1 to decide whether UE ignore PDCCH skipping while UL HARQ reTx timer is running.**
* **Option 2: UE ignores PDCCH skipping while *drx-RetransmissionTimerUL* is running.**
* Option 3: For configured grant, if UE receives PDCCH skipping command before UL HARQ reTx timer is started, UE should ignore PDCCH skipping.

# Others

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| **Source** | **Proposal** |
| Ericsson [6] | Proposal : The UE starts *drx-OnDurationTimer* when the DCP occasion(s) overlap with the PDCCH skip duration.*[Rapporteur’s Comments]: This issue was discussed in RAN2#116bise. No need to further discuss as RAN2 has already sent an LS (R2-2201960) to RAN1 in last meeting.* |
| Ericsson [6] | Proposal: The UE reports aperiodic CSI during Active Time and outside Active Time when expected independent from the PDCCH skipping period. Proposal : The UE reports periodic CSI during Active time independent from the PDCCH skipping duration. *[Rapporteur’s Comments]: This issue was discussed in RAN2#116bise. No need to further discuss as RAN2 has already sent an LS (R2-2201960) to RAN1 in last meeting.* |
| Ericsson [6] | Proposal: Introduce preferred skipping duration in *UEAssistanceInformation* message.*[Rapporteur’s Comments]: This issue was discussed in RAN2#116bise (see summary document R2-2201915). Only one company out of 16 supported the proposal.* |
| Xaomi [7] | The *bwp-InactivityTimer* and/or *sCellDeactivationTimer* on relevant cell(s) are not impacted by PDCCH-skipping.*[Rapporteur’s Comments]: There is no proposal on the table which states that the bwp-InactivityTimer and/or sCellDeactivationTimer on relevant cell(s) are not impacted by PDCCH-skipping. So no need to discuss.* |

 **Proposal (for discussion): Introduce preferred skipping duration in *UEAssistanceInformation* message.**

# Conclusion

**For discussion**

**Proposal 1: UE ignores PDCCH skipping on all serving cells of the corresponding CG while SR is pending.**

**Proposal 2: During RAR/MsgB window, UE ignores PDCCH skipping on SpCell.**

**Proposal: UE ignores PDCCH skipping on SpCell while contention resolution timer is running.**

**Proposal 3: RAN2 to discuss and agree on one of the following:**

* **Option 1: It is up to RAN1 to decide whether UE ignore PDCCH skipping while UL HARQ reTx timer is running.**
* **Option 2: UE ignores PDCCH skipping while *drx-RetransmissionTimerUL* is running.**
* Option 3: For configured grant, if UE receives PDCCH skipping command before UL HARQ reTx timer is started, UE should ignore PDCCH skipping.

**Proposal (for discussion): Introduce preferred skipping duration in *UEAssistanceInformation* message.**

# Reference

[1] R2-2202287 PDCCH Skipping in RRC\_CONNECTED Samsung Electronics Co., Ltd

[2] R2-2202311 Discussion on PDCCH Skipping in RRC\_CONNECTED vivo

[3] R2-2202883 UL PUSCH transmission impact on PDCCH skipping Nokia, Nokia Shanghai Bell

[4] R2-2202994 Discussion on PDCCH skipping OPPO

[5] R2-2203230 PDCCH skipping while UL reTx timer is running Huawei, HiSilicon

[6] R2-2203253 DCI-based power saving adaptation during DRX Active Time Ericsson

[7] R2-2202354 Discussion on remaining issues on UE power saving Xiaomi Communications