**3GPP TSG-RAN WG4 Meeting #95-e *R4-2008999***

**Online, 25th May – 05th June, 2020**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
|  |
|  | **38.133** | **CR** | **0808** | **rev** | **1** | **Current version:** | **16.3.0** |  |
|  |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network |  |

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| --- |
|  |
| ***Title:***  | CR on interruption requirements for FR2 inter-band CA |
|  |  |
| ***Source to WG:*** | Huawei, HiSilicon  |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_RRM\_Enh-Core |  | ***Date:*** | 2020-05-15 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-16 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)Rel-12 (Release 12)**Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)* |
|  |  |
| ***Reason for change:*** | In Rel-16, the interruption requirements for FR2 inter-band CA need to be clarified for independent beam management. |
|  |  |
| ***Summary of change:*** | 1. To define the interruption requirements due to FR2 inter-band SCell addition/release for independent beam management.
2. To define the interruption requirements due to FR2 inter-band SCell activation/deactivation for independent beam management.
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|  |  |
| ***Consequences if not approved:*** | The interruption requirements will be not properly for FR2 inter-band CA scenario. |
|  |  |
| ***Clauses affected:*** | 8.2.1.2.3, 8.2.1.2.4, 8.2.2.2.1, 8.2.2.2.2, 8.2.3.2.3, 8.2.3.2.4,  |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** | **X** |  |  Test specifications | TS38.533 |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

<Start of Change 1>

##### 8.2.1.2.3 Interruptions at SCell addition/release

The requirements in this clause shall apply for the UE configured with PSCell.

When one E-UTRA SCell in MCG is added or released:

- the UE is allowed an interruption on any active serving cell in SCG:

- of up to X1 slot, if the active serving cell is not in the same band as any of the E-UTRA SCells being added or released, or

- of up to max{Y1 slot + TSMTC\_duration, 5ms} if the active serving cells are in the same band as any of the E-UTRA SCells being added or released, provided the cell specific reference signals from the active serving cells and the E-UTRA SCells being added or released are available in the same slot, where TSMTC\_duration is the longest SMTC duration among all above active serving cells in SCG;

Where X1 and Y1 are specified in Table 8.2.1.2.3-1.

When one SCell in SCG is added or released:

- the UE is allowed an interruption on any active serving cell in SCG:

- of up to X1 slot, if the active serving cell is not in the same band as any of the SCells being added or released, provided the active serving cell and the SCell being added or released are in a band pair with independent beam management,

or

- of up to Y1 slot + TSMTC\_duration if the active serving cells are in the same band as any of the SCells being added or released, provided the cell specific reference signals from the active serving cells and the SCells being added or released are available in the same slot, where, TSMTC\_duration is

- the longest SMTC duration among all above active serving cells in SCG and the SCell being added when one SCell is added;

- the longest SMTC duration among all above active serving cells in SCG when one SCell is released.

Where X1 and Y1 are specified in Table 8.2.1.2.3-2.

**Table 8.2.1.2.3-1: Interruption length X1 and Y1 at E-UTRA SCell addition/Release**

|  |  |  |  |
| --- | --- | --- | --- |
|  | NR Slot length (ms) | Interruption length X1 (slots) | Interruption length Y1 (slots) |
| Sync | Async | Sync | Async |
| 0 | 1 | 1 | 2 | 1 | 2 |
| 1 | 0.5 | 2 | 3 | 2 | 3 |
| 2 | 0.25 | 5 | 4 | 5 |
| 3 | 0.125 | 9 | N/A | - N/A |

Table 8.2.1.2.3-2: Interruption length X1 and Y1 at SCell addition/Release

|  |  |  |  |
| --- | --- | --- | --- |
|  | NR Slot length (ms) of victim cell | Interruption length X1 (slots) | Interruption length Y1 (slots) |
| 0 | 1 | 1 | 1 |
| 1 | 0.5 | 2 | 2 |
| 2 | 0.25 | Both aggressor cell and victim cell are on FR2 | 4 | 4 |
| Either aggressor cell or victim cell is on FR1 | 5 |
| 3 | 0.125 | Aggressor cell is on FR2 | 8 | 8 |
| Aggressor cell is on FR1 | 9 |

##### 8.2.1.2.4 Interruptions at SCell activation/deactivation

The requirements in this clause shall apply for the UE configured with PSCell and one SCell.

When one E-UTRA SCell in MCG is activated from deactivated or dormant state, or deactivated from activated or dormant state:

- the UE is allowed an interruption on any active serving cell in SCG:

- of up to X2 slot, if the active serving cell is not in the same band as any of the E-UTRA SCells being activated or deactivated, or

- of up to max{Y2 slot + TSMTC\_duration, 5ms} if the active serving cells are in the same band as any of the E-UTRA SCells being activated or deactivated, provided the cell specific reference signals from the active serving cells and the E-UTRA SCells being activated or deactivated are available in the same slot, where TSMTC\_duration is the longest SMTC duration among all above active serving cells in SCG.

Where X2 and Y2 are specified in Table 8.2.1.2.4-1.

When one SCell in SCG is activated or deactivated:

- an interruption on any serving cell in SCG:

- of up to X2 slot, if the active serving cell is not in the same band as any of the SCells being activated or deactivated, provided the active serving cells and the SCells being activated or deactivated are in a band pair with independent beam management,

or

- of up to Y2 slot + TSMTC\_duration if the active serving cells are in the same band as any of the SCells being activated or deactivated, provided the cell specific reference signals from the active serving cells and the SCells being activated or deactivated are available in the same slot, where, TSMTC\_duration is

- the longest SMTC duration among all above active serving cells in SCG and the SCell being activated when one SCell is activated;

- the longest SMTC duration among all above active serving cells in SCG when one SCell is deactivated.

Where X2 and Y2 are specified in Table 8.2.1.2.4-2.

Table 8.2.1.2.4-1: Interruption length X2 and Y2 at E-UTRA SCell activation/deactivation

|  |  |  |  |
| --- | --- | --- | --- |
|  | NR Slot length (ms) | Interruption length X2 (slots) | Interruption length Y2 (slots) |
| Sync | Async | Sync | Async |
| 0 | 1 | 1 | 2 | 1 | 2 |
| 1 | 0.5 | 1 | 2 | 1 | 2 |
| 2 | 0.25 | 3 | 2 | 3 |
| 3 | 0.125 | 5 | N/A | N/A |

Table 8.2.1.2.4-2: Interruption length X2 and Y2 at SCell activation/deactivation

|  |  |  |  |
| --- | --- | --- | --- |
|  | NR Slot length (ms) of victim cell | Interruption length X2 (slots) | Interruption length Y2 (slots) |
| 0 | 1 | 1 | 1 |
| 1 | 0.5 | 1 | 1 |
| 2 | 0.25 | Both aggressor cell and victim cell are on FR2 | 2 | 2 |
| Either aggressor cell or victim cell is on FR1 | 3 |
| 3 | 0.125 | Aggressor cell is on FR2 | 4 | 4 |
| Aggressor cell is on FR1 | 5 |

<End of Change 1>

<Start of Change 2>

##### 8.2.2.2.1 Interruptions at SCell addition/release

When any number of SCells between one and 7 is added or released using the same *RRCConnectionReconfiguration* message as defined in TS 38.331 [2], the UE is allowed an interruption on any active serving cell during the RRC reconfiguration procedure as follows:

- an interruption on any active serving cell:

- of up to X1 slot, if the active serving cell is not in the same band as any of the SCells being added or released, provided the active serving cell and the SCell being added or released are in a band pair with independent beam management,

Where X1 is specified in Table 8.2.2.2.1-1.

or

- of up to the duration shown in table 8.2.2.2.1-2, if the active serving cells are in the same band as any of the SCells being added or released, provided the cell specific reference signals from the active serving cells and the SCells being added or released are available in the same slot.

Table 8.2.2.2.1-1: Interruption length X1 for SCell addition/release for inter-band CA

|  |  |  |
| --- | --- | --- |
|  | **NR Slot length (ms) of victim cell** | **Interruption length X1 (slots)** |
| 0 | 1 | 1  |
| 1 | 0.5 | 2  |
| 2 | 0.25 | Both aggressor cell and victim cell are on FR2 | 4  |
| Either aggressor cell or victim cell is on FR1 | 5 |
| 3 | 0.125 | Aggressor cell is on FR2 | 8  |
| Aggressor cell is on FR1 | 9  |

**Table 8.2.2.2.1-2: Interruption duration for SCell addition/release for intra-band CA**

|  |  |  |
| --- | --- | --- |
|  | **NR Slot length (ms)** | **Interruption length (slots)** |
| 0 | 1 | 1 + TSMTC\_duration \* $N\_{slot}^{subframe,μ}$ |
| 1 | 0.5 | 2 + TSMTC\_duration \* $N\_{slot}^{subframe,μ}$ |
| 2 | 0.25 | 4 + TSMTC\_duration \* $N\_{slot}^{subframe,μ}$ |
| 3 | 0.125 | 8 + TSMTC\_duration \* $N\_{slot}^{subframe,μ}$ |
| NOTE 1: TSMTC\_duration measured in subframes is - the longest SMTC duration among all above active serving cells and the SCell being added when one SCell is added; - the longest SMTC duration among all active serving cells in the same band when one SCell is released. NOTE 2: $N\_{slot}^{subframe,μ}$ is as defined in TS 38.211 [6]. |

##### 8.2.2.2.2 Interruptions at SCell activation/deactivation

When an intra-band SCell is activated or deactivated as defined in TS 37.340 [17], the UE is allowed

- an interruption on any active serving cell:

- of up to X2 slot, if the active serving cell is not in the same band as any of the SCells being activated or deactivated, provided the active serving cell and the SCell being activated or deactivated are in a band pair with independent beam management,

Where X2 is specified in Table 8.2.2.2.2-1.

or

- of up to the duration shown in table 8.2.2.2.2-2, if the active serving cells are in the same band as any of the SCells being activated or deactivated provided the cell specific reference signals from the active serving cells and the SCells being activated or deactivated are available in the same slot.

Table 8.2.2.2.2-1: Interruption length X2 for SCell activation/deactivation for inter-band CA

|  |  |  |
| --- | --- | --- |
|  | **NR Slot length (ms) of victim cell** | **Interruption length X2 (slots)** |
| 0 | 1 |  | 1  |
| 1 | 0.5 |  | 1  |
| 2 | 0.25 | Both aggressor cell and victim cell are on FR2 | 2  |
| Either aggressor cell or victim cell is on FR1 | 3 |
| 3 | 0.125 | Aggressor cell is on FR2 | 4  |
| Aggressor cell is on FR1 | 5  |

**Table 8.2.2.2.2-2: Interruption duration for SCell activation/deactivation for intra-band CA**

|  |  |  |
| --- | --- | --- |
|  | **NR Slot length (ms)** | **Interruption length (slots)** |
| 0 | 1 | 1 + TSMTC\_duration \* $N\_{slot}^{subframe,μ}$ |
| 1 | 0.5 | 1 + TSMTC\_duration \* $N\_{slot}^{subframe,μ}$ |
| 2 | 0.25 | 2 + TSMTC\_duration \* $N\_{slot}^{subframe,μ}$ |
| 3 | 0.125 | 4 + TSMTC\_duration \* $N\_{slot}^{subframe,μ}$ |
| NOTE 1: TSMTC\_duration measured in subframes is - the longest SMTC duration among all above active serving cells and the SCell being activated when one SCell is activated; - the longest SMTC duration among all active serving cells in the same band when one SCell is deactivated.NOTE 2: $N\_{slot}^{subframe,μ}$ is as defined in TS 38.211 [6]. |

<End of Change 2>

<Start of Change 3>

##### 8.2.3.2.3 Interruptions at PSCell/SCell addition/release

The requirements in this clause shall apply for the UE configured with E-UTRA PSCell.

When one E-UTRA PSCell/SCell in SCG is added or released:

- the UE is allowed an interruption on any active serving cell in MCG:

- of up to X1 slot, if the active serving cell is not in the same band as any of the E-UTRA PSCell/SCells being added or released, or

- of up to max{Y1 slot + TSMTC\_duration, 5ms} if the active serving cells are in the same band as any of the E-UTRA PSCell/SCells being added or released, provided the cell specific reference signals from the active serving cells and the E-UTRA PSCell/SCells being added or released are available in the same slot, where TSMTC\_duration is the longest SMTC duration among all above activated serving cells in MCG;

Where X1 and Y1 are specified in Table 8.2.3.2.3-1.

When one SCell in MCG is added or released:

- the UE is allowed an interruption on any activated serving cell in MCG:

- of up to X1 slot, if the active serving cell is not in the same band as any of the SCells being added or released, provided the active serving cell and the SCell being added or released are in a band pair with independent beam management,

or

- of up to Y1 slot + TSMTC\_duration if the active serving cells are in the same band as any of the SCells being added or released, provided the cell specific reference signals from the active serving cells and the SCells being added or released are available in the same slot, where, TSMTC\_duration is

- the longest SMTC duration among all above active serving cells in MCG and the SCell being added when one SCell is added;

- the longest SMTC duration among all above active serving cells in MCG when one SCell is released.

Where X1 and Y1 are specified in Table 8.2.3.2.3-2.

Table 8.2.3.2.3-1: Interruption length X1 and Y1 at E-UTRA PSCell/SCell addition/release

|  |  |  |  |
| --- | --- | --- | --- |
|  | NR Slot length (ms) | Interruption length X1 (slots) | Interruption length Y1 (slots) |
| Sync | Async | Sync | Async |
| 0 | 1 | 1 | 2 | 1 | 2 |
| 1 | 0.5 | 2 | 3 | 2 | 3 |
| 2 | 0.25 | 5 | 4 | 5 |
| 3 | 0.125 | 9 | N/A | N/A |

Table 8.2.3.2.3-2: Interruption length X1 and Y1 at SCell addition/Release

|  |  |  |  |
| --- | --- | --- | --- |
|  | NR Slot length (ms) of victim cell | Interruption length X1 (slots) | Interruption length Y1 (slots) |
| 0 | 1 | 1 | 1 |
| 1 | 0.5 | 2 | 2 |
| 2 | 0.25 | Both aggressor cell and victim cell are on FR2 | 4 | 4 |
| Either aggressor cell or victim cell is on FR1 | 5 |
| 3 | 0.125 | Aggressor cell is on FR2 | 8 | 8 |
| Aggressor cell is on FR1 | 9 |

##### 8.2.3.2.4 Interruptions at SCell activation/deactivation

The requirements in this clause shall apply for the UE configured with E-UTRA PSCell and one SCell.

When one E-UTRA SCell in SCG is activated from deactivated or dormant state, or deactivated from activated or dormant state:

- the UE is allowed an interruption on any active serving cell in MCG:

- of up to X2 slot, if the active serving cell is not in the same band as any of the E-UTRA SCells being activated or deactivated, or

- of up to max{Y2 slot + TSMTC\_duration, 5ms} if the active serving cells are in the same band as any of the E-UTRA SCells being activated or deactivated, provided the cell specific reference signals from the active serving cells and the E-UTRA SCells being activated or deactivated are available in the same slot, where TSMTC\_duration is the longest SMTC duration among all above active serving cells in MCG.

Where X2 and Y2 are specified in Table 8.2.3.2.4-1.

When one SCell in MCG is activated or deactivated:

- the UE is allowed an interruption on any serving cell in MCG:

- of up to X2 slot, if the active serving cell is not in the same band as any of the SCells being activated or deactivated, provided the active serving cells and the SCells being activated or deactivated are in a band pair with independent beam management,

or

- of up to Y2 slot + TSMTC\_duration if the active serving cells are in the same band as any of the SCells being activated or deactivated, provided the cell specific reference signals from the active serving cells and the SCells being activated or deactivated are available in the same slot, where, TSMTC\_duration is

- the longest SMTC duration among all above active serving cells in MCGand the SCell being activated when one SCell is activated;

- the longest SMTC duration among all above active serving cells in MCG when one SCell is deactivated.

Where X2 and Y2 are specified in Table 8.2.3.2.4-2.

Table 8.2.3.2.4-1: Interruption length X2 and Y2 at E-UTRA SCell activation/deactivation

|  |  |  |  |
| --- | --- | --- | --- |
|  | NR Slot length (ms) | Interruption length X2 (slots) | Interruption length Y2 (slots) |
| Sync | Async | Sync | Async |
| 0 | 1 | 1 | 2 | 1 | 2 |
| 1 | 0.5 | 1 | 2 | 1 | 2 |
| 2 | 0.25 | 3 | 2 | 3 |
| 3 | 0.125 | 5 | N/A | N/A |

Table 8.2.3.2.4-2: Interruption length X2 and Y2 at SCell activation/deactivation

|  |  |  |  |
| --- | --- | --- | --- |
|  | NR Slot length (ms) of victim cell | Interruption length X2 (slots) | Interruption length Y2 (slots) |
| 0 | 1 | 1 | 1 |
| 1 | 0.5 | 1 | 1 |
| 2 | 0.25 | Both aggressor cell and victim cell are on FR2 | 2 | 2 |
| Either aggressor cell or victim cell is on FR1 | 3 |
| 3 | 0.125 | Aggressor cell is on FR2 | 4 | 4 |
| Aggressor cell is on FR1 | 5 |

<End of Change 3>