**3GPP TSG-RAN WG2 Meeting #126 *R2-240XXXX***

**Fukuoka, Japan, May 20 – 24, 2024**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.321** | **CR** | **1851** | **rev** | **1** | **Current version:** | **18.1.0** |  |
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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:*** | Micellaneous MAC corrections for CE | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | ZTE Corporation | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_cov\_enh2-Core | | | | |  | ***Date:*** | | | 2024-06-06 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***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 can be 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-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | 1. Capture below RAN2 agreement made in RAN#125bis:  * **PRACH mask configuration is not supported for MSG1 based repetition in Re-18**  1. As observed in R2-2403125, in the procedure text of multple entry PHR for assumed PUSCH, the reporting of MPE field is missing. 2. As observed in R2-2402909, the size of Single Entry PHR with assumed PUSCH MAC CE should be variable instead of fixed, the MAC CE size can be 2 or 3 octets according to the value of E field. 3. Regarding the RACH resource selection for SI-request with Msg1 repetition, to capture the below agreements made in RAN2#126.  * **For non-REDCAP specific initial BWP, UE (both RedCap and non-RedCap UEs) use the parameters (e.g. rach-ConfigGeneric and ssb-perRACH-Occasion) in rach-ConfigCommon associated with the same repetition number only in case that rach-OccasionsSI is absent.** * **For non-REDCAP specific initial BWP, UE (both RedCap and non-RedCap UEs) use the other parameters (e.g. prach-RootSequenceIndex, msg1-SubcarrierSpacing etc) in rach-ConfigCommon associated with the same repetition number only regardless of whether or not rach-OccasionsSI is absent.** * **For REDCAP specific initial BWP, UE use the parameters (e.g. rach-ConfigGeneric and ssb-perRACH-Occasion) in rach-ConfigCommon associated with the same repetition number and (e)RedCap indication only in case that rach-OccasionsSI is absent.** * **For REDCAP specific initial BWP, UE use the other parameters (e.g. prach-RootSequenceIndex and msg1-SubcarrierSpacing etc) in rach-ConfigCommon associated with the same repetition number and (e)RedCap indication only regardless of whether or not rach-OccasionsSI is absent.**  1. About enhancement of multiple entry PHR with assumed PUSCH MAC CE, to capture the below agreements made in RAN2#126.  * **For the Multiple Entry PHR with assumed PUSCH MAC CE:** * **Ek indicates the presence of a PCMAX,f,c for assumed PUSCH field of Serving Cells for which Ci field is set to 1 and PCell.** * **The Serving Cells for which Ci field is set to 1 and PCell are indexed sequentially starting with PCell and followed by other Serving Cells in ascending order of *ServCellIndex* i.** * **The Ek field set to 1 indicates that a PCMAX,f,c for assumed PUSCH field for the kth Serving Cell is reported.** | | | | | | | | |
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| ***Summary of change:*** | | 1. In 5.1.2, remove the sentence that related to Msg1 repetition and RO mask configuration. 2. In 5.4.6, add procedure text for reporting MPE field when *phr-AssumedPUSCH-Reporting* is configured. 3. In 6.1.3.78, revise the text so that “Single Entry PHR with assumed PUSCH MAC CE” has variable size. 4. In 5.1.1b,for RACH procedure that iniitated by SI-request with Msg1 repetition, to clarify th at: 5. In non RedCap-specific initial BWP, the UE selects the RACH resource set that only associated with the same repetition number for this RACH procedure; 6. In RedCap-specific initial BWP, if configured, the UE selects the RACH resource set that associated with only RedCap indication and the same Msg1 repetition number; if such resource set is not configured and the UE is eRedCap UE, the UE selects the RACH resource set that associated with eRedCap indication and the same Msg1 repetition number; 7. In 6.1.3.79, update the definition of E fields, so the length of E fields can be variable depending on the the number of serving cells for which PH value is reported.   **Impact analysis**  Impacted 5G architecture options:  NR SA, NR-DC, NE-DC  Impacted functionality:  NR Further Coverage enhancement | | | | | | | | |
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| ***Consequences if not approved:*** | | 1. It is unclear whether PRACH mask configuration can be applied to Msg1 repetition. 2. The UE is unable to report MPE for FR2 serving cells when phr-AssumedPUSCH-Reporting is configured. 3. The size of Single Entry PHR with assumed PUSCH MAC CE is confused. 4. It is unclear which RACH common configuration should be applied in case of SI request with Msg1 repetition; 5. The size of multiple entry PHR with assumed PUSCH MAC CE may be large and cause signalling overhead. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 5.1.1b, 5.1.2, 5.4.6, 6.1.3.78, 6.1.3.79 | | | | | | | | |
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|  | | **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:*** | | 1. This CR is the outcome of [POST125bis][804][CE\_enh] MAC CR update (ZTE).  2. Capture the new agreements made in RAN2#126. | | | | | | | | |

Start of changes

### 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.

1> if contention-free Random Access Resources have been provided for this Random Access procedure and a Msg1 repetition number is indicated in *rach-ConfigDedicated*:

2> assume Msg1 repetition is applicable and Msg1 repetition number applicable for the current Random Access procedure is the Msg1 repetition number indicated in *rach-ConfigDedicated*.

1> else if contention free Random Access Resources have not been provided for this Random Access procedure and the BWP selected for the Random Access procedure is configured with set(s) of Random Access resources with *msg1-Repetitions* set to *true* and set(s) of Random Access resources without *msg1-Repetitions* set to *true*:

2> if the BWP selected for the Random Access procedure is configured with set(s) of Random Access resources associated with Msg1 repetition number 8 and the RSRP of the downlink pathloss reference is less than *rsrp-ThresholdMsg1-RepetitionNum8*:

3> assume Msg1 repetition is applicable and Msg1 repetition number applicable for the current Random Access procedure includes 8.

2> if the BWP selected for the Random Access procedure is configured with set(s) of Random Access resources associated with Msg1 repetition number 4 and the RSRP of the downlink pathloss reference is less than *rsrp-ThresholdMsg1-RepetitionNum4*:

3> assume Msg1 repetition is applicable and Msg1 repetition number applicable for the current Random Access procedure includes 4.

2> if the BWP selected for the Random Access procedure is configured with set(s) of Random Access resources associated with Msg1 repetition number 2 and the RSRP of the downlink pathloss reference is less than *rsrp-ThresholdMsg1-RepetitionNum2*:

3> assume Msg1 repetition is applicable and Msg1 repetition number applicable for the current Random Access procedure includes 2.

2> else if the RSRP of the downlink pathloss reference is not less than any configured *rsrp-ThresholdMsg1-RepetitionNumX*:

3> assume Msg1 repetition is not applicable for the current Random Access procedure.

1> else ifthe BWP selected for Random Access procedure is configured only with Random Access resources with *msg1-Repetitions* set to *true*:

2> assume Msg1 repetition is applicable for the current Random Access procedure;

2> if at least one of *rsrp-ThresholdMsg1-RepetitionNumX* is configured:

3> if *rsrp-ThresholdMsg1-RepetitionNum8* is configured and the RSRP of the downlink pathloss reference is less than *rsrp-ThresholdMsg1-RepetitionNum8*;

4> assume Msg1 repetition number applicable for the current Random Access procedure includes 8.

3> if *rsrp-ThresholdMsg1-RepetitionNum4* is configured and the RSRP of the downlink pathloss reference is less than *rsrp-ThresholdMsg1-RepetitionNum4*:

4> assume Msg1 repetition number applicable for the current Random Access procedure includes 4.

3> if *rsrp-ThresholdMsg1-RepetitionNum2* is configured and the RSRP of the downlink pathloss reference is less than *rsrp-ThresholdMsg1-RepetitionNum2*:

4> assume Msg1 repetition number applicable for the current Random Access procedure includes 2.

3> else if the RSRP of the downlink pathloss reference is not less than any configured *rsrp-ThresholdMsg1-RepetitionNumX*:

4> assume Msg1 repetition number applicable for the current Random Access procedure is the lowest Msg1 repetition number configured for this BWP.

2> else (none of *rsrp-ThresholdMsg1-RepetitionNumX* is configured):

3> assume Msg1 repetition number applicable for the current Random Access procedure is the Msg1 repetition number that configured for this BWP.

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 (e)RedCap and/or Slicing and/or SDT and/or MSG3 repetition and/or MSG1 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 (e)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 if there are more than one set of Random Access resources available which can be used for indicating all features triggering this Random Access procedure and Msg1 repetition is applicable for this Random Access procedure:

3> select the set of Random Access resources that associated with highest repetition number among the sets of Random Access resources.

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 with Msg1 repetition have been provided for this Random Access procedure and Msg1 repetition number is indicated in *rach-ConfigDedicated*, and RedCap is applicable for the current Random Access procedure:

2> select the set of Random Access resources that is only configured with RedCap indication and Msg1 repetition indication and associated with the indicated Msg1 repetition number for this Random Access procedure.

1> else if contention-free Random Access Resources with Msg1 repetition have been provided for this Random Access procedure and Msg1 repetition number is indicated in *rach-ConfigDedicated*, and eRedCap is applicable for the current Random Access procedure:

2> select the set of Random Access resources that is only configured with eRedCap indication and Msg1 repetition indication and associated with the indicated Msg1 repetition number 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; or

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

1> if contention-free Random Access Resources have been provided for this Random Access procedure and eRedCap is applicable for the current Random Access procedure and there is no set of Random Access resources available that is only configured with eRedCap indication 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> if the Random Access procedure is initiated by PDCCH order with DCI *PRACH association indicator* field set to 1 and *SSB-MTC-AdditionalPCI* is configured by upper layers, as specified in clause 7.3.1.2.1 of TS 38.212 [9]:

3> select the set of Random Access resources corresponding to the active *additionalPCI*.

2> else if the Random Access procedure is initiated by PDCCH order for an LTM candidate cell:

3> select the set of Random Access resources corresponding to the field *Cell indicator* in PDCCH order.

2> else if contention-free Random Access Resources with Msg1 repetition have been provided for this Random Access procedure, and Msg1 repetition number is indicated in *rach-ConfigDedicated*:

3> select the set of Random Access resources that is only configured with Msg1 repetition indication and associated with the indicated Msg1 repetition number for this Random Access procedure.

2> else if the Random Access procedure was initiated for SI request and Random Access Resources associated with Msg1 repetition for SI request and Msg1 repetition number have been provided for this Random Access procedure:

3> ifthe BWP selected for Random Access procedure is indicated by *initialUplinkBWP-RedCap*:

4> if RedCap is applicable for the current Random Access procedure:

5> select the set of Random Access Resources that is only configured with RedCap indication and Msg1 repetition indication and associated with the indicated Msg1 repetition number for this Random Access procedure.

4> else if eRedCap is applicable for the current Random Access procedure:

5> if there is one set of Random Access resources available that is only configured with RedCap indication and Msg1 repetition indication and associated with the indicated Msg1 repetition number:

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

5> else:

6> select the set of Random Access Resources that is only configured with eRedCap indication and Msg1 repetition indication and associated with the indicated Msg1 repetition number for this Random Access procedure.

~~4> else if eRedcap is applicable for the current Random Access procedure and there is one set of Random Access resources available that is only configured with eRedCap indication and Msg1 repetition indication and associated with the indicated Msg1 repetition number:~~

~~5> select this set of Random Access resources for this Random Access procedure.~~

3> else:

4> select the set of Random Access resources that is only configured with Msg1 repetition indication and associated with the indicated Msg1 repetition number for this Random Access procedure.

2> else:

3> 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

### 5.1.2 Random Access Resource selection

If the selected *RA\_TYPE* is set to *4-stepRA*, the MAC entity shall:

1> if the Random Access procedure was initiated for SpCell beam failure recovery (as specified in clause 5.17); and

1> if the *beamFailureRecoveryTimer* (in clause 5.17) is either running or not configured; and

1> if the contention-free Random Access Resources for beam failure recovery request associated with any of the SSBs and/or CSI-RSs have been explicitly provided by RRC; and

1> if at least one of the SSBs with SS-RSRP above *rsrp-ThresholdSSB* amongst the SSBs in *candidateBeamRSList* or the CSI-RSs with CSI-RSRP above *rsrp-ThresholdCSI-RS* amongst the CSI-RSs in *candidateBeamRSList* is available:

2> select an SSB with SS-RSRP above *rsrp-ThresholdSSB* amongst the SSBs in *candidateBeamRSList* or a CSI-RS with CSI-RSRP above *rsrp-ThresholdCSI-RS* amongst the CSI-RSs in *candidateBeamRSList*;

2> if CSI-RS is selected, and there is no *ra-PreambleIndex* associated with the selected CSI-RS:

3> set the *PREAMBLE\_INDEX* to a *ra-PreambleIndex* corresponding to the SSB in *candidateBeamRSList* which is quasi-colocated with the selected CSI-RS as specified in TS 38.214 [7].

2> else:

3> set the *PREAMBLE\_INDEX* to a *ra-PreambleIndex* corresponding to the selected SSB or CSI-RS from the set of Random Access Preambles for beam failure recovery request.

1> else if the *ra-PreambleIndex* has been explicitly provided by PDCCH; and

1> if the *ra-PreambleIndex* is not 0b000000:

2> set the *PREAMBLE\_INDEX* to the signalled *ra-PreambleIndex*;

2> select the SSB signalled by PDCCH.

1> else if the *ra-PreambleIndex* has been explicitly provided by an LTM Cell Switch Command MAC CE and the signalled SSB with SS-RSRP above *rsrp-ThresholdSSB* is available:

2> set the *PREAMBLE\_INDEX* to the signalled *ra-PreambleIndex*;

2> select the SSB signalled by the LTM Cell Switch Command MAC CE.

1> else if the contention-free Random Access Resources associated with SSBs have been explicitly provided in *rach-ConfigDedicated* and at least one SSB with SS-RSRP above *rsrp-ThresholdSSB* amongst the associated SSBs is available:

2> select an SSB with SS-RSRP above *rsrp-ThresholdSSB* amongst the associated SSBs;

2> set the *PREAMBLE\_INDEX* to a *ra-PreambleIndex* corresponding to the selected SSB.

1> else if the contention-free Random Access Resources associated with CSI-RSs have been explicitly provided in *rach-ConfigDedicated* and at least one CSI-RS with CSI-RSRP above *rsrp-ThresholdCSI-RS* amongst the associated CSI-RSs is available:

2> select a CSI-RS with CSI-RSRP above *rsrp-ThresholdCSI-RS* amongst the associated CSI-RSs;

2> set the *PREAMBLE\_INDEX* to a *ra-PreambleIndex* corresponding to the selected CSI-RS.

1> else if the Random Access procedure was initiated for SI request (as specified in TS 38.331 [5]); and

1> if the Random Access Resources for SI request have been explicitly provided by RRC:

2> if at least one of the SSBs with SS-RSRP above *rsrp-ThresholdSSB* is available:

3> select an SSB with SS-RSRP above *rsrp-ThresholdSSB*.

2> else:

3> select any SSB.

2> select a Random Access Preamble corresponding to the selected SSB, from the Random Access Preamble(s) determined according to *ra-PreambleStartIndex* as specified in TS 38.331 [5];

2> set the *PREAMBLE\_INDEX* to selected Random Access Preamble.

1> else (i.e. for the contention-based Random Access preamble selection):

2> if at least one of the SSBs with SS-RSRP above *rsrp-ThresholdSSB* is available:

3> select an SSB with SS-RSRP above *rsrp-ThresholdSSB*.

2> else:

3> select any SSB.

2> if the *RA\_TYPE* is switched from *2-stepRA* to *4-stepRA*:

3> if a Random Access Preambles group was selected during the current Random Access procedure:

4> select the same group of Random Access Preambles as was selected for the 2-step RA type.

3> else:

4> if Random Access Preambles group B is configured; and

4> if the transport block size of the MSGA payload configured in the *rach-ConfigDedicated* corresponds to the transport block size of the MSGA payload associated with Random Access Preambles group B:

5> select the Random Access Preambles group B.

4> else:

5> select the Random Access Preambles group A.

2> else if Msg3 buffer is empty:

3> if Random Access Preambles group B is configured:

4> if the potential Msg3 size (UL data available for transmission plus MAC subheader(s) and, where required, MAC CEs) is greater than *ra-Msg3SizeGroupA* and the pathloss is less than *PCMAX* (of the Serving Cell performing the Random Access Procedure) – *preambleReceivedTargetPower* – *msg3-DeltaPreamble* – *messagePowerOffsetGroupB*; or

4> if the Random Access procedure was initiated for the CCCH logical channel and the CCCH SDU size plus MAC subheader is greater than *ra-Msg3SizeGroupA*:

5> select the Random Access Preambles group B.

4> else:

5> select the Random Access Preambles group A.

3> else:

4> select the Random Access Preambles group A.

2> else (i.e. Msg3 is being retransmitted):

3> select the same group of Random Access Preambles as was used for the Random Access Preamble transmission attempt corresponding to the first transmission of Msg3.

2> select a Random Access Preamble randomly with equal probability from the Random Access Preambles associated with the selected SSB and the selected Random Access Preambles group;

2> set the *PREAMBLE\_INDEX* to the selected Random Access Preamble.

1> if the Random Access procedure was initiated for SI request (as specified in TS 38.331 [5]); and

1> if *ra-AssociationPeriodIndex* and *si-RequestPeriod* are configured:

2> determine the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB in the association period given by *ra-AssociationPeriodIndex* in the *si-RequestPeriod* permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured (the MAC entity shall select a PRACH occasion randomly with equal probability amongst the consecutive PRACH occasions according to clause 8.1 of TS 38.213 [6] corresponding to the selected SSB).

1> else if an SSB is selected above:

2> if the set of Random Access resources associated with Msg1 repetition is selected for this Random Access procedure:

3> determine the next available set of PRACH occasions (as specified in TS 38.213 [6]) for the Msg1 repetition number applicable for this Random Access procedure corresponding to the selected SSB (the MAC entity shall select a set of PRACH occasions randomly with equal probability amongst sets of PRACH occasions according to clause 8.1 of TS 38.213 [6] regardless the FR2 UL gap, corresponding to the selected SSB and selected Msg1 repetition number for this Random Access procedure; the MAC entity may take into account the possible occurrence of measurement gaps and MUSIM gaps when determining the next available set of PRACH occasions corresponding to the selected SSB).

2> else:

3> determine the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, or *ssb-SharedRO-MaskIndex* if configured, or indicated by PDCCH, or indicated by the LTM Cell Switch Command MAC CE (the MAC entity shall select a PRACH occasion randomly with equal probability amongst the consecutive PRACH occasions according to clause 8.1 of TS 38.213 [6] regardless the FR2 UL gap, corresponding to the selected SSB; the MAC entity may take into account the possible occurrence of measurement gaps and MUSIM gaps when determining the next available PRACH occasion corresponding to the selected SSB).

1> else if a CSI-RS is selected above:

2> if there is no contention-free Random Access Resource associated with the selected CSI-RS:

3> determine the next available PRACH occasion from the PRACH occasions, permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, corresponding to the SSB in *candidateBeamRSList* which is quasi-colocated with the selected CSI-RS as specified in TS 38.214 [7] (the MAC entity shall select a PRACH occasion randomly with equal probability amongst the consecutive PRACH occasions according to clause 8.1 of TS 38.213 [6] regardless the FR2 UL gap, corresponding to the SSB which is quasi-colocated with the selected CSI-RS; the MAC entity may take into account the possible occurrence of measurement gaps and MUSIM gaps when determining the next available PRACH occasion corresponding to the SSB which is quasi-colocated with the selected CSI-RS).

2> else:

3> determine the next available PRACH occasion from the PRACH occasions in *ra-OccasionList* corresponding to the selected CSI-RS (the MAC entity shall select a PRACH occasion randomly with equal probability amongst the PRACH occasions occurring simultaneously but on different subcarriers regardless the FR2 UL gap, corresponding to the selected CSI-RS; the MAC entity may take into account the possible occurrence of measurement gaps and MUSIM gaps when determining the next available PRACH occasion corresponding to the selected CSI-RS).

1> perform the Random Access Preamble transmission procedure (see clause 5.1.3).

NOTE 1: When the UE determines if there is an SSB with SS-RSRP above *rsrp-ThresholdSSB* or a CSI-RS with CSI-RSRP above *rsrp-ThresholdCSI-RS*, the UE uses the latest unfiltered L1-RSRP measurement.

NOTE 2: Void.

NOTE 3: If an (e)RedCap UE in RRC\_IDLE or RRC\_INACTIVE mode is configured with a BWP indicated by *initialDownlinkBWP-RedCap* which is not associated with any SSB, SS-RSRP measurement is performed based on the SSB associated with the BWP indicated by *initialDownlinkBWP*. If an (e)RedCap UE in RRC\_INACTIVE mode is configured with SDT and with a BWP indicated by *initialDownlinkBWP-RedCap* which is associated with NCD-SSB, SS-RSRP measurement can also be performed based on this NCD-SSB during SDT.

NOTE 4: If an (e)RedCap UE in RRC\_IDLE or RRC\_INACTIVE mode is configured with a BWP indicated by *initialDownlinkBWP-RedCap* which is not associated with any SSB for RACH, it is up to the UE implementation to perform a new RSRP measurements before Msg1/MsgA retransmission.

Next change

### 5.4.6 Power Headroom Reporting

The Power Headroom reporting procedure is used to provide the serving gNB with the following information:

- Type 1 power headroom: the difference between the nominal UE maximum transmit power and the estimated power for UL-SCH transmission per activated Serving Cell;

- Type 2 power headroom: the difference between the nominal UE maximum transmit power and the estimated power for UL-SCH and PUCCH transmission on SpCell of the other MAC entity (i.e. E-UTRA MAC entity in EN-DC, NE-DC, and NGEN-DC cases);

- Type 3 power headroom: the difference between the nominal UE maximum transmit power and the estimated power for SRS transmission per activated Serving Cell;

- MPE P-MPR: the power backoff to meet the MPE FR2 requirements for a Serving Cell operating on FR2;

- DPC: the adjustment to maximum output power for a given power class for a Serving Cell operating on FR1;

- DPCBC: the adjustment to maximum output power for a given power class for a Band Combination operating on FR1.

RRC controls Power Headroom reporting by configuring the following parameters:

- *dpc-Reporting-FR1*;

- *phr-AssumedPUSCH-Reporting*;

- *phr-PeriodicTimer*;

- *phr-ProhibitTimer*;

- *phr-Tx-PowerFactorChange*;

- *phr-Type2OtherCell*;

- *phr-ModeOtherCG*;

- *multiplePHR*;

- *mpe-Reporting-FR2*;

- *mpe-ProhibitTimer*;

- *mpe-Threshold*;

- *numberOfN*;

- *mpe-ResourcePoolToAddModList*;

- *twoPHRMode*.

A Power Headroom Report (PHR) shall be triggered if any of the following events occur:

- *phr-ProhibitTimer* expires or has expired and the path loss has changed more than *phr-Tx-PowerFactorChange* dB for at least one RS used as pathloss reference for one activated Serving Cell of any MAC entity of which the active DL BWP is not dormant BWP since the last transmission of a PHR in this MAC entity when the MAC entity has UL resources for new transmission;

NOTE 1: The path loss variation for one cell assessed above is between the pathloss measured at present time on the current pathloss reference and the pathloss measured at the transmission time of the last transmission of PHR on the pathloss reference in use at that time, irrespective of whether the pathloss reference has changed in between. The current pathloss reference for this purpose does not include any pathloss reference configured using *pathlossReferenceRS-Pos* in TS 38.331 [5].

- *phr-PeriodicTimer* expires;

- upon configuration or reconfiguration of the power headroom reporting functionality by upper layers, which is not used to disable the function;

- activation of an SCell of any MAC entity with configured uplink of which *firstActiveDownlinkBWP-Id* is not set to dormant BWP;

- activation of an SCG;

- addition of the PSCell except if the SCG is deactivated (i.e. PSCell is newly added or changed);

- *phr-ProhibitTimer* expires or has expired, when the MAC entity has UL resources for new transmission, and the following is true for any of the activated Serving Cells of any MAC entity with configured uplink:

- there are UL resources allocated for transmission or there is a PUCCH transmission on this cell, and the required power backoff due to power management (as allowed by P-MPRc as specified in TS 38.101-1 [14], TS 38.101-2 [15], and TS 38.101-3 [16]) for this cell has changed more than *phr-Tx-PowerFactorChange* dB since the last transmission of a PHR when the MAC entity had UL resources allocated for transmission or PUCCH transmission on this cell.

- Upon switching of activated BWP from dormant BWP to non-dormant DL BWP of an SCell of any MAC entity with configured uplink;

- if *dpc-Reporting-FR1* is configured, ΔPPowerClass /ΔPPowerClass, CA/ΔPPowerClass, EN-DC/ΔPPowerClass, NR-DC reporting is triggered upon uplink duty cycle exceedance or upon return to the power class after the duty cycle exceedance, as specified in TS 38.101-1 [14] and TS 38.101-3 [16]).

- if *mpe-Reporting-FR2* is configured, and *mpe-ProhibitTimer* is not running:

- the measured P-MPR applied to meet FR2 MPE requirements as specified in TS 38.101-2 [15] is equal to or larger than *mpe-Threshold* for at least one activated FR2 Serving Cell since the last transmission of a PHR in this MAC entity; or

- the measured P-MPR applied to meet FR2 MPE requirements as specified in TS 38.101-2 [15] has changed more than *phr-Tx-PowerFactorChange* dB for at least one activated FR2 Serving Cell since the last transmission of a PHR due to the measured P-MPR applied to meet MPE requirements being equal to or larger than *mpe-Threshold* in this MAC entity.

in which case the PHR is referred below to as 'MPE P-MPR report'.

NOTE 2: The MAC entity should avoid triggering a PHR when the required power backoff due to power management decreases only temporarily (e.g. for up to a few tens of milliseconds) and it should avoid reflecting such temporary decrease in the values of PCMAX,f,c/PH when a PHR is triggered by other triggering conditions.

NOTE 3: If a HARQ process is configured with *cg-RetransmissionTimer* and if the PHR is already included in a MAC PDU for transmission on configured grant by this HARQ process, but not yet transmitted by lower layers, it is up to UE implementation how to handle the PHR content.

If the MAC entity has UL resources allocated for a new transmission the MAC entity shall:

1> if it is the first UL resource allocated for a new transmission since the last MAC reset:

2> start *phr-PeriodicTimer*.

1> if the Power Headroom reporting procedure determines that at least one PHR has been triggered and not cancelled; and

1> if the allocated UL resources can accommodate the MAC CE for PHR which the MAC entity is configured to transmit, plus its subheader, as a result of LCP as defined in clause 5.4.3.1:

2> if *multiplePHR* with value *true* is configured:

3> for each activated Serving Cell with configured uplink associated with any MAC entity of which the active DL BWP is not dormant BWP; and

3> for each activated Serving Cell with configured uplink associated with E-UTRA MAC entity:

4> if this MAC entity is configured with *twoPHRMode*:

5> if this Serving Cell is configured with *multipanelSchemeSDM* or *multipanelSchemeSFN* and the MAC entity this Serving Cell belongs to is configured with *twoPHRMode*:

6> obtain two values of the Type 1 power headroom for the corresponding uplink carrier as specified in clause 7.7 of TS 38.213 [6] for NR Serving Cell.

5> else if this Serving Cell is configured with multiple TRP PUSCH repetition (i.e., not configured with *multipanelSchemeSDM* or *multipanelSchemeSFN*) and the MAC entity this Serving Cell belongs to is configured with *twoPHRMode*:

6> obtain two values of the Type 1 or the value of Type 3 power headroom for the corresponding uplink carrier as specified in clause 7.7 of TS 38.213 [6] for NR Serving Cell.

5> else:

6> obtain the value of the Type 1 or Type 3 power headroom for the corresponding uplink carrier as specified in clause 7.7 of TS 38.213 [6] for NR Serving Cell and clause 5.1.1.2 of TS 36.213 [17] for E-UTRA Serving Cell.

4> else (i.e. this MAC entity is not configured with *twoPHRMode*):

5> if this Serving Cell is configured with multiple TRP PUSCH repetition or *multipanelSchemeSDM* or *multipanelSchemeSFN* and if the MAC entity this Serving Cell belongs to is configured with *twoPHRMode*:

6> if there is at least one real PUSCH transmission at the slot where the PHR MAC CE is transmitted:

7> obtain the value of the Type 1 power headroom of the first real transmission of the corresponding uplink carrier as specified in clause 7.7 of TS 38.213[6] for NR Serving Cell.

6> else if there is no real PUSCH transmission at the slot where the PHR MAC CE is transmitted:

7> obtain the value of the type 1 power headroom of the reference PUSCH transmission associated with the *SRS-ResourceSet* with a lower *SRS-resourceSetID* or the value of the type 3 power headroom for the corresponding uplink carrier as specified in clause 7.7 of TS 38.213[6] for NR Serving Cell.

5> else:

6> obtain the value of the Type 1 or Type 3 power headroom for the corresponding uplink carrier as specified in clause 7.7 of TS 38.213 [6] for NR Serving Cell and clause 5.1.1.2 of TS 36.213 [17] for E-UTRA Serving Cell.

4> if this MAC entity is configured with *phr-AssumedPUSCH-Reporting*:

5> if this MAC entity has UL resources allocated for transmission on this Serving Cell; or

5> if the other MAC entity, if configured, has UL resources allocated for transmission on this Serving Cell and *phr-ModeOtherCG* is set to *real* by upper layers:

6> if *dynamicTransformPrecoderFieldPresenceDCI-0-1-r18* or *dynamicTransformPrecoderFieldPresenceDCI-0-2-r18* is set to *enabled* in the active BWP of this Serving Cell:

7> obtain the value for the corresponding PCMAX,f,c field for assumed PUSCH from the physical layer if available, as specified in clause 7.7 of TS 38.213 [6].

6> obtain the value for the corresponding PCMAX,f,c field from the physical layer.

6> if *mpe-Reporting-FR2* is configured and this Serving Cell operates on FR2 and this Serving Cell is associated to this MAC entity:

7> obtain the value for the corresponding MPE field from the physical layer.

4> else (i.e. if this MAC entity is not configured with *phr-AssumedPUSCH-Reporting*):

5> if this MAC entity is configured with *twoPHRMode* and if this Serving Cell is configured with *multipanelSchemeSDM* or *multipanelSchemeSFN*:

6> obtain two values for the corresponding PCMAX,f,c,k fields from the physical layer.

6> if *mpe-Reporting-FR2* is configured and this Serving Cell operates on FR2 and this Serving Cell is associated to this MAC entity:

7> obtain two values for the corresponding MPEk fields from the physical layer.

5> else:

6> if this MAC entity has UL resources allocated for transmission on this Serving Cell; or

6> if the other MAC entity, if configured, has UL resources allocated for transmission on this Serving Cell and *phr-ModeOtherCG* is set to *real* by upper layers:

7> obtain the value for the corresponding PCMAX,f,c field from the physical layer.

7> if *mpe-Reporting-FR2* is configured and this Serving Cell operates on FR2 and this Serving Cell is associated to this MAC entity:

8> obtain the value for the corresponding MPE field from the physical layer.

7> if *mpe-Reporting-FR2-r17* is configured and this Serving Cell operates on FR2 and this Serving Cell is associated to this MAC entity:

8> obtain the value for the corresponding MPEi field from the physical layer;

8> obtain the value for the corresponding Resourcei field from the physical layer.

7> if *dpc-Reporting-FR1* is configured and ΔPPowerClass /ΔPPowerClass, CA/ΔPPowerClass, EN-DC/ΔPPowerClass, NR-DC reporting is triggered and this Serving Cell operates on FR1 and this Serving Cell is associated to this MAC entity:

8> obtain the value for the corresponding DPC field(s) from the physical layer.

3> if *phr-Type2OtherCell* with value *true* is configured:

4> if the other MAC entity is E-UTRA MAC entity:

5> obtain the value of the Type 2 power headroom for the SpCell of the other MAC entity (i.e. E-UTRA MAC entity);

5> if *phr-ModeOtherCG* is set to *real* by upper layers:

6> obtain the value for the corresponding PCMAX,f,c field for the SpCell of the other MAC entity (i.e. E-UTRA MAC entity) from the physical layer.

3> if this MAC entity is configured with *mpe-Reporting-FR2-r17*:

4> instruct the Multiplexing and Assembly procedure to generate and transmit the Enhanced Multiple entry PHR as defined in clause 6.1.3.49 based on the values reported by the physical layer.

3> else if this MAC entity is configured with *twoPHRMode* and any associated Serving Cell is configured with *multipanelSchemeSDM* or *multipanelSchemeSFN*:

4> instruct the Multiplexing and Assembly procedure to generate and transmit the Enhanced Multiple Entry PHR for multiple TRP STx2P MAC CE as defined in clause 6.1.3.YY based on the values reported by the physical layer.

3> else if this MAC entity is configured with *twoPHRMode* and any associated Serving Cell is configured with multiple TRP PUSCH repetition:

4> instruct the Multiplexing and Assembly procedure to generate and transmit the Enhanced Multiple Entry PHR for multiple TRP MAC CE as defined in clause 6.1.3.51 based on the values reported by the physical layer.

3> else if this MAC entity is configured with *phr-AssumedPUSCH-Reporting*:

4> instruct the Multiplexing and Assembly procedure to generate and transmit the Multiple Entry PHR with assumed PUSCH MAC CE as defined in clause 6.1.3.78 based on the values reported by the physical layer.

3> else:

4> instruct the Multiplexing and Assembly procedure to generate and transmit the Multiple Entry PHR MAC CE as defined in clause 6.1.3.9 based on the values reported by the physical layer.

2> else (i.e. Single Entry PHR format is used):

3> if this MAC entity is configured with *twoPHRMode* for multiple TRP PUSCH repetition or *multipanelSchemeSDM* or *multipanelSchemeSFN*:

4> obtain two values of the Type 1 power headroom from the physical layer for the corresponding uplink carrier of the PCell.

3> else:

4> obtain the value of the Type 1 power headroom from the physical layer for the corresponding uplink carrier of the PCell.

3> if this MAC entity is configured with *phr-AssumedPUSCH-Reporting*:

4> if *dynamicTransformPrecoderFieldPresenceDCI-0-1-r18* or *dynamicTransformPrecoderFieldPresenceDCI-0-2-r18* is set to *enabled* in the active BWP of this Serving Cell:

5> obtain the value for the corresponding PCMAX,f,c field for assumed PUSCH from the physical layer, if available, as specified in clause 7.7 of TS 38.213 [6].

3> if this MAC entity is configured with *twoPHRMode* and if this Serving Cell is configured with *multipanelSchemeSDM* or *multipanelSchemeSFN*:

4> obtain two values for the corresponding PCMAX,f,c,k fields from the physical layer.

4> if *mpe-Reporting-FR2* is configured and this Serving Cell operates on FR2 and this Serving Cell is associated to this MAC entity:

5> obtain two values for the corresponding MPEk fields from the physical layer.

3> else:

4> obtain the value for the corresponding PCMAX,f,c field from the physical layer;

4> if *mpe-Reporting-FR2* is configured and this Serving Cell operates on FR2:

5> obtain the value for the corresponding MPE field from the physical layer.

4> if *mpe-Reporting-FR2-r17* is configured and this Serving Cell operates on FR2 and this Serving Cell is associated to this MAC entity:

5> obtain the value for the corresponding MPEi field from the physical layer;

5> obtain the value for the corresponding Resourcei field from the physical layer.

4> if *dpc-Reporting-FR1* is configured and this Serving Cell operates on FR1:

5> obtain the value for the corresponding DPC field from the physical layer.

3> instruct the Multiplexing and Assembly procedure to generate and transmit the Enhanced Single entry PHR as defined in clause 6.1.3.48 if this MAC entity is configured with *mpe-Reporting-FR2-r17* or the Enhanced Single Entry PHR for multiple TRP MAC CE as defined in clause 6.1.3.50 if this MAC entity is configured with *twoPHRMode* or the Single Entry PHR with assumed PUSCH MAC CE as defined in clause 6.1.3.78 if this MAC entity is configured with *phr-AssumedPUSCH-Reporting* or the Single Entry PHR MAC CE as defined in clause 6.1.3.8 otherwise based on the values reported by the physical layer.

2> if this PHR report is an MPE P-MPR report:

3> start or restart the *mpe-ProhibitTimer*;

3> cancel triggered MPE P-MPR reporting for Serving Cells included in the PHR MAC CE.

2> start or restart *phr-PeriodicTimer*;

2> start or restart *phr-ProhibitTimer*;

2> cancel all triggered PHR(s).

All triggered PHRs shall be cancelled when there is an ongoing SDT procedure as in clause 5.27 and the UL grant(s) can accommodate all pending data available for transmission but is not sufficient to additionally accommodate the PHR MAC CE plus its subheader.

Next change

### 6.1.3 MAC Control Elements (CEs)

#### 6.1.3.78 Single Entry PHR with assumed PUSCH MAC CE

The Single Entry PHR with assumed PUSCH MAC CE is identified by a MAC subheader with eLCID as specified in Table 6.2.1-2.

It has a variable size and consists of two or three octets defined as follows (Figure 6.1.3.8-1):

- R: Reserved bit, set to 0;

- Power Headroom (PH): This field indicates the power headroom level. The length of the field is 6 bits. The reported PH and the corresponding power headroom levels are shown in Table 6.1.3.8-1 below (the corresponding measured values in dB are specified in TS 38.133 [11]);

- E: This field indicates the presence of a PCMAX,f,c for assumed PUSCH field for PCell. The E field set to 1 indicates that a PCMAX,f,c for assumed PUSCH field for PCell is reported. The E field set to 0 indicates that a PCMAX,f,c for assumed PUSCH field for PCell is not reported;

- P: If *mpe-Reporting-FR2* is configured and the Serving Cell operates on FR2, the MAC entity shall set this field to 0 if the applied P-MPR value, to meet MPE requirements, as specified in TS 38.101-2 [15], is less than P-MPR\_00 as specified in TS 38.133 [11] and to 1 otherwise. If *mpe-Reporting-FR2* is not configured or the Serving Cell operates on FR1, this field indicates whether power backoff is applied due to power management (as allowed by P-MPRc as specified in TS 38.101-1 [14], TS 38.101-2 [15], and TS 38.101-3 [16]). The MAC entity shall set the P field to 1 if the corresponding PCMAX,f,c field would have had a different value if no power backoff due to power management had been applied;

- PCMAX,f,c: This field indicates the PCMAX,f,c (as specified in TS 38.213 [6]) used for calculation of the preceding PH field. The reported PCMAX,f,c and the corresponding nominal UE transmit power levels are shown in Table 6.1.3.8-2 (the corresponding measured values in dBm are specified in TS 38.133 [11]);

- PCMAX,f,c for assumed PUSCH: This field indicates the PCMAX,f,c for assumed PUSCH(as specified in TS 38.213 [6]). The reported PCMAX,f,c and the corresponding nominal UE transmit power levels are shown in [Table 6.1.3.8-2] (the corresponding measured values in dBm are specified in TS 38.133 [11]);

- MPE: If *mpe-Reporting-FR2* is configured, and the Serving Cell operates on FR2, and if the P field is set to 1, this field indicates the applied power backoff to meet MPE requirements, as specified in TS 38.101-2 [15]. This field indicates an index to Table 6.1.3.8-3 and the corresponding measured values of P-MPR levels in dB are specified in TS 38.133 [11]. The length of the field is 2 bits. If *mpe-Reporting-FR2* is not configured, or if the Serving Cell operates on FR1, or if the P field is set to 0, R bits are present instead.



Figure 6.1.3.78-1: Single Entry PHR with assumed PUSCH MAC CE

Next change

#### 6.1.3.79 Multiple Entry PHR with assumed PUSCH MAC CE

The Multiple Entry PHR with assumed PUSCH MAC CE is identified by a MAC subheader with eLCID as specified in Table 6.2.1-2.

It has a variable size, and includes the bitmap, a Type 2 PH field , an octet containing the associated PCMAX,f,c field (if reported) and an octet containing the associated PCMAX,f,c field for assumed PUSCH (if reported) for SpCell of the other MAC entity; a Type 1 PH field, an octet containing the associated PCMAX,f,c field (if reported) and an octet containing the associated PCMAX,f,c field for assumed PUSCH (if reported) for the PCell. It further includes, in ascending order based on the *ServCellIndex*, one or multiple of Type X PH fields, octets containing the associated PCMAX,f,c fields (if reported) and octets containing the associated PCMAX,f,c fields for assumed PUSCH (if reported) for Serving Cells other than PCell indicated in the bitmap. X is either 1 or 3 according to TS 38.213 [6] and TS 36.213 [17].

The presence of Type 2 PH field for SpCell of the other MAC entity is configured by *phr-Type2OtherCell* with value *true*.

A single octet Ci bitmap is used for indicating the presence of PH per Serving Cell when the highest *ServCellIndex* of Serving Cell with configured uplink is less than 8, otherwise four octets are used.

The length of the Ek bitmap is based on the total number of Serving Cells, i.e. Serving Cells for which Ci field set to 1 and PCell. A single octet Ek bitmap is included if the total number of Serving Cells is greater than 0 and less than 9; a two octets Ek bitmap is included if the total number of Serving Cells is greater than 8 and less than 17; a three octets Ek bitmap is included if the total number of Serving Cells is greater than 16 and less than 25; a four octets Ek bitmap is included if the total number of Serving Cells is greater than 24; Ek bitmap is not included if the total number of Serving Cells is zero.The MAC entity determines whether PH value for an activated Serving Cell is based on real transmission or a reference format by considering the configured grant(s) and downlink control information which has been received until and including the PDCCH occasion in which the first UL grant for a new transmission that can accommodate the MAC CE for PHR as a result of LCP as defined in clause 5.4.3.1 is received since a PHR has been triggered if the PHR MAC CE is reported on an uplink grant received on the PDCCH or until the first uplink symbol of PUSCH transmission minus PUSCH preparation time as defined in clause 7.7 of TS 38.213 [6] if the PHR MAC CE is reported on a configured grant.

For a band combination in which the UE does not support dynamic power sharing, the UE may omit the octets containing Power Headroom field and PCMAX,f,c field for Serving Cells in the other MAC entity except for the PCell in the other MAC entity and the reported values of Power Headroom and PCMAX,f,c for the PCell are up to UE implementation.

The PHR MAC CEs are defined as follows:

- Ci: This field indicates the presence of a PH field for the Serving Cell with *ServCellIndex* i as specified in TS 38.331 [5]. The Ci field set to 1 indicates that a PH field for the Serving Cell with *ServCellIndex* i is reported. The Ci field set to 0 indicates that a PH field for the Serving Cell with *ServCellIndex* i is not reported;

- Ek: This field indicates the presence of a PCMAX,f,c for assumed PUSCH field of the kth Serving Cell. The Serving Cells for which Ci field is set to 1 and PCell are indexed sequentially starting with PCell and followed by other Serving cells in ascending order of *ServCellIndex* i as specified in TS 38.331 [5]. The Ek field set to 1 indicates that a PCMAX,f,c for assumed PUSCH field for the kth Serving Cell is reported. The Ek field set to 0 indicates that a PCMAX,f,c for assumed PUSCH field for the kth Serving Cell is not reported. For the E-UTRA Serving Cell, the corresponding Ek field is set to 0;

- R: Reserved bit, set to 0;

- V: This field indicates if the PH value is based on a real transmission or a reference format. For Type 1 PH, the V field set to 0 indicates real transmission on PUSCH and the V field set to 1 indicates that a PUSCH reference format is used. For Type 2 PH, the V field set to 0 indicates real transmission on PUCCH and the V field set to 1 indicates that a PUCCH reference format is used. For Type 3 PH, the V field set to 0 indicates real transmission on SRS and the V field set to 1 indicates that an SRS reference format is used. Furthermore, for Type 1, Type 2, and Type 3 PH, the V field set to 0 indicates the presence of the octet containing the associated PCMAX,f,c field and the MPE field, and the V field set to 1 indicates that the octet containing the associated PCMAX,f,c field and the MPE field is omitted;

- Power Headroom (PH): This field indicates the power headroom level. The length of the field is 6 bits. The reported PH and the corresponding power headroom levels are shown in Table 6.1.3.8-1 (the corresponding measured values in dB for the NR Serving Cell are specified in TS 38.133 [11] while the corresponding measured values in dB for the E-UTRA Serving Cell are specified in TS 36.133 [12]);

- P: If *mpe-Reporting-FR2* is configured and the Serving Cell operates on FR2, the MAC entity shall set this field to 0 if the applied P-MPR value, to meet MPE requirements, as specified in TS 38.101-2 [15], is less than P-MPR\_00 as specified in TS 38.133 [11] and to 1 otherwise. If *mpe-Reporting-FR2* is not configured or the Serving Cell operates on FR1, this field indicates whether power backoff is applied due to power management (as allowed by P-MPRc as specified in TS 38.101-1 [14], TS 38.101-2 [15], and TS 38.101-3 [16]). The MAC entity shall set the P field to 1 if the corresponding PCMAX,f,c field would have had a different value if no power backoff due to power management had been applied;

- PCMAX,f,c: If present, this field indicates the PCMAX,f,c (as specified in TS 38.213 [6]) for the NR Serving Cell and the PCMAX,c or P̃CMAX,c (as specified in TS 36.213 [17]) for the E-UTRA Serving Cell used for calculation of the preceding PH field. The reported PCMAX,f,c and the corresponding nominal UE transmit power levels are shown in Table 6.1.3.8-2 (the corresponding measured values in dBm for the NR Serving Cell are specified in TS 38.133 [11] while the corresponding measured values in dBm for the E-UTRA Serving Cell are specified in TS 36.133 [12]);

- PCMAX,f,c for assumed PUSCH: If present, this field indicates the PCMAX,f,c for assumed PUSCH(as specified in TS 38.213 [6]) for the NR Serving Cell. The reported PCMAX,f,c and the corresponding nominal UE transmit power levels are shown in [Table 6.1.3.8-2] (the corresponding measured values in dBm for the NR Serving Cell are specified in TS 38.133 [11];

- MPE: If *mpe-Reporting-FR2* is configured, and the Serving Cell operates on FR2, and if the P field is set to 1, this field indicates the applied power backoff to meet MPE requirements, as specified in TS 38.101-2 [15]. This field indicates an index to Table 6.1.3.8-3 and the corresponding measured values of P-MPR levels in dB are specified in TS 38.133 [11]. The length of the field is 2 bits. If *mpe-Reporting-FR2* is not configured, or if the Serving Cell operates on FR1, or if the P field is set to 0, R bits are present instead.



Figure 6.1.3.79-1: Multiple Entry PHR with assumed PUSCH MAC CE with the highest *ServCellIndex* of Serving Cell with configured uplink is less than 8



Figure 6.1.3.79-2: Multiple Entry PHR with assumed PUSCH MAC CE with the highest ServCellIndex of Serving Cell with configured uplink is equal to or higher than 8

End of changes