**3GPP TSG- Meeting #**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
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|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
|  |
| *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 | **x** | Core Network |  |

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| ***Title:***  |  |
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| ***Source to WG:*** |  |
| ***Source to TSG:*** |  |
|  |  |
| ***Work item code:*** |  |  | ***Date:*** |  |
|  |  |  |  |  |
| ***Category:*** |  |  | ***Release:*** |  |
|  | *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-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
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| ***Reason for change:*** | RAN2 LS to RAN1 in R1-2100023 *LS on half-duplex operation*, RAN2 requested RAN1 to indicate how the configuration of the half duplex operation should be interpreted, as a per-cell configuration or as a per-UE configuration. The LS also notes that the configuration parameter name used in 38.213 is not matching to that of 38.331. |
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| ***Summary of change:*** | 1. Clarifying that the configuration is evaluated on a cell pair basis.
2. Correcting the RRC configuration parameter name.
3. Adding the name of the UE capability for half duplex TDD CA operation
4. Adding the name of the UE capability for simultaneous Rx and Tx for clarity
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| ***Consequences if not approved:*** | The TS38.213 and TS38.331 will use different configuration parameter name when enabling the half duplex operation for TDD CA, and it is not clear how the configuration parameter is to be understood when the RRC configures the operation to some cells, but not for some other cells. |
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| ***Clauses affected:*** | 11.1 |
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|  | **Y** | **N** |  |  |
| ***Other specs*** | **x** |  |  Other core specifications  | TS38.331CR2017 |
| ***affected:*** |  | **x** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
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| ***Other comments:*** | The original behaviour was introduced in RAN#87 38.213CR0097 in RP-200195 and later corrected in RAN#88 38.213CR0113 in RP-200697**Isolated Impact Analysis:**The CR impact is isolated to the configuration of the collision handling for half duplex UEs in unpaired band with CA only, and has no impact to any other functionality. The feature is broken before the RRC and L1 corrections are introduced, and it cannot be used with earlier versions of the specifications. |
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| ***This CR's revision history:*** |  |

## 11.1 Slot configuration

A slot format includes downlink symbols, uplink symbols, and flexible symbols.

The following are applicable for each serving cell.

If a UE is provided *tdd-UL-DL-ConfigurationCommon*, the UE sets the slot format per slot over a number of slots as indicated by *tdd-UL-DL-ConfigurationCommon*.

The *tdd-UL-DL-ConfigurationCommon* provides

- a reference SCS configuration  by *referenceSubcarrierSpacing*

- a *pattern1*.

The *pattern1* provides

- a slot configuration period of  msec by *dl-UL-TransmissionPeriodicity*

- a number of slots  with only downlink symbols by *nrofDownlinkSlots*

- a number of downlink symbols  by *nrofDownlinkSymbols*

- a number of slots  with only uplink symbols by *nrofUplinkSlots*

- a number of uplink symbols  by *nrofUplinkSymbols*

A value  msec is valid only for . A value  msec is valid only for  or . A value  msec is valid only for , or , or .

A slot configuration period of  msec includes  slots with SCS configuration . From the  slots, a first  slots include only downlink symbols and a last  slots include only uplink symbols. The  symbols after the first  slots are downlink symbols. The  symbols before the last  slots are uplink symbols. The remaining  are flexible symbols.

The first symbol every  periods is a first symbol in an even frame.

If *tdd-UL-DL-ConfigurationCommon* provides both *pattern1* and *pattern2*, the UE sets the slot format per slot over a first number of slots as indicated by *pattern1* and the UE sets the slot format per slot over a second number of slots as indicated by *pattern2*.

The *pattern2* provides

- a slot configuration period of  msec by *dl-UL-TransmissionPeriodicity*

- a number of slots  with only downlink symbols by *nrofDownlinkSlots*

- a number of downlink symbols  by *nrofDownlinkSymbols*

- a number of slots  with only uplink symbols by *nrofUplinkSlots*

- a number of uplink symbols  by *nrofUplinkSymbols*

The applicable values of  are same as the applicable values for .

A slot configuration period of  msec includes first  slots and second  slots.

From the  slots, a first  slots include only downlink symbols and a last  include only uplink symbols. The  symbols after the first  slots are downlink symbols. The  symbols before the last  slots are uplink symbols. The remaining  are flexible symbols.

A UE expects that  divides 20 msec.

The first symbol every  periods is a first symbol in an even frame.

A UE expects that the reference SCS configuration  is smaller than or equal to a SCS configuration  for any configured DL BWP or UL BWP. Each slot provided by *pattern1* or *pattern2* is applicable to  consecutive slots in the active DL BWP or the active UL BWP where the first slot starts at a same time as a first slot for the reference SCS configuration  and each downlink or flexible or uplink symbol for the reference SCS configuration  corresponds to  consecutive downlink or flexible or uplink symbols for the SCS configuration .

If the UE is additionally provided *tdd-UL-DL-ConfigurationDedicated*, the parameter *tdd-UL-DL-ConfigurationDedicated* overrides only flexible symbols per slot over the number of slots as provided by *tdd-UL-DL-ConfigurationCommon*.

The *tdd-UL-DL-ConfigurationDedicated* provides

- a set of slot configurations by *slotSpecificConfigurationsToAddModList*

- for each slot configuration from the set of slot configurations

- a slot index for a slot provided by *slotIndex*

- a set of symbols for a slot by *symbols* where

- if *symbols* = *allDownlink*, all symbols in the slot are downlink

- if *symbols* = *allUplink*, all symbols in the slot are uplink

- if *symbols* = *explicit*, *nrofDownlinkSymbols* provides a number of downlink first symbols in the slot and *nrofUplinkSymbols* provides a number of uplink last symbols in the slot. If *nrofDownlinkSymbols* is not provided, there are no downlink first symbols in the slot and if *nrofUplinkSymbols* is not provided, there are no uplink last symbols in the slot. The remaining symbols in the slot are flexible

For each slot having a corresponding index provided by *slotIndex*, the UE applies a format provided by a corresponding *symbols*. The UE does not expect *tdd-UL-DL-ConfigurationDedicated* to indicate as uplink or as downlink a symbol that *tdd-UL-DL-ConfigurationCommon* indicates as a downlink or as an uplink symbol, respectively.

For each slot configuration provided by *tdd-UL-DL-ConfigurationDedicated*, a reference SCS configuration is the reference SCS configuration  provided by *tdd-UL-DL-ConfigurationCommon*.

A slot configuration period and a number of downlink symbols, uplink symbols, and flexible symbols in each slot of the slot configuration period are determined from *tdd-UL-DL-ConfigurationCommon* and *tdd-UL-DL-ConfigurationDedicated* and are common to each configured BWP.

A UE considers symbols in a slot indicated as downlink by *tdd-UL-DL-ConfigurationCommon*, or *tdd-UL-DL-ConfigurationDedicated* to be available for receptions and considers symbols in a slot indicated as uplink by *tdd-UL-DL-ConfigurationCommon*, or by *tdd*-*UL-DL-ConfigurationDedicated* to be available for transmissions.

If a UE is not configured to monitor PDCCH for DCI format 2\_0, for a set of symbols of a slot that are indicated as flexible by *tdd-UL-DL-ConfigurationCommon* and *tdd*-*UL-DL-ConfigurationDedicated* if provided, or when *tdd-UL-DL-ConfigurationCommon* and *tdd*-*UL-DL-ConfigurationDedicated* are not provided to the UE

- the UE receives PDSCH or CSI-RS in the set of symbols of the slot if the UE receives a corresponding indication by a DCI format

- the UE transmits PUSCH, PUCCH, PRACH, or SRS in the set of symbols of the slot if the UE receives a corresponding indication by a DCI format, a RAR UL grant, fallbackRAR UL grant, or successRAR

For operation on a single carrier in unpaired spectrum, if a UE is configured by higher layers to receive a PDCCH, or a PDSCH, or a CSI-RS, or a DL PRS in a set of symbols of a slot, the UE receives the PDCCH, the PDSCH, the CSI-RS, or the DL PRS if the UE does not detect a DCI format that indicates to the UE to transmit a PUSCH, a PUCCH, a PRACH, or a SRS in at least one symbol of the set of symbols of the slot; otherwise, the UE does not receive the PDCCH, or the PDSCH, or the CSI-RS, or the DL PRS in the set of symbols of the slot.

For operation with shared spectrum channel access, if a UE is provided *csi-RS-ValidationWith-DCI*, is not provided *CO-DurationsPerCell*, and is not provided *SlotFormatCombinationsPerCell*, and if the UE is configured by higher layers to receive a CSI-RS in a set of symbols of a slot, the UE cancels the CSI-RS reception in the set of symbols of the slot if the UE does not detect a DCI format indicating an aperiodic CSI-RS reception or scheduling a PDSCH reception in the set of symbols of the slot.

If a UE is provided *channelAccessMode ='dynamic'* and is provided *availableRB-SetsToAddModList* and *availableRB-SetsToRelease*, the UE expects to be provided *co-DurationsPerCellToAddModList* and *co-DurationsPerCellToReleaseList* and/or *slotFormatCombToAddModList* and *slotFormatCombToReleaseList*.

For operation on a single carrier in unpaired spectrum, if a UE is configured by higher layers to transmit SRS, or PUCCH, or PUSCH, or PRACH in a set of symbols of a slot and the UE detects a DCI format indicating to the UE to receive CSI-RS or PDSCH in a subset of symbols from the set of symbols, then

- the UE does not expect to cancel the transmission in symbols from the set of symbols that occur, relative to a last symbol of a CORESET where the UE detects the DCI format, after a number of symbols that is smaller than the PUSCH preparation time $T\_{proc,2}$ for the corresponding UE processing capability [6, TS 38.214] assuming $d\_{2,1}=1$ and $μ$ corresponds to the smallest SCS configuration between the SCS configuration of the PDCCH carrying the DCI format and the SCS configuration of the SRS, PUCCH, PUSCH or $μ\_{r}$, where $μ\_{r}$ corresponds to the SCS configuration of the PRACH if it is 15kHz or higher; otherwise $μ\_{r}=0$

- the UE cancels the PUCCH, or the PUSCH, or an actual repetition of the PUSCH [6, TS 38.214], determined from Clauses 9 and 9.2.5 or Clause 6.1 of [6. TS 38.214], or the PRACH transmission in remaining symbols from the set of symbols and cancels the SRS transmission in remaining symbols from the subset of symbols

For a set of symbols of a slot that are indicated to a UE as uplink by *tdd-UL-DL-ConfigurationCommon*, or *tdd-UL-DL-ConfigurationDedicated*, the UE does not receive PDCCH, PDSCH, or CSI-RS when the PDCCH, PDSCH, or CSI-RS overlaps, even partially, with the set of symbols of the slot.

For a set of symbols of a slot that are indicated to a UE as uplink by *tdd-UL-DL-ConfigurationCommon*, or *tdd-UL-DL-ConfigurationDedicated*, the UE does not receive DL PRS in the set of symbols of the slot, if the UE is not provided with a measurement gap.

For a set of symbols of a slot that are indicated to a UE as downlink by *tdd-UL-DL-ConfigurationCommon*, or *tdd-UL-DL-ConfigurationDedicated*, the UE does not transmit PUSCH, PUCCH, PRACH, or SRS when the PUSCH, PUCCH, PRACH, or SRS overlaps, even partially, with the set of symbols of the slot.

For a set of symbols of a slot that are indicated to a UE as flexible by *tdd-UL-DL-ConfigurationCommon*, and *tdd-UL-DL-ConfigurationDedicated* if provided, the UE does not expect to receive both dedicated higher layer parameters configuring transmission from the UE in the set of symbols of the slot and dedicated higher layer parameters configuring reception by the UE in the set of symbols of the slot.

For operation on a single carrier in unpaired spectrum, for a set of symbols of a slot indicated to a UE by *ssb-PositionsInBurst* in *SIB1* or *ssb-PositionsInBurst* in *ServingCellConfigCommon*, for reception of SS/PBCH blocks, the UE does not transmit PUSCH, PUCCH, PRACH in the slot if a transmission would overlap with any symbol from the set of symbols and the UE does not transmit SRS in the set of symbols of the slot. The UE does not expect the set of symbols of the slot to be indicated as uplink by *tdd-UL-DL-ConfigurationCommon*, or *tdd-UL-DL-ConfigurationDedicated*, when provided to the UE.

If a UE

- is configured with multiple serving cells and is provided with *directionalCollisionHandling-r16* = 'enabled' for at least two serving cells, and

- is not capable of simultaneous transmission and reception on any of the multiple serving cells as indicated with *simultaneousRxTxInterBandCA* capability, and

- indicates support of capability for half-duplex operation in CA with unpaired spectrum with *half-DuplexTDD-CA-SameSCS-r16* capability, and

- is not configured to monitor PDCCH for detection of DCI format 2\_0 on any of the multiple serving cells,

for a set of symbols of a slot that are indicated to the UE for reception of SS/PBCH blocks in any of multiple serving cells by *ssb-PositionsInBurst* in *SystemInformationBlockType1* or by *ssb-PositionsInBurst* in *ServingCellConfigCommon*, when provided to the UE, the UE does not transmit PUSCH, PUCCH, or PRACH in the slot if a transmission would overlap with any symbol from the set of symbols, and the UE does not transmit SRS in the set of symbols of the slot in any of multiple serving cells.

For a set of symbols of a slot corresponding to a valid PRACH occasion and  symbols before the valid PRACH occasion, as described in Clause 8.1, the UE does not receive PDCCH, PDSCH, or CSI-RS in the slot if a reception would overlap with any symbol from the set of symbols. The UE does not expect the set of symbols of the slot to be indicated as downlink by *tdd-UL-DL-ConfigurationCommon* or *tdd-UL-DL-ConfigurationDedicated*.

For a set of symbols of a slot indicated to a UE by *pdcch-ConfigSIB1* in *MIB* for a CORESET for Type0-PDCCH CSS set, the UE does not expect the set of symbols to be indicated as uplink by *tdd-UL-DL-ConfigurationCommon*, or *tdd-UL-DL-ConfigurationDedicated*.

If a UE is scheduled by a DCI format to receive PDSCH over multiple slots, and if *tdd-UL-DL-ConfigurationCommon*, or *tdd-UL-DL-ConfigurationDedicated*, indicate that, for a slot from the multiple slots, at least one symbol from a set of symbols where the UE is scheduled PDSCH reception in the slot is an uplink symbol, the UE does not receive the PDSCH in the slot.

If a UE is scheduled by a DCI format to transmit PUSCH over multiple slots, and if *tdd-UL-DL-ConfigurationCommon*, or *tdd-UL-DL-ConfigurationDedicated*, indicates that, for a slot from the multiple slots, at least one symbol from a set of symbols where the UE is scheduled PUSCH transmission in the slot is a downlink symbol, the UE does not transmit the PUSCH in the slot.

If a UE

- is configured with multiple serving cells and is provided with *directionalCollisionHandling-r16* = 'enabled' for at least two serving cells, and

- is not capable of simultaneous transmission and reception on any of the multiple serving cells as indicated with *simultaneousRxTxInterBandCA* capability, and

- indicates support of capability for half-duplex operation in CA with unpaired spectrum with *half-DuplexTDD-CA-SameSCS-r16* capability, and

- is not configured to monitor PDCCH for detection of DCI format 2-0 on any of the multiple serving cells,

the UE determines a reference cell for a symbol as an active cell with the smallest cell index among serving cells where the symbol is configured as

- downlink, or uplink, as indicated by *tdd-UL-DL-ConfigurationCommon* or *tdd-UL-DL-ConfigurationDedicated*

- uplink, if the symbol is flexible and the UE is configured to transmit SRS, PUCCH, PUSCH, or PRACH on the symbol

- downlink, if the symbol is flexible and the UE is configured to receive PDCCH, PDSCH or CSI-RS on the symbol

If a UE

- is configured with multiple serving cells in a frequency band and is provided with  *directionalCollisionHandling-r16* = 'enabled' for at least two serving cells, and

- is not capable of simultaneous transmission and reception on any of the multiple serving cells as indicated with *simultaneousRxTxInterBandCA* capability, and

- indicates support of capability for half-duplex operation in CA with unpaired spectrum with *half-DuplexTDD-CA-SameSCS-r16* capability, and

- is not configured to monitor PDCCH for detection of DCI format 2\_0 on any of the multiple serving cells,

the UE does not expect

- a symbol to be indicated as downlink or uplink on the reference cell and as uplink or downlink on another cell, respectively, by *tdd-UL-DL-ConfigurationCommon* or by *tdd-UL-DL-ConfigurationDedicated*,

- *tdd-UL-DL-ConfigurationCommon* or *tdd-UL-DL-ConfigDedicated* to indicate a symbol as downlink on the reference cell and to detect a DCI format scheduling a transmission on the symbol on another cell, and

- to be configured by higher layers to receive PDCCH, PDSCH, or CSI-RS on a flexible symbol on the reference cell and to detect a DCI format scheduling a transmission on the symbol on another cell.

If the reference cell and another cell for a UE operate in different frequency bands and if the UE

- is configured with multiple serving cells and is provided with *directionalCollisionHandling-r16* = 'enabled' for at least two serving cells, and

- is not capable of simultaneous transmission and reception on any of the multiple serving cells as indicated with *simultaneousRxTxInterBandCA* capability, and

- indicates support of capability for half-duplex operation in CA with unpaired spectrum with *half-DuplexTDD-CA-SameSCS-r16* capability, and

- is not configured to monitor PDCCH for detection of DCI format 2-0 on any of the multiple serving cells,

the UE

- UE assumes symbol as flexible, is not required to receive higher layer configured PDCCH, PDSCH, or CSI-RS and not expected to transmit higher layers configured SRS, PUCCH, PUSCH, or PRACH, when *tdd-UL-DL-ConfigurationCommon* or *tdd-UL-DL-ConfigurationDedicated* indicates symbol as downlink or uplink on the other cell and as uplink or downlink for the reference cell, respectively,

- transmits a signal/channel scheduled by a DCI format on a symbol of the other cell when the symbol is indicated as downlink by *tdd-UL-DL-ConfigurationCommon* or *tdd-UL-DL-ConfigDedicated* for the reference cell,

- is not required to receive a higher layer configured PDCCH, PDSCH, or CSI-RS on flexible symbols on the reference cell in a set of symbols, if the UE detects a DCI format scheduling a transmission on one or more symbols in the set of symbols on the other cell.

If a UE

- is configured with multiple serving cells and is provided with *directionalCollisionHandling-r16* = 'enabled' for at least two serving cells, and

- is not capable of simultaneous transmission and reception on any cell from the multiple serving cells as indicated with *simultaneousRxTxInterBandCA* capability, and

- indicates support of capability for half-duplex operation in CA with unpaired spectrum with *half-DuplexTDD-CA-SameSCS-r16* capability, and

- is not configured to monitor PDCCH for detection of DCI format 2-0 on any of the multiple serving cells,

the UE

- does not expect *tdd-UL-DL-ConfigurationCommon* or *tdd-UL-DL-ConfigurationDedicated* for the reference cell to indicate a symbol as uplink and to detect a DCI format scheduling a reception on the symbol on another cell

- does not expect to be configured by higher layers to transmit SRS, PUCCH, PUSCH, or PRACH on a flexible symbol on the reference cell and to detect a DCI format scheduling a reception on the symbol on another cell

- does not transmit a PUCCH, PUSCH or PRACH that is configured by higher layers on a set of symbols on another cell if at least one symbol from the set of symbols is indicated as downlink by *tdd-UL-DL-ConfigurationCommon* or *tdd-UL-DL-ConfigurationDedicated* or is a symbol corresponding to a PDCCH, PDSCH, or CSI-RS reception that is configured by higher layers on the reference cell

- does not transmit a SRS that is configured by higher layers on a set of symbols on another cell if the set of symbols is indicated as downlink by *tdd-UL-DL-ConfigurationCommon* or *tdd-UL-DL-ConfigurationDedicated* or corresponds to a PDCCH, PDSCH or CSI-RS reception that is configured by higher layers on the reference cell

- does not receive a PDCCH, PDSCH or CSI-RS that is configured by higher layers on a set of symbols on another cell if at least one symbol from the set of symbols is indicated as uplink by *tdd-UL-DL-ConfigurationCommon* or *tdd-UL-DL-ConfigurationDedicated* or is a symbol corresponding to a SRS, PUCCH, PUSCH, or PRACH transmission that is configured by higher layers on the reference cell

- assumes a symbol indicated as downlink or uplink by *tdd-UL-DL-ConfigurationCommon* or *tdd-UL-DL-ConfigurationDedicated* on another cell to be flexible, if the UE is respectively configured by higher layers to transmit SRS, PUCCH, PUSCH, or PRACH or to receive PDCCH, PDSCH, or CSI-RS on the reference cell

- does not expect to detect a first DCI format scheduling a transmission or reception on a symbol on a first cell and a second DCI format scheduling a reception or transmission on the symbol on a second cell, respectively