**3GPP TSG-RAN WG4 Meeting #95-e *R4-2008559***

 **Electronic Meeting, 25 May - 05 June, 2020**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
|  |
|  | **36.133** | **CR** |  **6854** | **rev** | **1** | **Current version:** | **16.5.0** |  |
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| *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 to TS 36.133: adding handover to NR-U  |
|  |  |
| ***Source to WG:*** | Nokia, Nokia Shanghai Bell  |
| ***Source to TSG:*** | RAN4 |
|  |  |
| ***Work item code:*** | NR\_unlic-Core |  | ***Date:*** | 15-05-2020 |
|  |  |  |  |  |
| ***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)* |
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| ***Reason for change:*** | Introduction of NR-U handover in TS 36.133. |
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| ***Summary of change:*** | The CR introduces a new Handover clause to capture the agreements made at previous meetings and endorsed in the draft CR R4-2005363. |
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| ***Consequences if not approved:*** | The specification is incomplete.  |
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| ***Clauses affected:*** | 5.3.4.3 and 5.3.4A |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ... |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** | . Endorsed Draft CR: R4-2005363.***R4-2007259*** |

<Start of Change 1>

### 5.3.4 E-UTRAN - NR FR1 Handover

#### 5.3.4.1 Introduction

The purpose of inter-RAT handover from E-UTRAN to NR in FR1 is to transfer a connection between the UE and E-UTRAN to NR in FR1. The handover procedure is initiated from E-UTRAN with a RRC message (MOBILITY FROM E-UTRA). The procedure is described in in TS 36.331 [2].

#### 5.3.4.2 Handover delay

When the UE receives a RRC message implying inter-RAT handover to the UE shall be ready to start the transmission of the uplink PRACH channel in NR within Dhandover seconds from the end of the last TTI containing the RRC command. Dhandover is defined as

 Dhandover = TRRC\_procedure\_delay + Tinterruption

Where:

 TRRC\_procedure\_delay: it is the RRC procedure delay which is [50] ms.

 Tinterruption: it is the time between end of the last TTI containing the RRC command on the PDSCH in E-UTRAN and the time the UE starts transmission of the PRACH in NR, excluding TRRC\_procedure\_delay. Tinterruption is defined in clause 5.3.4.3.

#### 5.3.4.3 Interruption time

When inter-RAT handover to NR is commanded, the interruption time shall be less than Tinterrupt

 Tinterrupt = Tsearch + TIU + Trs + Tprocessing + Tmargin ms

Where:

 Tsearch is the time required to search the target cell when the target cell is not already known when the handover command is received by the UE. If the target cell is known, then Tsearch = 0 ms. If the target cell is an unknown cell and target cell Es/Iot ≥ [-2] dB, then Tsearch = 3▪Trs ms. Regardless of whether DRX is in use by the UE, Tsearch shall still be based on non-DRX target cell search times.

Tprocessing is time for UE processing. Tprocessing can be up to 20 ms.

Tmargin is time for SSB post-processing. Tmargin can be up to 2 ms.

 TIU is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. TIU can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [39].

NOTE: The actual value of TIU shall depend upon the PRACH configuration used in the target cell.

 Trs is the SMTC period of the taget NR cell if the UE has been provided with an SMTC configuration for the target cell prior to, or in the handover command, otherwise Trs is the target cell SSB transmission period, if such is provided. If the UE is not provided with an SMTC configuration or SSB transmission period, the requirement in this section is applied with Trs = 5 ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If UE is provided with both SMTC configuration and SSB transmission period the requirement shall be based on SMTC periodicity.

In the interruption requirement a cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown. Relevant cell identification requirements are described in clause 8.1.2.4.21 and 8.1.2.4.22.

### 5.3.4A E-UTRAN - NR FR1 Handover to target cell using CCA

#### 5.3.4A.1 Introduction

The purpose of inter-RAT handover from E-UTRAN to NR in FR1 in carrier frequencies with CCA is to transfer a connection between the UE and E-UTRAN to NR in FR1 carrier frequencies with CCA. The handover procedure is initiated from E-UTRAN with an RRC message (MOBILITY FROM E-UTRA). The procedure is described in in TS 36.331 [2].

#### 5.3.4A.2 Handover delay

When the UE receives an RRC message implying inter-RAT handover to the UE shall be ready to start the transmission of the uplink PRACH channel in NR within Dhandover seconds from the end of the last TTI containing the RRC command. Dhandover is defined as

 Dhandover = TRRC\_procedure\_delay + Tinterruption

Where:

 TRRC\_procedure\_delay: it is the RRC procedure delay which is [50] ms.

 Tinterruption: it is the time between end of the last TTI containing the RRC command on the PDSCH in E-UTRAN and the time the UE starts transmission of the PRACH in NR, excluding TRRC\_procedure\_delay. Tinterrupt is defined in clause 5.3.4A.3.

#### 5.3.4A.3 Interruption time

When inter-RAT handover to NR is commanded, the interruption time shall be less than Tinterrupt

 Tinterrupt = Tsearch + TIU + Trs + Tprocessing + Tmargin ms

Where:

 Tsearch is the time required to search the target cell when the target cell is not already known when the handover command is received by the UE. If the target cell is known, then Tsearch = 0 ms. If the target cell is an unknown cell and target cell Es/Iot ≥ [-2] dB, then Tsearch = (3+L1´) \*Trs ms. Regardless of whether DRX is in use by the UE, Tsearch shall still be based on non-DRX target cell search times.

L1´ is the number of SMTC occasions not available at the UE during the inter-RAT detection period. Regardless of whether DRX is in use by the UE, Tsearch shall still be based on non-DRX target cell search times.

*Editor’s note: FFS for the definition of “SMTC occasions not available at the UE”.*

Tprocessing is time for UE processing. Tprocessing can be up to 20 ms.

Tmargin is time for SSB post-processing. Tmargin can be up to 2 ms.

 TIU is the interruption uncertainty due to the random access procedure when sending PRACH to the new cell. TIU can be up to: ~~(1 + L~~~~3~~~~) \* T~~~~SSB,RO~~ ~~+ 10 ms~~ TSSB,RO + L3 \* TRO + 10 ms where TSSB,RO is the SSB to PRACH occasion association period and L3 is the number of consecutive PRACH occasions that are unavailable for PRACH transmission due to UL CCA failure, and TRO is the time period to next PRACH occasion. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [39]. L3 = 0 for Type 2C UL channel access procedure as defined in TS 37.213.

*Editor’s note: the interruption uncertainty might be revisited to add the requirements for consistent UL LBT failure detection / recovery, if the procedure also includes HO.*

NOTE 1: The actual value of TIU shall depend upon the PRACH configuration used in the target cell.

NOTE 2: The interruption time extended by L1´and L3 parameters is limited by the T304 timer. The UE behaviour at the T304 timer expiry is specified in TS 38.331 [38].

 Trs is the SMTC period of the taget NR cell if the UE has been provided with an SMTC configuration for the target cell prior to, or in the handover command, otherwise Trs is the target cell SSB transmission period, if such is provided. If the UE is not provided with an SMTC configuration or SSB transmission period, the requirement in this section is applied with Trs = 5 ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If UE is provided with both SMTC configuration and SSB transmission period the requirement shall be based on SMTC periodicity.

In the interruption requirement a cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown. Relevant cell identification requirements are described in clause 8.1.2.4.21A, and 8.1.2.4.22A.

<End of Change 1>