**3GPP TSG-RAN2 Meeting #124** **R2-231**

**Chicago, USA, 13th – 17th Nov., 2023**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  | **38.321** | **CR** | 1699 | **rev** | **2** | **Current version:** | 17.6.0 |  |
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| *For* [***HELP***](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 | **X** | Core Network |  |

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| ***Title:***  | Introduction of MT-SDT for MAC spec |
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| ***Source to WG:*** | Huawei, HiSilicon |
| ***Source to TSG:*** | RAN2 |
|  |  |
| ***Work item code:*** | NR\_MT\_SDT-Core, TEI18  |  | ***Date:*** | 2023-11-20 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-18 |
|  | *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-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
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| ***Reason for change:*** | * Issue1: Abbreviation should be added for MO-SDT and MT-SDT
* Issue2: The current spec is written in the background of MO-SDT. In this introduction of MT-SDT, it needs to be clarified that the small data transmission procedure can be triggered for either MO-SDT or MT-SDT according to TS 38.331.
* Issue3: We have agreed that CCCH message can be transmitted on CG-SDT without data when triggered by MT-SDT. The legacy conditions for SDT for logical channel restriction needs to be revised.
	+ Another agreement has been made during RAN2#122: ***LCH restrictions are checked for DRBs as in MO-SDT (if UL data is available during SDT procedure). Ensure CCCH can be transmitted in CG-SDT when MT-SDT is triggered in stage 3 discussion.***
* Issue4: it is still pending whether the legacy DVT condition is needed when the SDT procedure is triggered for MT-SDT

=================UPDATE after RAN2#122======================* Issue5: RAN2#122 has agreed on the following ***A separate sdt-RSRP threshold for MT-SDT can be configured, at least in the case where MO-SDT is not configured in the cell***.
	+ When lagacy RACH is triggered for MT-SDT, the UE should check this RSRP condition. If the condition is not satisfied, the UE should indicate to the upper layer that the condition to trigger legacy RACH for MT-SDT cannot be satisfied.
* Issue6: RAN2#122 has agreed on the following ***RA-SDT resources are not used for MT-SDT initiation RACH***
	+ When checking the conditions for initiating RA-SDT during SDT type seleciton procedure, condition needs to be added that the SDT procedure is not triggered for MT-SDT
* Issue7: RAN2#122 has agreed on the following ***For both MO and MT-SDT, if the next CG-SDT resource is too far, then RACH resource can be selected first. This is checked at the point of initial resource selection (e.g. CG SDT selection). FFS what is too far and how this is configured. Assumption is that we will continue this discussion in SDT session.***
	+ Hence, a condition needs to be added for initiating CG-SDT for both MO-SDT and MT-SDT

=================UPDATE after RAN2#123=====================* Issue8: RAN2#123 has agreed that ***Sdt-RSRP threshold is included in MT-SDT configuration. Optional IE, but mandatorily present if only MT-SDT is configured. The network can configure the MT and MO SDT threshold differently if it wants***
* Issue9: RAN2#123 has agreed that ***Confirm that the condition for data volume threshold is not applicable for Small Data Transmission procedure triggered for MT-SDT***

=================UPDATE after RAN2#123bis===================* Issue10: During RAN2#123bis, the following has been agreed for the condition to perform CG-SDT”: ***cg-SDT-MaxDurationToNext-CG-Occassion is configured per LCH. When there are multiple LCHs mapped to CG-SDT resource the shortest time is chosen.***
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| ***Summary of change:*** | The following changes have been applied in the current CR* Change1: Add abbreviation for MT-SDT and MO-SDT
* Change2: Voided.
* Change3: For the condition of *configuredGrantType1Allowed* for CG-SDT type selection, specify that it is only for the case when the SDT procedure is triggered for MO-SDT
* Change4: For the DVT condition, add the condition that it is used for MO-SDT
* Change5: Voided
* Change6a: Clarify in the selection of the set of RA resource and availability of RA resource that SDT is not applicable for Random Access procedure triggered by upper layer for MT-SDT
* Change6b: When SDT procedure is triggered by upper layer for MT-SDT, RA-SDT cannot be used.
* Change7a: RRC parameter added for the condition that “the next CG-SDT resource is not too far”
* Change7b: MAC procedure added for SDT procedure that the next CG-SDT resource cannot be too far when initiating CG-SDT for SDT procedure
* Change8a: Add a new RRC parameter for the RSRP threshold for MT-SDT and modify on the name of the legacy threshold for MO-SDT
* Change8b: Add the condition for triggering the SDT procedure in the MAC spec for MT-SDT for the RSRP threshold
* Change9: Remove the previous editor’s NOTE and confirm that DVT condition is not used for MT-SDT.
* Change10: Implement the RAN2 agreement on per LCH condition for performing CG-SDT
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| ***Consequences if not approved:*** | The new feature MT-SDT cannot be well supported by the MAC spec |
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| ***Clauses affected:*** | 3.2, 5.1.1b, 5.1.1c, 5.27.1 |
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|  | **Y** | **N** |  |  |
| ***Other specs*** | **X** |  |  Other core specifications  | *MT-SDT*TS 38.331 CR 4194 TS 38.300 CR 0711*CG-SDT enh*TS 38.331 CR 4471TS 38.300 CR 0743*Common*TS 38.306 CR [TBD] |
| ***affected:*** |  | **X** |  Test specifications |  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications |  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** | Ver0 in RAN2#124: R2-2312252Ver1 in RAN2#124: R2-2313592Ver2 in RAN2#124: R2-231 |

====================================CHANGE BEGINS===================================

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

AP Aperiodic

BFR Beam Failure Recovery

BSR Buffer Status Report

BWP Bandwidth Part

CE Control Element

CG Cell Group

CG-SDT Configured Grant-based SDT

CI-RNTI Cancellation Indication RNTI

CSI Channel State Information

CSI-IM CSI Interference Measurement

CSI-RS CSI Reference Signal

CS-RNTI Configured Scheduling RNTI

DAPS Dual Active Protocol Stack

DCP DCI with CRC scrambled by PS-RNTI

DL-PRS DownLink-Positioning Reference Signal

G-CS-RNTI Group Configured Scheduling RNTI

G-RNTI Group RNTI

IAB Integrated Access and Backhaul

INT-RNTI Interruption RNTI

LBT Listen Before Talk

LCG Logical Channel Group

LCP Logical Channel Prioritization

MBS Multicast/Broadcast Services

MCCH MBS Control Channel

MCCH-RNTI MBS Control Channel RNTI

MCG Master Cell Group

MO-SDT Mobile Originated SDT

MPE Maximum Permissible Exposure

MTCH MBS Traffic Channel

MT-SDT Mobile Terminated SDT

NCD-SSB Non Cell Defining SSB

NSAG Network Slice AS Group

NUL Normal Uplink

NZP CSI-RS Non-Zero Power CSI-RS

PDB Packet Delay Budget

PEI-RNTI Paging Early Indication RNTI

PHR Power Headroom Report

PS-RNTI Power Saving RNTI

PTAG Primary Timing Advance Group

PTM Point to Multipoint

PTP Point to Point

QCL Quasi-colocation

PPW PRS Processing Window

PRS Positioning Reference Signal

RA-SDT Random Access-based SDT

RS Reference Signal

SCG Secondary Cell Group

SDT Small Data Transmission

SFI-RNTI Slot Format Indication RNTI

SI System Information

SL-RNTI Sidelink RNTI

SLCS-RNTI Sidelink Configured Scheduling RNTI

SpCell Special Cell

SP Semi-Persistent

SP-CSI-RNTI Semi-Persistent CSI RNTI

SPS Semi-Persistent Scheduling

SR Scheduling Request

SS Synchronization Signals

SSB Synchronization Signal Block

STAG Secondary Timing Advance Group

SUL Supplementary Uplink

TAG Timing Advance Group

TCI Transmission Configuration Indicator

TPC-SRS-RNTI Transmit Power Control-Sounding Reference Signal-RNTI

TRIV Time Resource Indicator Value

TRP Transmit/Receive Point

TRS CSI-RS for tracking

U2N UE-to-Network

UCI Uplink Control Information

V2X Vehicle-to-Everything

ZP CSI-RS Zero Power CSI-RS

================================NEXT CHANGE========================================

### 5.1.1b Selection of the set of Random Access resources for the Random Access procedure

The MAC entity shall:

1> if the BWP selected for Random Access procedure is configured with both set(s) of Random Access resources with *msg3-Repetitions* set to *true* and set(s) of Random Access resources without *msg3-Repetitions* set to *true* and the RSRP of the downlink pathloss reference is less than *rsrp-ThresholdMsg3*; or

1> if the BWP selected for Random Access procedure is only configured with the set(s) of Random Access resources with *msg3-Repetitions* set to *true*:

2> assume Msg3 repetition is applicable for the current Random Access procedure.

1> else:

2> assume Msg3 repetition is not applicable for the current Random Access procedure.

NOTE 1: Void.

1> if neither contention-free Random Access Resources nor Random Access Resources for SI request have been provided for this Random Access procedure and one or more of the features including RedCap and/or Slicing and/or SDT and/or MSG3 repetition is applicable for this Random Access procedure:

NOTE 2: The applicability of SDT is determined by MAC entity according to clause 5.27. The applicability of *NSAG-ID* is determined by upper layers when the Random Access procedure is initiated. The applicability of RedCap is also determined by upper layers when Random Access procedure is initiated and it is applicable to the Random Access procedures initiated by PDCCH orders and any Random Access procedure initiated by the MAC entity.

NOTE 3: SDT is not applicable for the Random Access procedure initiated by upper layers for MT-SDT.

2> if none of the sets of Random Access resources are available for any feature applicable to the current Random Access procedure (as specified in clause 5.1.1c):

3> select the set(s) of Random Access resources that are not associated with any feature indication (as specified in clause 5.1.1c) for this Random Access procedure.

2> else if there is one set of Random Access resources available which can be used for indicating all features triggering this Random Access procedure:

3> select this set of Random Access resources for this Random Access procedure.

2> else (i.e. there are one or more sets of Random Access resources available that are configured with indication(s) for a subset of all features triggering this Random Access procedure):

3> select a set of Random Access resources from the available set(s) of Random Access resources based on the priority order indicated by upper layers as specified in clause 5.1.1d for this Random Access Procedure.

1> else if contention-free Random Access Resources have been provided for this Random Access procedure and RedCap is applicable for the current Random Access procedure and there is one set of Random Access resources available that is only configured with RedCap indication:

2> select this set of Random Access resources for this Random Access procedure.

1> else:

2> select the set of Random Access resources that are not associated with any feature indication (as specified in clause 5.1.1c) for the current Random Access procedure.

================================NEXT CHANGE========================================

### 5.1.1c Availability of the set of Random Access resources

The MAC entity shall for each set of configured Random Access resources for 4-step RA type and for each set of configured Random Access resources for 2-step RA type:

1> if *redCap* is set to *true* for a set of Random Access resources:

2> consider the set of Random Access resources as not available for a Random Access procedure for which RedCap is not applicable.

1> if *smallData* is set to *true* for a set of Random Access resources:

2> consider the set of Random Access resources as not available for the Random Access procedure which is not triggered for RA-SDT by MO-SDT as specified in TS 38.331 [5].

1> if *NSAG-List* is configured for a set of Random Access resources:

2> consider the set of Random Access resources as not available for the Random Access procedure unless it is triggered for any one of the *NSAG-ID*(s) in the *NSAG-List*.

1> if *msg3-Repetitions* is set to *true* for a set of Random Access resources:

2> consider the set of Random Access resources as not available for the Random Access procedure if Msg3 repetition is not applicable.

1> if a set of Random Access resources is not configured with *FeatureCombination*:

2> consider the set of Random Access resources to not associated with any feature.

==============================NEXT CHANGE==========================================

5.27.1 General

The MAC entity may be configured by RRC with SDT and the SDT procedure may be initiated by RRC layer for MO-SDT or MT-SDT. The SDT procedure initiated by MO-SDT can be performed either by Random Access procedure with 2-step RA type or 4-step RA type (i.e., RA-SDT) or by configured grant Type 1 (i.e., CG-SDT). The SDT procedure initiated by MT-SDT can be performed either by Random Access procedure with 2-step RA type or 4-step RA type (i.e., RA-SDT is not applicable as specified in clause 5.1.1b) or by configured grant Type 1 (i.e., CG-SDT).

RRC configures the following parameters for SDT procedure:

- *sdt-DataVolumeThreshold*: data volume threshold for the UE to determine whether to perform SDT procedure initiated for MO-SDT;

- *sdt-RSRP-Threshold*: RSRP threshold for UE to determine whether to perform SDT procedure initiated for MO-SDT;

- *sdt-RSRP-ThresholdMT*: RSRP threshold for UE to determine whether to perform SDT procedure initiated for MT-SDT;

- *cg-SDT-RSRP-ThresholdSSB*: an RSRP threshold configured for SSB selection for CG-SDT;

*- cg-MT-SDT-MaxDurationToNextCG-Occasion*: time threshold which is used by the UE to determine whether to perform CG-SDT for MT-SDT;

- *cg-SDT-MaxDurationToNextCG-Occasion*: time threshold configured per Logical Channel which is used by the UE to determine whether to perform CG-SDT for MO-SDT.

The following UE variable is used for the SDT procedure:

- *MAX\_DURATION\_TO\_NEXT\_CG\_OCCASION*;

- *RSRP\_THRESHOLD.*

The MAC entity shall, if initiated by the upper layers for SDT procedure:

1> if SDT procedure is initiated for MO-SDT as specified in TS 38.331 [5]:

2> set the *MAX\_DURATION\_TO\_NEXT\_CG\_OCCASION* to the shortest value of *cg-SDT-MaxDurationToNextCG-Occasion,* if configured, among all the logical channel configured with this parameter by upper layer and having data for transmission;

2> set the *RSRP\_THRESHOLD* to the value of *sdt-RSRP-Threshold,* if configured.

1> else if SDT procedure is initiated for MT-SDT as specified in TS 38.331 [5]:

2> set the *MAX\_DURATION\_TO\_NEXT\_CG\_OCCASION* to the value of *cg-MT-SDT-MaxDurationToNextCG-Occasion,* if configured;

2> if *sdt-RSRP-ThresholdMT* is configured:

3> set the *RSRP\_THRESHOLD* to the value of *sdt-RSRP-ThresholdMT.*

2> else if *sdt-RSRP-Threshold* is configured:

3> set the *RSRP\_THRESHOLD* to the value of *sdt-RSRP-Threshold*.

1> if the data volume of the pending UL data across all RBs configured for SDT is less than or equal to *sdt-DataVolumeThreshold*, or if the SDT procedure is initiated for MT-SDT as specified in TS 38.331 [5]; and

NOTE 1: For SDT procedure, the MAC entity also considers the suspended RBs configured with SDT for data volume calculation. It is up to the UE's implementation how the UE calculates the data volume for the suspended RBs. Size of the CCCH message is not considered for data volume calculation.1> if the RSRP of the downlink pathloss reference is higher than *RSRP\_THRESHOLD* or if *RSRP\_THRESHOLD* is not set:2> if the Serving Cell is configured with supplementary uplink as specified in TS 38.331 [5]; and

2> if the RSRP of the downlink pathloss reference is less than *rsrp-ThresholdSSB-SUL*:

3> select the SUL carrier.

2> else:

3> select the NUL carrier.

2> if CG-SDT is configured on the selected UL carrier, and TA for CG-SDT is valid according to clause 5.27.2 in the first available CG occasion for initial CG-SDT transmission with CCCH message according to clause 5.8.2; and

2> if, for each RB having data available for transmission, *configuredGrantType1Allowed*, if configured for CG-SDT, is configured with value *true* for the corresponding logical channel, or if the SDT procedure is initiated for MT-SDT as specified in TS 38.331 [5]; and

2> if at least one SSB configured for CG-SDT with SS-RSRP above *cg-SDT-RSRP-ThresholdSSB* is available, and if either the time gap between the initiation of the SDT procedure and first available CG occasion for initial CG-SDT transmission with CCCH message according to clause 5.8.2 is less than *MAX\_DURATION\_TO\_NEXT\_CG\_OCCASION*, or if the *MAX\_DURATION\_TO\_NEXT\_CG\_OCCASION* is not set:

3> indicate to the upper layers that the conditions for initiating SDT procedure are fulfilled;

3> perform CG-SDT procedure on the selected UL carrier according to clause 5.8.2.

2> else if a set of Random Access resources for RA-SDT is configured and can be selected according to clause 5.1.1b on the selected UL carrier on the BWP configured by *initialUplinkBWP-RedCap*, if configured for a RedCap UE; otherwise, on the BWP configured by *initialUplinkBWP*; or

2> if the SDT procedure is initiated for MT-SDT as specified in TS 38.331 [5]:

3> if *cg-SDT-TimeAlignmentTimer* is running, consider *cg-SDT-TimeAlignmentTimer* as expired and perform the corresponding actions in clause 5.2;

3> indicate to the upper layers that the conditions for initiating SDT procedure are fulfilled.

2> else:

3> indicate to the upper layers that the conditions for initiating SDT procedure are not fulfilled.

1> else:

2> indicate to the upper layers that the conditions for initiating SDT procedure are not fulfilled.

If Random Access procedure is selected above for SDT procedure initiated by MO-SDT or MT-SDT and after the Random Access procedure is successfully completed (see clause 5.1.6), the UE monitors PDCCH addressed to C-RNTI received in random access response until the -SDT procedure is terminated. If CG-SDT is selected above and after the initial transmission for CG-SDT is performed, the UE monitors PDCCH addressed to C-RNTI as stored in UE Inactive AS context as specified in TS 38.331 [5] and CS-RNTI until the SDT procedure is terminated.

NOTE 2: When the UE determines if there is an SSB with SS-RSRP above *cg-SDT-RSRP-ThresholdSSB*, the UE uses the latest unfiltered L1-RSRP measurement.

===============================CHANGE ENDS=========================================