**3GPP TSG RAN WG1#116bis R1-24xxxxx**

**Changsha, China, April 15th – 29th, 2024**

Source: Moderator (Nokia)

Title: [116bis-Pre-R18-NR] Summary on SCell A-CSI reporting UE capabilities

Agenda Item: 7

Release: Release 15, Release 16, Release 17

WI code: NR\_newRAT-Core, LTE\_NR\_DC\_CA\_enh-Core, NR\_DSS-Core

Document for: Discussion and Decision

# Introduction

A contribution [1] submitted to the RAN1#116bis raised questions on the needed UE capabilities for a number of different A-CSI reporting cases with DL carrier aggregation.

|  |  |
| --- | --- |
| A diagram of a curve  Description automatically generated  **Case 1a (same SCS):**   * PUSCH carrying A-CSI report is self-scheduled * A-CSI-RS is cross-carrier triggered | A diagram of a normal curve  Description automatically generated with medium confidence  **Case 1b/1c (same SCS):**   * PUSCH carrying A-CSI report is self-scheduled * **1b:** A-CSI report is derived from P-CSI-RS * **1c:** A-CSI report is derived from SP-CSI-RS |
| A graph with a blue line  Description automatically generated  **Case 2a (same SCS):**   * PUSCH carrying A-CSI report is cross-cc-scheduled * A-CSI-RS is same-carrier triggered | **Case 2b/2c (same SCS):**   * PUSCH carrying A-CSI report is cross-cc-scheduled * **2b:** A-CSI report is derived from P-CSI-RS * **2c:** A-CSI report is derived from SP-CSI-RS |
| A diagram of a line  Description automatically generated with medium confidence  **Case 3a (different SCS):**   * PUSCH carrying A-CSI report is self-scheduled * A-CSI-RS is cross-carrier triggered | **Case 3b/3c:**   * PUSCH carrying A-CSI report is self-scheduled * **3b:** A-CSI report is derived from P-CSI-RS * **3c:** A-CSI report is derived from SP-CSI-RS |
| A graph with a blue line  Description automatically generated  **Case 4a (different SCS):**   * PUSCH carrying A-CSI report is cross-cc-scheduled * A-CSI-RS is same-carrier triggered | A graph with a line  Description automatically generated  **Case 4b/4c (different SCS):**   * PUSCH carrying A-CSI report is cross-cc-scheduled * **4b:** A-CSI report is derived from P-CSI-RS * **4c:** A-CSI report is derived from SP-CSI-RS |

The following proposals were made:

**Proposal 1: RAN1 to conclude the following:**

**For the case where an SCell A-CSI report is**

* **Triggered by a DCI on PCell, and**
* **The A-CSI report is transmitted on a PUSCH on the PCell**

**the following optional UE capabilities are needed for the following cases:**

|  |  |  |
| --- | --- | --- |
| **SCell CSI-RS** | **PCell/SCell SCS** | **Optional UE capabilities needed** |
| A-CSI-RS | Same | None (mandatory features only) |
| P-CSI-RS | Same | None (mandatory features only) |
| SP-CSI-RS | Same | UE support of SP-CSI-RS configuration |
| A-CSI-RS | Different | *crossCarrierA-CSI-trigDiffSCS* |
| P-CSI-RS | Different | None (mandatory features only) |
| SP-CSI-RS | Different | UE support of SP-CSI-RS configuration |

**Proposal 2: RAN1 to conclude the following:**

**For the case where a an SCell A-CSI report is**

* **Triggered by a DCI on SCell, and**
* **The A-CSI report is transmitted on a PUSCH on the PCell**

**the following optional UE capabilities are needed for the following cases:**

|  |  |  |
| --- | --- | --- |
| **SCell CSI-RS** | **PCell/SCell SCS** | **Optional UE capabilities needed** |
| A-CSI-RS | Same | *crossCarrierSchedulingSCell-SpCellTypeA*, or *crossCarrierSchedulingSCell-SpCellTypeB* |
| A-CSI-RS | Same |
| SP-CSI-RS | Same | One of the above and support for SP-CSI-RS configuration |
| A-CSI-RS | Different | *crossCarrierSchedulingSCell-SpCellTypeA*, or *crossCarrierSchedulingSCell-SpCellTypeB* |
| P-CSI-RS | Different |
| SP-CSI-RS | Different | One of the above and support for SP-CSI-RS configuration |

# References

1. R1-2403312 Ambiguities in SCell A-CSI reporting UE capabilities Nokia

# Discussion

**Question 1:** Do you have a concern with the following interpretation of the needed UE capabilities for the case where the triggering DCI and the PUSCH with the A-CSI report are both on the PCell:

|  |  |  |
| --- | --- | --- |
| **SCell CSI-RS** | **PCell/SCell SCS** | **Optional UE capabilities needed** |
| A-CSI-RS | Same | None (mandatory features only) |
| P-CSI-RS | Same | None (mandatory features only) |
| SP-CSI-RS | Same | UE support of SP-CSI-RS configuration |
| A-CSI-RS | Different | *crossCarrierA-CSI-trigDiffSCS* |
| P-CSI-RS | Different | None (mandatory features only) |
| SP-CSI-RS | Different | UE support of SP-CSI-RS configuration |

Please provide your comment on the question to the table below

|  |  |
| --- | --- |
| Company | Comments |
| Apple | Our comments are in Red   |  |  |  | | --- | --- | --- | | **SCell CSI-RS** | **PCell/SCell SCS** | **Optional UE capabilities needed** | | A-CSI-RS | Same | None (mandatory features only)  Agree | | P-CSI-RS | Same | None (mandatory features only)  Agree | | SP-CSI-RS | Same | UE support of SP-CSI-RS configuration  sp-CSI-RS, sp-CSI-IM | | A-CSI-RS | Different | crossCarrierA-CSI-trigDiffSCS  Agree | | P-CSI-RS | Different | None (mandatory features only)  Agree | | SP-CSI-RS | Different | UE support of SP-CSI-RS configuration  sp-CSI-RS, sp-CSI-IM | |
| Nokia | Thanks Apple for the comments, fully agree with the additional clarification.  In our view the critical question is that all companies are aligned that no other UE capabilities are needed for the abovementioned cases than indicated in the table. |
| **CLOSED** | |

**Question 2:** Do you have a concern with the following interpretation of the needed UE capabilities for the case where the triggering DCI is on the SCell and the PUSCH with the A-CSI report is on the PCell:

|  |  |  |
| --- | --- | --- |
| **SCell CSI-RS** | **PCell/SCell SCS** | **Optional UE capabilities needed** |
| A-CSI-RS | Same | *crossCarrierSchedulingSCell-SpCellTypeA*, or *crossCarrierSchedulingSCell-SpCellTypeB* |
| ~~A~~P-CSI-RS | Same |
| SP-CSI-RS | Same | One of the above and support for SP-CSI-RS configuration |
| A-CSI-RS | Different | *crossCarrierSchedulingSCell-SpCellTypeA*, or *crossCarrierSchedulingSCell-SpCellTypeB* |
| P-CSI-RS | Different |
| SP-CSI-RS | Different | One of the above and support for SP-CSI-RS configuration |

Please provide your comment on the question to the table below

|  |  |
| --- | --- |
| Company | Comments |
| Apple | Our comments are in Red  First, we need to clarify that this is the case where CSI-RS and DCI are on the same SCell and have the same SCS, specification also allows the CSI-RS to be on PCell or a different SCell   |  |  |  | | --- | --- | --- | | **SCell CSI-RS** | **PCell/SCell SCS** | **Optional UE capabilities needed** | | A-CSI-RS | Same | crossCarrierSchedulingSCell-SpCellTypeA, or crossCarrierSchedulingSCell-SpCellTypeB  Agree | | ~~A~~P-CSI-RS | Same | | SP-CSI-RS | Same | One of the above and support for SP-CSI-RS configuration  sp-CSI-RS, sp-CSI-IM | | A-CSI-RS | Different | crossCarrierSchedulingSCell-SpCellTypeA, or crossCarrierSchedulingSCell-SpCellTypeB  and crossCarrierSchedulingUL-DiffSCS-r16 | | P-CSI-RS | Different | | SP-CSI-RS | Different | One of the above and support for SP-CSI-RS configuration  and crossCarrierSchedulingUL-DiffSCS-r16, sp-CSI-RS, sp-CSI-IM | |
| Nokia | Thanks Apple for the comments and the correction to the table. We agree that for the last three cases, also the different SCS cross-carrier scheduling capability is needed. |
| **CLOSED** | |

**Question 3:** Would you be able to agree to one of the two RAN1 conclusion:

**Alt 1:** [The two conclusion proposals of R1-2403312]

**Alt 2: No concerns were seen with the interpretation of UE capabilities for the indicates A-CSI reporting cases of R1-2403312**

Please provide your comment on the question to the table below

|  |  |
| --- | --- |
| Company | Comments |
| Apple | We are fine to draw conclusion for both cases |
| Nokia | Would support a RAN1 conclusion along the lines of the original proposal with the corrections from Apple. |
| **CLOSED** | |

## Discussion summary and moderator proposal (Tuesday)

The discussion did not draw a lot of comments, which could be interpreted to mean that companies do not have many concerns.

**Moderator Proposal 1: Record RAN1 conclusions as proposed in R1-2403312 with revisions as below:**

**For the case where an SCell A-CSI report is**

* **Triggered by a DCI on PCell, and**
* **The A-CSI report is transmitted on a PUSCH on the PCell**

**the following optional UE capabilities are needed for the following cases:**

|  |  |  |
| --- | --- | --- |
| **SCell CSI-RS** | **PCell/SCell SCS** | **Optional UE capabilities needed** |
| A-CSI-RS | Same | None (mandatory features only) |
| P-CSI-RS | Same | None (mandatory features only) |
| SP-CSI-RS | Same | UE support of SP-CSI-RS/SP-CSI-IM configuration |
| A-CSI-RS | Different | *crossCarrierA-CSI-trigDiffSCS* |
| P-CSI-RS | Different | None (mandatory features only) |
| SP-CSI-RS | Different | UE support of SP-CSI-RS/SP-CSI-IM configuration |

**For the case where ~~a~~ an SCell A/SP-CSI report is**

* **Triggered by a DCI on the same SCell where the CSI-RS is transmitted, and**
* **The A-CSI report is transmitted on a PUSCH on the PCell**

**the following optional UE capabilities are needed for the following cases:**

|  |  |  |
| --- | --- | --- |
| **SCell CSI-RS** | **PCell/SCell SCS** | **Optional UE capabilities needed** |
| A-CSI-RS | Same | *crossCarrierSchedulingSCell-SpCellTypeA*, or *crossCarrierSchedulingSCell-SpCellTypeB* |
| ~~A~~P-CSI-RS | Same |
| SP-CSI-RS | Same | One of the above and support for SP-CSI-RS/SP-CSI-IM configuration |
| A-CSI-RS | Different | *crossCarrierSchedulingSCell-SpCellTypeA*, or *crossCarrierSchedulingSCell-SpCellType*,and  *crossCarrierSchedulingUL-DiffSCS-r16* |
| P-CSI-RS | Different |
| SP-CSI-RS | Different | One ~~of the above~~ *crossCarrierSchedulingSCell-SpCellTypeA*, or *crossCarrierSchedulingSCell-SpCellType*,  and *crossCarrierSchedulingUL-DiffSCS-r16*,  and support for SP-CSI-RS/SP-CSI-IM configuration |