**3GPP TSG-RAN WG2#117-e Draft R2-2203380**

**Online, 21 February - 3 March 2022**

**Source:** Huawei, HiSilicon

**Title:** [Pre117-e][220][DCCA] Summary of UE behaviour while SCG is deactivated (Huawei)

**Agenda Item:** 8.2.2.2

**Document for:** Discussion and decision

# 1 Introduction

This document:

- discusses open issues in R2-2202029 related to RLM, BFD, TA timer and RACH-less SCG activation;

- discusses open issues in R2-2202029 about UE power limitation and PDCCH blind decoding while the SCG is deactivated;

- proposes solutions, with only a few small changes to the 38.331 [2] and 38.321 [3] running CRs.

# 2 Discussion

## 2.1 SCG RLF while the SCG is deactivated

The following actions are proposed at RLF while the SCG is deactivated:

1) stop the TA timer [5][11][12][14] / not stop TA timer [9][17]

2) stop RLM [1][4][9][12][14]

3) stop BFD [17] and maybe [1][4][12][14] (companies wrote "stop RLM/BFD at RLF/BF", so not sure the stop applies to BFD in case of RLF) / not stop RLM [11]

4) resume RLM upon RLF recovery [4] or reconfiguration [8] (of RLM RS [5][17], with sync [14][16]) / not resume [12]

In the Rel-16 SCG failure information procedure, SCG MAC is reset, so TA timer is stopped. No company said why it should be different when the SCG is deactivated.

In Rel-16, there is no explicit indication to stop RLM or BFD upon RLM and the network is expected to do reconfiguration with sync or to release the SCG.

For the deactivated SCG, while there is no SCG transmission so a network action might not be as urgent as for the activated SCG, an SCG for which SCG RLF cannot be activated without PSCell change. Therefore, there is not much use for the network to keep an unusable SCG and it could be assumed that the network quickly will reconfigure or release the SCG, so there may be not much need to specify that the UE shall stop RLM/BFD.

To keep the SCG following SCG RLF, the PSCell is to be changed, which requires including reconfigurationWithSync, even if the SCG remains deactivated so that PSCell change does not trigger random access (it will be needed at SCG activation). From that perspective, the existing criteria (

**Proposal 1: Agree UE behaviours for SCG RLF while the SCG is deactivated:**

**a) at SCG RLF, SCG MAC is reset (like in Rel-16, this will stop the TA timer)**

**b) at SCG RLF, stop RLM and BFD (not captured in Rel-16, but perhaps UEs do that)**

**c) resume RLM and BFD upon reconfiguration with sync**

**Note: can shortly discuss if, instead of b) and c), to align with Rel-16, what is stopped and resumed is triggering of SCG failure information again upon RLF/beam failure.**

## 2.2 PSCell beam failure while the SCG is deactivated

The following actions are proposed at beam failure while the SCG is deactivated:

1) stop TA timer [11], not stop the TA timer [5][9][16]

2) stop BFD [9][11]

3) resume BFD upon recovery [4], reconfiguration [8], reconfiguration with sync [14], reconfiguration of BFD RS [5][16][17], network message [13] / not resume [12]

While not so many companies had explicit proposals to stop BFD, resuming BFD somehow implies that it was stopped, so companies proposing to resume BFD probably assume it is stopped.

**Proposal 2: Agree UE behaviours for PSCell beam failure while the SCG is deactivated:**

**a) at PSCell beam failure, TA timer is not stopped**

**b) at PSCell beam failure, stop BFD**

**c) resume BFD upon reconfiguration of BFD RS (RadioLinkMonitoringConfig or tci-Info)**

## 2.3 TA timer expiry while the SCG is deactivated

The following actions are proposed at TA timer expiry:

1) stop RLM [1][12] / not stop RLM [5][6][8][9][11][16][17]

2) stop BFD [1][11][12] / not stop BFD [6][8][9][16][17]

The rapporteur suggests following the majority view..

**Proposal 3: While the SCG is deactivated and the UE is configured to perform RLM/BFD, the UE continues RLM after TA timer expiry.**

**Proposal 4: While the SCG is deactivated and the UE is configured to perform RLM/BFD, the UE continues BFD after TA timer expiry.**

## 2.4 RACH-less SCG activation if the UE is not configured to perform RLM/BFD while the SCG is deactivated

Some companies want that the UE can perform RACH-less SCG activation even if the UE is not configured to perform RLM/BFD ([5][16]) while other companies think it should not be the case ([4][8][11][12][13][14][20]).

The rapporteur suggests following the majority view.

**Proposal 5: If the UE is not configured to perform RLM/BFD while the SCG is deactivated, the UE always performs RACH upon receiving an SCG activation command.**

## 2.5 MCG power limitation and PDCCH blind decoding limitation while the SCG is deactivated

[11][15][16][17] propose that there is no change to RAN2 specifications for MCG power limitation and PDCCH blind decoding while the SCG is deactivated.

[7] proposes sending an LS to RAN1.

**Proposal 6: MCG power limitation and PDCCH blind decoding limitations are not affected by SCG deactivation. If needed, RAN1 can clarify their specifications.**

**Proposal 7: Discuss whether there is the need for an LS to inform RAN1.**

## 2.6 UL split bearer handling while the SCG is deactivated

[20][21][22][24][25][29][31][34][36][38][40] supports that the network ensures, by explicit signalling, that for UL split bearers, primaryPath is set to the MCG RLC entity, ul-DataSplitThreshold is set to infinity and PDCP duplication is not activated between MCG and SCG.

[32][41] proposes that PDCP duplication is not activated between MCG and SCG but to modify 38.323 to ensure that, regardless of primaryPath and ul-DataSplitThreshold, the PDCP does not submit data for UL split bearers to MCG.

The rapporteur suggests going with the majority view.

**Proposal 8: The network ensures by explicit signalling (that exists in Rel-16 already) that, while the SCG is deactivated, for each UL split bearer:**

**a) primaryPath is set to an MCG RLC entity (capture restriction in 38.331)**

**b) ul-DataSplitThreshold is set to infinity (capture restriction in 38.331)**

**c) PDCP duplication is not activated both MCG and SCG RLC entities (capture restriction in 38.321+38.331 or in 38.323)**

## 2.7 Active BWP while the SCG is deactivated

Only one company is proposing that there is no active BWP while the SCG is deactivated.

**Proposal 9: There is an active DL BWP while the SCG is deactivated.**

At SCG deactivation, there are the following proposals:

- switch to first active BWP [6][25][28][29][34][39]

- follow existing firstActiveDownlinkBWP-Id field if present, otherwise no switching, [24]

- no switching to first active BWP [30]

- keep currently active BWP [31][39][41]

- switch to a dormant BWP [26]

At SCG activation, there are the following proposals:

- switch to first active BWP [21][25][28][29][34][39]

- no switching to first active BWP [30]

The rapporteur's understanding is that:

- according to previous agreements, tci-Info can be used to switch the active DL BWP, at SCG deactivation, while the SCG is deactivated, at SCG activation

- according to previous agreements, firstActiveDownlinkBWP-Id and firstActiveUplinkBWP-Id can be reconfigured at SCG deactivation, while the SCG is activated and at SCG activation

- firstActiveDownlinkBWP-Id is mandatory for the SpCell at reconfiguration with sync, setup and resume, otherwise it is Need N

In other words, there is no "UE autonomous action" upon reception of this field, the UE simply follows what the network indicates in the received message.

Therefore, the rapporteur think the following might be agreeable to all companies.

**Proposal 10: The active DL BWP is handled as follows:**

**- at SCG deactivation:**

 **if the network includes firstActiveDownlinkBWP-Id in the SCG deactivation command, the UE switches the active DL BWP to the indicated firstActiveDownlinkBWP-Id**

**- while the SCG is deactivated:**

**- if the network includes firstActiveDownlinkBWP-Id in an RRC reconfiguration, the UE switches the active DL BWP to the indicated firstActiveDownlinkBWP-Id**

**- If configured the UE performs RLM/BFD on the active DL BWP**

**- at SCG activation:**

**- if the network includes firstActiveDownlinkBWP-Id in the SCG activation command, the UE switches the active DL BWP to the indicated firstActiveDownlinkBWP-Id**

**- bwp-Id is removed from tci-Info (since it is controlled by firstActiveDownlinkBWP-Id)**

# 3 Conclusion

Based on companies' inputs, the rapporteur proposes the following in order to close a number of open issues:

**Proposal 1: Agree UE behaviours for SCG RLF while the SCG is deactivated:**

**a) at SCG RLF, SCG MAC is reset (like in Rel-16, this will stop the TA timer)**

**b) at SCG RLF, stop RLM and BFD (not captured in Rel-16, but probably UEs do that)**

**c) resume RLM and BFD upon reconfiguration with sync**

**Proposal 2: Agree UE behaviours for PSCell beam failure while the SCG is deactivated:**

**a) at PSCell beam failure, TA timer is not stopped**

**b) at PSCell beam failure, stop BFD**

**c) resume BFD upon reconfiguration of BFD RS (RadioLinkMonitoringConfig or tci-Info)**

**Note: can shortly discuss if, instead of b) and c), to align with Rel-16, what is stopped and resumed is triggering of SCG failure information again upon RLF/beam failure.**

**Proposal 3: While the SCG is deactivated and the UE is configured to perform RLM/BFD, the UE continues RLM after TA timer expiry.**

**Proposal 4: While the SCG is deactivated and the UE is configured to perform RLM/BFD, the UE continues BFD after TA timer expiry.**

**Proposal 5: If the UE is not configured to perform RLM/BFD while the SCG is deactivated, the UE always performs RACH upon receiving an SCG activation command.**

**Proposal 6: MCG power limitation and PDCCH blind decoding limitations are not affected by SCG deactivation. If needed, RAN1 can clarify their specifications.**

**Proposal 7: Discuss whether there is the need for an LS to inform RAN1.**

**Proposal 8: The network ensures by explicit signalling (that exists in Rel-16 already) that, while the SCG is deactivated, for each UL split bearer:**

**a) primaryPath is set to an MCG RLC entity (capture restriction in 38.331)**

**b) ul-DataSplitThreshold is set to infinity (capture restriction in 38.331)**

**c) PDCP duplication is not activated both MCG and SCG RLC entities (capture restriction in 38.321+38.331 or in 38.323)**

**Proposal 9: There is an active DL BWP while the SCG is deactivated.**

**Proposal 10: The active DL BWP is handled as follows:**

**- at SCG deactivation:**

 **if the network includes firstActiveDownlinkBWP-Id in the SCG deactivation command, the UE switches the active DL BWP to the indicated firstActiveDownlinkBWP-Id**

**- while the SCG is deactivated:**

**- if the network includes firstActiveDownlinkBWP-Id in an RRC reconfiguration, the UE switches the active DL BWP to the indicated firstActiveDownlinkBWP-Id**

**- If configured the UE performs RLM/BFD on the active DL BWP**

**- at SCG activation:**

**- if the network includes firstActiveDownlinkBWP-Id in the SCG activation command, the UE switches the active DL BWP to the indicated firstActiveDownlinkBWP-Id**

**- bwp-Id is removed from tci-Info (since it is controlled by firstActiveDownlinkBWP-Id)**

# 4 References

[1] R2-2202248, How to model the PSCell in SCG deactivation?, OPPO

[2] R2-2202250, SCG deactivation indication when resuming from RRC\_INACTIVE due to MO data, OPPO

[3] R2-2202280 QoS flow remapping during SCG deactivation Fujitsu

[4] R2-2202575 Discussion on UE behavior with SCG deactivated Lenovo, Motorola Mobility

[5] R2-2202649 Discussion on UE behaviour when SCG is deactivated ZTE Corporation, Sanechips

[6] R2-2202679 Views on several issues Samsung Electronics

[7] R2-2202680 DC power sharing for deactivated SCG Samsung Electronics

[8] R2-2202705 UE behaviour while SCG is deactivated Qualcomm Incorporated

[9] R2-2202756 UE behavior while the SCG is deactivated InterDigital, Inc.

[10] R2-2202767 Deactivation of SCG LG Electronics Finland

[11] R2-2202795 Discussion on UE behaviour while SCG is deactivated vivo

[12] R2-2202919 TA timer and RLM/BFD while the SCG is deactivated MediaTek Inc.

[13] R2-2203097 Discussions on UE Behavior in Deactivated SCG CATT

[14] R2-2203176 Open Issues on UE Behavior NTT DOCOMO INC.

[15] R2-2203184 UE behaviour while SCG is deactivated Nokia, Nokia Shanghai Bell

[16] R2-2203375 Open issues on UE behaviours while the SCG is deactivated Huawei, HiSilicon

[17] R2-2203390 UE behaviour while SCG is deactivated Ericsson

[18] R2-2202247 L2 based SCG activation and SCG RRM OPPO

[19] R2-2202281 Proposal for releasing statusReportRequired for SCG bearers at SCG deactivation Fujitsu

[20] R2-2202282 Remaining issues on UL data arrival for SCG Fujitsu

[21] R2-2202351 Futher discussion on actions at SCG activation or deactivation Transsion Holdings

[22] R2-2202413 Discussion on activation and deactivation of SCG Spreadtrum Communications

[23] R2-2202576 MAC related issues upon SCG activation and deactivation Lenovo, Motorola Mobility

[24] R2-2202650 Activation of deactivated SCG ZTE Corporation, Sanechips

[25] R2-2202701 Actions at SCG activation and deactivation Qualcomm Incorporated

[26] R2-2202757 Deactivation of SCG InterDigital, Inc.

[27] R2-2202758 Activation of SCG InterDigital, Inc.

[28] R2-2202796 Discussion on actions at SCG activation and deactivation vivo

[29] R2-2202809 Remaining issues on SCG deactivation NEC

[30] R2-2203039 Remaining issues for MAC procedure in deactivated SCG SHARP Corporation

[31] R2-2203061 split bearer handling upon SCG deactivation Sharp

[32] R2-2203087 Open issues on SCG deactivation DENSO CORPORATION

[33] R2-2203092 Discussion on partial MAC reset upon SCG deactivation LG Electronics Inc.

[34] R2-2203098 Remaining Issues on Actions at SCG Activation and Deactivation CATT

[35] R2-2203099 Discussion on RRC Aspects of SCG Deactivation CATT

[36] R2-2203166 Discussion on data transmission to MN for split bearer LG Electronics Inc.

[37] R2-2203177 Open Issues on SCG Activation and Deactivation NTT DOCOMO INC.

[38] R2-2203185 UL data handling at SCG deactivation Nokia, Nokia Shanghai Bell

[39] R2-2203186 Actions at SCG activation and deactivation Nokia, Nokia Shanghai Bell

[40] R2-2203391 Actions at SCG activation and deactivation Ericsson

[41] R2-2203376 Handling of uplink split bearers and BWP when the SCG deactivated Huawei, HiSilicon