3GPP TSG-RAN WG2 Meeting #116 electronic R2-210xxxx

Online, November 1-12, 2021

Agenda Item: 8.24.2 RAN1 Led Items

Source: Ericsson

Title: Summary of [AT116-e][026][NR17] DSS (Ericsson)

Document for: Discussion, Decision

# 1 Introduction

This contribution summarizes the following discussion:

**DSS**

Offline first, then online

* [AT116-e][026][NR17] DSS (Ericsson)

Scope: Treat R2-2109332, R2-2110731, R2-2110729, R2-2109953, R2-2111025, R2-2110507, R2-21000730.

Collect a round of comments, Identify potentially easy agreements, identify discussion points for online.

Intended outcome: Report

Deadline: Monday W1 (online)

R2-2109332 LS on Cross-carrier scheduling from SCell to P(S)Cell (R1-2108662; contact: Ericsson) RAN1 LS in Rel-17 NR\_DSS To:RAN2

R2-2110731 RAN2 impact in DSS WI Ericsson discussion NR\_DSS

R2-2110729 stage2 38.300 running CR for DSS Ericsson draftCR Rel-17 38.300 16.7.0 NR\_DSS

R2-2109953 Cross-carrier scheduling from SCell to P(S)Cell Nokia (Rapporteur) draftCR Rel-17 38.300 16.7.0 B NR\_DSS

R2-2111025 Considerations on cross-carrier scheduling from SCell to P(S)Cell Huawei, HiSilicon discussion Rel-17 NR\_DSS-Core

R2-2110507 Discussion on Cross-Carrier Scheduling from sSCell to P(S)Cell vivo discussion Rel-17 NR\_DSS

R2-2110730 RRC running CR for DSS Ericsson draftCR Rel-16 38.331 16.6.0 NR\_DSS

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# 2 Discussion

## 2.1 Stage 2 CR: 38.300

R2-2109332 LS on Cross-carrier scheduling from SCell to P(S)Cell (R1-2108662; contact: Ericsson) RAN1 LS in Rel-17 NR\_DSS To:RAN2

R2-2110729 stage2 38.300 running CR for DSS Ericsson draftCR Rel-17 38.300 16.7.0 NR\_DSS

R2-2109953 Cross-carrier scheduling from SCell to P(S)Cell Nokia (Rapporteur) draftCR Rel-17 38.300 16.7.0 NR\_DSS

In the LS, R2-2109332, RAN1 sends an endorsed text proposal for TS 38.300 and requests RAN2 to consider in the future work. Two draft CRs are submitted in this meeting. The draft CR R2-2110729 captures exactly the endorsed TP in RAN1, while the draft CR R2-2109953 from the spec TS 38300 rapporteur includes further editorial changes.

**Q1a. Do companies agree the additional editorial changes proposed in the draft CR R2-2109953?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or No ?** | **Comments** |
| Huawei, HiSilicon | Not strong view | It seems okay with the editorial changes. |
| vivo | No | It seems R2-2109953 misses the original text line:  ‘- When an SCell is configured with a PDCCH, that cell's PDSCH and PUSCH are always scheduled by the PDCCH on this SCell;‘  However, the original meaning of ‘that cell‘ refers to an SCell. Since the case sSCell scheduling P(S)Cell has been captured in R2-2109953, the missed line can be revised as:  ‘- When an SCell is configured with a PDCCH **scheduling another SCell**, that cell's PDSCH and PUSCH are always scheduled by the PDCCH on this SCell;‘ |
| Qualcomm Incorporated | Yes | We are not sure about Vivo’s proposal, and how it relates to this discussion. We believe the existing requirement for SCell remains regardless of whether the SCell is configured for cross-scheduling another SCell. |
| Ericsson | Yes | The editorial changes are okay. We can add back the text „When an SCell is configured with a PDCCH, that cell's PDSCH and PUSCH are always scheduled by the PDCCH on this SCell;“.  It is our view that RAN1 has carefully checked the meaning of the text. The revision by vivo has changed the meaning of the stage 2 text, since it now can be understood (implictly) that when an SCell is configured with a PDCCH scheduling PCell, the SCell’s PDSCH and PUSCH can be scheduled by another SCell. |
| Samsung | Yes | No strong view, the editorial change is also fine. |
| LG | Yes but | The following sentence seems to be mistakenly removed. We are ok with 9953 with addition of this existing text for the SCell configured with a PDCCH:  - When an SCell is configured with a PDCCH, that cell's PDSCH and PUSCH are always scheduled by the PDCCH on this SCell;  We are not sure why further modification, i.e., suggested by vivo above, should be considered because PDSCH/PUSCH of the SCell configured with a PDCCH is always scheduled by the PDCCH on this SCell regardless of whether that SCell is scheduling another SCell/PCell. |
| ZTE | Yes | We are fine with the editorial change with the addition of the wrongly removed text. |
| Nokia | Yes | The rapporteur would like to apologize for removing one of the existing statement i.e. “*When an SCell is configured with a PDCCH, that cell's PDSCH and PUSCH are always scheduled by the PDCCH on this SCell;*” – other than that, we think the editorial changes to the RAN1 text enhance the readability. |
| Apple | Yes but | We are fine with the editorial changes assuming following text will be re-added: “When an SCell is configured with a PDCCH, that cell's PDSCH and PUSCH are always scheduled by the PDCCH on this SCell”. As for the revision proposed by vivo we believe the modification slightly changes the meaning, so we’d tend to keep the original sentence. |
|  |  |  |

If RAN2 agrees the additional editorial changes, the email discussion rapporteur understands that RAN2 would merge the two draft CRs and endorse the merged version.

The below is to ask if there are further question/comments not covered by the above two draft CRs.

**Q1b. Companies can add further comments, if any, in the below.**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei, HiSilicon | Regardless which version should be adopted, we would like to point out coordination is anyhow needed on the running CR assignment (from this meeting) ☹. |
| vivo | Agree with Huawei. |
|  |  |

## 2.2 RRC running CR

R2-2109332 LS on Cross-carrier scheduling from SCell to P(S)Cell (R1-2108662; contact: Ericsson) RAN1 LS in Rel-17 NR\_DSS To:RAN2

R2-2111025 Considerations on cross-carrier scheduling from SCell to P(S)Cell Huawei, HiSilicon discussion Rel-17 NR\_DSS-Core

R2-2110507 Discussion on Cross-Carrier Scheduling from sSCell to P(S)Cell vivo discussion Rel-17 NR\_DSS

R2-2110730 RRC running CR for DSS Ericsson draftCR Rel-16 38.331 16.6.0 NR\_DSS

The RRC parameter list for DSS can be found in the below tdoc:

R2-2111246 LS on Re-17 LTE and NR higher-layers parameter list (R1-2110575; contact: Ericsson) RAN1 LS in Rel-17 To:RAN2, RAN3 Cc:RAN4

At the moment, there is only one stable RRC parameter for the DSS WI related with the IE *CrossCarrierSchedulingConfig*, see Annex 4. Two approaches have been proposed to capture the RRC parameter and the RAN1 agreements in this IE. The question is how to capture that the PCell/PSCell can be both a scheduled cell and a self-scheduling cell, which is not supported in the Rel-16.

**Alt 1: update the field description.**

The draft CR R2-2110730 adopts the approach of updating the field description and indicates by bubble comments in the draft CR on how the RAN1 agreements in the parameter list are captured.

R2-2110507 supports this alternative. It states that it is not finalized yet whether the CIF field is always present in the DCI transmitted on P(S)Cell, if a SCell is configured to cross-carrier schedule the P(S)Cell. In case CIF is always present in the DCI, this alternative (called option 1 in the paper) can be adopted.

The TP is copied below.

CrossCarrierSchedulingConfig ::= SEQUENCE {

schedulingCellInfo CHOICE {

own SEQUENCE { -- Cross carrier scheduling: scheduling cell

cif-Presence BOOLEAN

},

other SEQUENCE { -- Cross carrier scheduling: scheduled cell

schedulingCellId ServCellIndex,

cif-InSchedulingCell INTEGER (1..7)

}

},

|  |
| --- |
| ***other***  Parameters for cross-carrier scheduling. If configured for an SpCell, the SpCell can be scheduled by a PDCCH on another SCell in addition to the SpCell. If configured for an SCell, the SCell is scheduled by a PDDCH on another cell. |
| ***own***  Parameters for self-scheduling, i.e., a serving cell is scheduled by its own PDCCH. |
| ***schedulingCellId***  If configured for a SpCell, this field indicates which SCell, in addition to the SpCell, signals the downlink allocations and uplink grants, if applicable, for the concerned SpCell. If configured for a Scell, this field indicates which cell signals the downlink allocations and uplink grants, if applicable, for the concerned SCell. In case the UE is configured with DC, the scheduling cell is part of the same cell group (i.e. MCG or SCG) as the scheduled cell. In case the UE is configured with two PUCCH groups, the scheduling cell and the scheduled cell are within the same PUCCH group. If *drx-ConfigSecondaryGroup* is configured in the *MAC-CellGroupConfig* associated with this serving cell, the scheduling cell and the scheduled cell belong to the same Frequency Range. In addition, the serving cell with an aperiodic CSI trigger and the PUSCH resource scheduled for the report are on the same carrier and serving cell, but the cell for which CSI is reported may belong to the same or a different Frequency Range. The network should not trigger a CSI request for a serving cell in the other Frequency Range when that serving cell is outside Active Time. |

**Q2a. Do companies agree that the draft CR in R2-2110730 have correctly implemented the RRC parameter from RAN1? If not, pleased add detailed comments.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or No?** | **Comments** |
| Huawei, HiSilicon |  | Thanks our WI rapporteur to provide the RRC running CR.  As mentioned above, in case CIF is always present in the DCI even in case of P(S)Cell self-scheduling, this option would work. We don’t have a strong view right now, but tend to prefer Option 2 for better self-explanationary from the ASN.1. We understand in any case, the P(S)Cell should be configured with “other” IE, which would be a bit strange for P(S)Cell self-scheduling when sSCell is “deactivated”. Another possiblity would be we can wait for RAN1 to ensure Option 1 is safe (considering low interest from RAN2 contributions), as anyways RAN1 will update the L1 parameters after this meeting, which is to be included in RRC CR. |
| vivo | Yes | We are fine with the wordings in the editorial changes. |
| Qualcomm Incorporated | Yes | This can work. But in general, we prefer introducing new field, as opposed to tweaking the existing fieds, to clearly differentiate the release-17 feature from release-15/16 feature. |
| Ericsson | Yes | @Qualcomm. In Rel-15/16, the field *other* cannot be configured for P(S)Cell. In Rel-17, the draft RRC CR allows this configuration and explain what it means in the field description.  Adding another field would be possible but, given the existing RAN1 agreements, it is essentially the same content as in the field "*other“*. The field *schedulingCellInfo* is mandatory present and so the network must transmit this and additionally explain in the field description that the UE shall ignore. This seems like introducing unnecessary RRC signalling overhead for the only(?) benefit that implementation team can understand what is new in Rel-17, which they would do anyways separately. |
| Samsung | Yes |  |
| LG | Yes |  |
| ZTE | Yes |  |
| Nokia | Yes |  |
| Apple | Yes |  |
|  |  |  |

**Alt 2: add a third choice of “*own and other*”**

This is proposed in R2-2111025 and denoted as the Option 2 in R2-2110507. The proposal is to add a third choice of “own and other” in the field *schedulingCellInfo*.

R2-2111025 states that adding the third choice of “own and other” so that cif-Presence, schedulingCellId and cif-InSchedulingCell can be all available for this choice and the compatibility impact to legacy scheduling can be hence minimized. In this case, the CIF value for P(S)Cell self-scheduling can be set to “0” and explicitly configured by RRC.

R2-2110507 states that it is not finalized yet whether the CIF field is always present in the DCI transmitted on P(S)Cell, if a SCell is configured to cross-carrier schedule the P(S)Cell. In case CIF is NOT always present in the DCI, this alternative (called option 2 in the paper) can be adopted. The TP of the option 2 is copied below:

[[

schedulingCellInfo-r17 SEQUENCE {

own SEQUENCE { -- Cross carrier scheduling: scheduling cell

cif-Presence BOOLEAN

},

other SEQUENCE { -- Cross carrier scheduling: scheduled cell

schedulingCellId ServCellIndex,

cif-InSchedulingCell INTEGER (1..7)

}

}

]]

***schedulingCellInfo, schedulingCellInfo-r17***

The field is used to indicate how the concerned cell is scheduled and the parameters for scheduling. For *schedulingCellInfo*, the CHOICE conveys that the concerned cell is either scheduled by its own PDCCH or scheduled by a PDCCH on another (scheduling) cell. For *schedulingCellInfo-r17*, the network configures this field only for P(S)Cell, which indicate that the P(S)Cell can be scheduled by its own PDCCH and scheduled by a PDCCH on sSCell. The network configures only one of the fields.

**Q2b. Do companies agree that the TP for option 2 in the R2-2110507 have correctly implemented the RRC parameter from RAN1? If not, please add detailed comments.**

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| --- | --- | --- |
| **Company** | **Yes or No?** | **Comments** |
| Huawei, HiSilicon | Yes | As comments to Q2a, this option seems work and safe.  Another possiblity would be we can wait for RAN1. |
| vivo | Yes | The TP is clear to capture the agreements so far. |
| Qualcomm Incorporated | Yes |  |
| Ericsson | No | The above structure allows the network to indicate a value of *cif-Presenece* for the P(S)Cell. This means that for sSCell scheduling P(S)Cell, it is configurable by the network on if CIF is present or not in P(S)Cell. This configurability is NOT in the RAN1 RRC paramter list and agreements. Note that, it is also indicated that in the RRC parameter list that this parameter is stable.  More importantly, this option seems to be conditioned on that the below RAN1 working assumption is reverted and additionally, RAN1 would agree that the presence of CIF is configurable. It is our view that RAN2 shoud work on what has been agreed in RAN1. Please see details in the RAN1 email discussion summary R1-2110557.  **Working Assumption**   * When CIF for sSCell to PCell cross-carrier scheduling is configured, non-fallback DCI formats on P(S)Cell include same number of CIF bits as the corresponding non-fallback DCI formats on sSCell that are used for sSCell to P(S)Cell scheduling |
| Samsung | Wait for RAN1 | We are not sure the intended operation so it would be better to ask this functionality to RAN1. |
| LG | Yes | As rapporteur already mentioned, this options is correct only when the presence of CIF is configurable. |
| ZTE | Wait for RAN1 | We are not sure whether the presence of CIF is configurable, so it would be better to ask RAN1. |
| Nokia | Wait for RAN1 | The other alternative seems clearer, so best to wait for RAN1 feedback. |
| Apple | Wait for RAN1 | The TP is good and allows for easy distinction with Rel-16, but this addition may only be needed if RAN1 decides that CIF in the DCI does not always exist for sSCell scheduling P(S)Cell. Hence, we suggest to wait for RAN1. |
|  |  |  |

**Other:**

The below is to ask if there are further question/comment not covered by the above.

**Q2c. Companies can add further comments, if any, in the below.**

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| --- | --- |
| **Company** | **Comments** |
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## 2.3 Other RAN2 Impacts

R2-2111025 Considerations on cross-carrier scheduling from SCell to P(S)Cell Huawei, HiSilicon discussion Rel-17 NR\_DSS-Core

R2-2110507 Discussion on Cross-Carrier Scheduling from sSCell to P(S)Cell vivo discussion Rel-17 NR\_DSS

R2-2110731 RAN2 impact in DSS WI Ericsson discussion NR\_DSS

In what follows, the SCell configured with cross-carrier scheduling to SpCell (i.e., P(S)Cell) is referred to as ‘sSCell’, the same as in the RAN1 discussions. The term “CCS” is short for “cross carrier scheduling”.

**sSCell RLM/RLF:**

This is discussed in the below three papers:

* In R2-2111025, USS sets can be configured on both P(S)Cell and sSCell for PDCCH monitoring and whether to support simultaneous monitoring depends on the UE Type A or Type B, but it is not ruled out that a network implementation may have only the non-fallback DCI scheduling P(S)Cell transmitted on the sSCell. Thus, the radio link quality of the sSCell would be critical to the scheduling performance of P(S)Cell, and whether any optimization to the RLM on sSCell needs further discussions. However, a sensible network implementation is to always configure PDCCH monitoring at least for some DCIs on P(S)Cell and thus it can still count on RLM on P(S)Cell.
* R2-2110507 indicates that even though this is important, it can be left for RAN1 to discuss.
* R2-2110731 argues that the P(S)Cell is still self-schedulable and so the impact is not clear.

It is email discussion rapporteur’s understanding that none of the papers propose any enhancements. On the other hand, it is not clear either, if RAN1 would in the future agree some enhancements that might have RAN2 impacts. Thus, the email discussion rapporteur proposes not to initialize discussion on RLM/RLF at least from RAN2.

**Q3a. Do companies agree that RLM improvement for the sSCell (if any) is left for RAN1? Companies are invited to provide further inputs in the comment’s column.**

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| --- | --- | --- |
| **Company** | **Yes or No?** | **Comments** |
| Huawei, HiSilicon | Yes | We would like to minimize RAN2 spec for RLM.  We are just not sure if RAN1 is fully aware of potential RAN2 impact for this aspect as it is also relevant to RLF which will inevitably incur much RAN2 discussions. |
| vivo | Yes | We can wait for further RAN1 input on this topic and see if any RAN2 work is needed. |
| Qualcomm Incorporated | Yes | Nothing actionable from RAN2 at this stage. |
| Ericsson | Yes |  |
| Samsung | Yes |  |
| LG | Yes |  |
| ZTE | Yes |  |
| Nokia | Yes | Fallback to self-scheduling PDCCH can probably be taken care of by RAN1. If RAN2 involvement is required, they will let us know. |
| Apple | Yes | Whether or not to introduce RLM on sSCell is an important aspect to monitor going forward. Agree with Huawei. |
|  |  |  |

**BFR:**

This is discussed in the below three papers:

* In R2-2111025, the UE is allowed to detect the beam failure indication from physical layer and initiate RA for PCell BFR and BFR MAC CE for Scell BFR. For Pcell BFR, the UE is configured to monitor *recoverySearchSpaceId* for receiving the response and consider the BFR procedure completed, while for Scell BFR, the UE is expected to receive an uplink grant for the HARQ process used for transmission of the BFR MAC CE to consider the BFR procedure completed. Regarding the BFR of sSCell, it is necessary to consider which procedure is applied to recover the BFR detected on sSCell, there are proposals to move BFR SS from P(S)Cell to sSCell given that most USSs can be only configured on sSCell, but this needs RAN1’s inputs. The paper prefers to minimize the MAC impact, i.e., Scell BFR can be reused for sSCell and RA BFR can be reused for P(S)Cell as well.
* In R2-2110507, UE following Rel-16 sends one Scell BFR SR when it finds that one or more Scells are suffering from poor beam quality. When the gNB receives the SR, it only knows that there are some Scells having beam failure problems but does not know how many Scells and which Scells are experiencing BF until a MAC CE with information of these cells is received afterwards. The paper propose to further discuss the need to distinguish sSCell beam failure and normal Scell beam failure.
* R2-2110731 argues that the Scell BFR MAC CE can be transmitted on the P(S)Cell which is still self-schedulable and so the need for a new BFR procedure is not clear.

Since there are more companies to propose to follow the legacy BFR procedure and there is no concrete proposal on any enhancement, the email discussion rapporteur propose to adopt the legacy BFR as a baseline.

**Q3b. Do companies agree that “For P(S)Cell configured with CCS by a Scell, RAN2 considers that the legacy BFR procedure on the P(S)Cell and that Scell applies, as a baseline”? Companies are invited to provide further inputs in the comment’s column.**

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| --- | --- | --- |
| **Company** | **Yes or No?** | **Comments** |
| Huawei, HiSilicon | Yes | Proponent.  According to the past BFR discussions, either RAN1 or RAN2 can initiate the discussion as it is overlapping territory. Not sure if RAN1 will touch this issue in the end (but very likely…). If not, we think this baseline is useful. |
| Vivo | No strong view | We are OK to wait and see how RAN1 goes with this topic. |
| Qualcomm Incorporated | No | Nothing actionable from RAN2 at this stage. |
| Ericsson | Yes |  |
| Samsung | No strong view |  |
| LG | Yes |  |
| ZTE | No strong view |  |
| Nokia | No | Agree with Qualcomm |
| Apple | No | This topic needs further input from RAN1, we think it is too early to conclude on a baseline. |
|  |  |  |

**sSCell deactivation/dormancy:**

This is discussed in the below two papers:

* In R2-2111025, a SCell can be deactivated either by a configured sCellDeactivationTimer or SCell Activation/Deactivation MAC CE. When it comes to the sSCell, how to handle the deactivated/dormant sSCell and the corresponding PCell in MAC needs further discussions in RAN2, based on further RAN1 progress. For instance, in order to avoid the scheduling performance degradation, any fallback mechanism for a replacement or PDCCH monitoring “switching” to the P(S)Cell when sSCell is deactivated or dormant is still discussion in RAN1.
* R2-2110731 also mentions that the RAN1 is discussing a mechanism to support monitoring of additional PDCCH monitoring candidates/DCI formats on the P(S)Cell when sSCell is de-activated. Additionally, the paper argues even though such a mechanism may not be introduced, a reasonable network implementation would ensure the sSCell is not de-activated and so there won’t be any impacts from sSCell de-activation.

It is email discussion rapporteur’s understanding that the impact due to sSCell de-activation/dormancy is still under discussion in RAN1. As there is one proposal to wait for RAN1 inputs, email discussion rapporteur proposes to wait for further RAN1 inputs to avoid unnecessary discussions in RAN2.

**Q3c. Do companies agree that “RAN2 considers the discussion on sSCell deactivation and dormancy can be pending for RAN1 inputs”? Companies are invited to provide further inputs in the comment’s column.**

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| --- | --- | --- |
| **Company** | **Yes or No?** | **Comments** |
| Huawei, HiSilicon | Yes |  |
| vivo | Yes |  |
| Qualcomm Incorporated | Yes |  |
| Ericsson | Yes |  |
| Samsung | Yes |  |
| LG | Yes but | We can wait, but from RAN2 perspective, there seems to be no reason to create the complicated scenarios with no clear value. Similar to PUCCH SCell, the simpliest and reasonable approach would be not to configured sCellDeactivationTimer for the sSCell to keep this sSCell activated unless the network deactivates this sSCell intentionally. |
| ZTE | Yes |  |
| Nokia | Yes |  |
| Apple | Yes |  |
|  |  |  |

**Other:**

The below is to ask if there are further question/comment not covered by the above.

**Q3d. Companies can add further comments, if any, in the below.**

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| --- | --- |
| **Company** | **Comments** |
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# 3 Conclusion

TBD

# 4 Annex, RAN1 RRC parameter

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| --- | --- | --- | --- | --- | --- | --- |
| **Sub-feature group** | **Parameter name in the spec** | **New or existing?** | **Description** | **Per (UE, cell, TRP, …)** | **Comment** | **Status** |
| CCS from Scell to Pcell) | CrossCarrierSchedulingConfig | Existing | Update the specification of CrossCarrierSchedulingConfig to enable support for SCell to P(S)Cell cross-carrier scheduling.   When UE is configured with cross-carrier scheduling from a SCell (sSCell) to P(S)Cell, the P(S)Cell will have two scheduling cells a) P(S)Cell itself and b) one SCell (sSCell) that is used for cross-carrier scheduling to P(S)Cell. Also, cross-carrier scheduling from P(S)Cell to any other SCell is not allowed. | in CrossCarrierSchedulingConfig | Relevant RAN1 Agreements  Agreements: •Following scheduling combinations are allowed/not allowed when cross-carrier scheduling from an SCell to PCell/PSCell is configured a.self-scheduling on PCell/PSCell is allowed b.cross-carrier scheduling from PCell/PSCell to another SCell is not allowed c.self-scheduling on the ‘SCell used for scheduling PCell/PSCell’ is allowed d.cross-carrier scheduling from the ‘SCell used for scheduling PCell/PSCell’ to another serving cell is allowed e.cross-carrier scheduling from another serving cell to the ‘SCell used for scheduling PCell/PSCell’ is not allowed •FFS: Search space and DCI format handling for the allowed cases above   Agreements: •Configuring 2 or more Scells to schedule the PCell/PSCell is not allowed  Agreement •When CCS from sSCell to PCell/PSCell is configured oCIF=0 used for sSCell self-scheduling, and CIF for sSCell to PCell cross-carrier scheduling is explicitly configured using RRC signalling | Stable |