**3GPP TSG RAN WG1#122 R1-2506255**

**Bengaluru, India, Aug 25th – 29th, 2025**

**Agenda item:** 9.2.1

**Source:** Moderator (ZTE)

**Title:** Moderator Summary #3 on UE-initiated/event-driven beam management

**Document for:** Discussion and Decision

1. Introduction

In RAN#102, the Rel-19 WID on NR MIMO phase 5 is approved. In the approved WID, UE-initiated/event-driven beam management is a part of the RAN1 objectives as follows:

|  |
| --- |
| 1. Specify enhancement to facilitate UE-initiated/event-driven beam management for reducing overhead and/or latency, assuming the unified TCI while leveraging (as much as possible) legacy CSI measurement and reporting configuration frameworks, targeting FR2 and sTRP with intra- and inter-cell beam management    1. UL signaling content(s) (and procedure(s) as required) for UE-initiated/event-driven beam reporting facilitating fast beam switching    2. UL signaling medium/container considering the UE-initiated/event-driven nature of the UL transmission, designed primarily for the purpose of beam reporting |

1. Plan

Per Mr. Chair’s guidance, for Rel-19 maintenance, only essential corrections will be considered: only text proposals are to be submitted (i.e., no individual draft CRs).

* For each text proposal, we need to provide relevant information (e.g. reason for change, summary of change, consequences if not approved) in a clear and concise manner
* Finally, Editors to prepare final CRs

Then, based on the outcome of the contributions from companies [1]-[36], the followings are provided in this document:

* Summary of companies’ views on each of open issues raised by interested companies, where the open issues/TPs are categorized as follow:
  + Issue 1 – Trigger-event detection
  + Issue 2 – UL signaling content(s)
  + Issue 3 – UL signaling medium/container
  + Issue 4 – Cross-CC measurement/report
* Observations and recommended proposals based on the summary of companies’ views

Note-1: As mentioned in [21], we may have an in-coming LS from RAN4 (R4-2508391) on measurement restriction for UEIBR (which was approved in RAN4 but not delivered to RAN1, unfortunately, before RAN1#122 tdoc deadline). Once having that soon, we may have another session on handling this LS.

Note-2: While considering the progress of each of above issues, we optionally directly provide the proposals, in order to identify clear guidance/consensus for subsequent TP/CR drafting. Then, some editorial TPs, i.e., correcting typos or capturing agreement(s), are recommended to be provided to Editors, directly.

1. Contact Person

For potential offline discussion, companies/delegates are encouraged to enter the contact information in the table below:

Table 0 Contact Information

|  |  |  |
| --- | --- | --- |
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1. Discussion

## Issue 1 – Trigger-event detection

Table 1-1 Summary for Issue 1

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| **#** | **Issue** | **Companies’ view and Recommended Proposal** |
| 1.1 | Left-over for current beam for Event-2  ——  Extra condition(s) of resetting the counting | **[120] Agreement**  Regarding triggering event determination for Event 2, at least Candidate #2 is supported for resetting the counting.   * Candidate#1: RS reconfiguration/update or MAC-CE signaling (if supported) for new beam is received;   + FFS: whether to reset the counting for all new beams.   + FFS: whether to maintain the counting whose new beam is NOT updated. * Candidate#2: [The measured current beam based on] indicated TCI state is updated;   + In such case, the UE need to reset the counting for all new beams. * Candidate#3: UEI beam report is transmitted;   + FFS: Only reset the counting of new beams fulfilling triggering condition and reported by the UEI beam report * Candidate#4: NW response (e.g., DCI in step-2 of Mode-A) is detected. * Candidate#5: The time window expires * Candidate#6: The threshold for event evaluation is re-configured by RRC signaling * (FFS) Candidate#7: The RRC parameter(s) associated with the CSI report configuration for UEI beam report is reconfigured.   + FFS: RRC parameter(s) * FFS: Other candidates   Note: Whether this proposal is captured in RAN1 or RAN2 is a separate discussion point.  **[120b] Agreement**  Regarding triggering event determination for Event 2, on resetting the counting, the following modification on the agreed Candidate #2 in RAN1#120 is supported.   * Candidate#2: ~~[~~The measured current beam RS is updated based on~~]~~ indicated TCI state ~~is updated~~;   + In such case, the UE needs to reset the counting for all new beams.   + FFS: Further details on the update (if necessary)   FL Note: Please review the following update after online, candidate#1/7 proponents please consider the comments from OPPO, Samsung, MTK. While considering that we are in a maintenance phase, only critical issues will be discussed. If we fail to make any progress on that this meeting, we may have to close the door for them at all.  **Proposal 1.1 (Updated after online):** Regarding triggering event determination, besides for Candidate#2, at least Candidate #1, and Candidate#7 are additionally supported for resetting the counting.   * Candidate#1: Regarding Event-2 and 7, RS reconfiguration for new beam is received;   + In such case, the UE only needs to reset the counting of the removed new beams by RS reconfiguration, and stops the timers for those new beams.     - FFS: Whether/how to have any spec impact on the resetting the counting of the removed new beams by RS reconfiguration and stopping the timers for those new beams. * Candidate#7: The RRC parameter(s) of the threshold for event evaluation in Event-1/2 value of Q in Event-7, *eventInstanceCount* and *eventDetectionTimeWindowLength* are reconfigured for the CSI report configuration for UEI beam report.   + In such case, the UE need to reset the counting and stop the timers for all new beams.   When Candidate#2 is satisfied, the timers for all new beams should be stopped, besides for resetting counting.  Note: Candidate#2: The measured current beam RS is updated based on indicated TCI state  **Supported by:** Apple, Ericsson, Huawei/HiSi, ZTE, NTT DOCOMO, Spreadtrum (at least #1), UNISOC, xiaomi, ofinno, Fujitsu, google, vivo, Lenovo, CATT(#1,5,7), NEC, ETRI,  **Not supported by:**   * Option-1 concerned by: OPPO, Samsung, MTK * Option-7 concerned by: Samsung |

Table 1-2 Company input for Issue 1

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| **Company** | **Input** |
| Mod V00 | * Please input your comment/preference to those proposals and questions on the issue 1.1. |
| Ofinno | **Proposal 1.1:** Support. |
| MediaTek | **Proposal 1.1:**  We can be fine with Candidate#1 only if UE resets the counters and stop the timers for all the new beam(s) newly configured and remove the FFS point. |
| Samsung | We don’t support the proposal.  RRC reconfiguration related impacts are not typical cases and should not be considered as essential for the maintenance phase. Besides, for Candidates #1 and #7, there are quite a few other RRC parameters that would impact the UEI-BR procedure including, for example, PUCCH resource, PUSCH resource, Scell reconfiguration, BWP reconfiguration and etc. If all these parameters are considered, there would request lot of standard work.  Based on the above, we have strong concerns on RRC reconfiguration related counting resetting operation(s). Besides, we do not support timer stoppage even for the previously agreed candidate #2 – the current specification is not broken without specifying timer stoppage (the timer can keep running though the counting is reset). |
| Mod | Companies’ input is captured. |
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## Issue 2 – UL signaling content(s)

Table 2-1 Summary for Issue 2

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| **#** | **Issue** | **Companies’ view and Recommended Proposal** |
| 2.1 | L1-RSRP report format —— Reverting the agreement on differential RSRP | FL Note: Per companies input [22], as shown in the following figure, For UE-initiated/event-driven beam reporting according to Event-2,   * The new beam with the strongest reported L1-RSRP may not satisfy the condition of Event-2. * When the mandatory inclusion of the current beam in the report is enabled, even the current beam may be reported as the one with the strongest L1-RSRP.   To handle this issue, the following proposal is proposed. If agreed, the corresponding TP will be provided later. Of course, out of range indicator is another candidate [11].    **Proposal 2.1:** Regarding UE-initiated/event-driven beam reporting according to Event-2 and Event-7, if the current beam is configured to always be reported, down-select one of the following options:   * Option-1: An **absolute** L1-RSRP of the current beam should be reported; * Option-2: Introduce a new indication of out-of-range corresponding to the current beam * Option-3: No further enhancement.   Option-1: QC, Lenovo, ZTE, MediaTek, Ericsson, NTT DOCOMO,  Option-2: Ofinno, Panasonic  Option-3: OPPO, xiaomi, Google, Spreadtrum, CATT, NEC, Huawei, Apple, Fujitsu, Samsung, vivo, |
| 2.2 | Reference time unit for determining current beam | FL Note: Per companies input [9, 23], for the report format of carrying the current beam RSRP value, the time point of deriving the current beam is unclear, while considering dynamic update for TCI indication/activation. Therefore, the following clarification should be needed. Besides for event-detection procedure, per my assessment, any further restriction (e.g., the measured occasions for the current beam RS and the new beam RS(s) should be within the same periodicity) can be left to RAN4.  **Proposal 2.2 (Alt-1):** Regarding UE-initiated/event-driven beam reporting, on both Mode-A and Mode-B, if the current beam is configured to always be reported, down-select one of the following options on the reference time for deriving the current beam RS in a report instance:   * Option-1:   + For a single CC case and for a UEI-BR carried in a second PUSCH of a CSI report configuration, the current beam RS is the same as the RS derived by the TCI state indicated in a latest PDCCH before a first PUCCH associated with the second PUSCH.   + For a multi-CC case and for a UEI-BR carried in a second PUSCH of a CSI report configuration, the current beam RS is the same as the RS derived by the TCI state, indicated in a latest PDCCH, for the serving cell of the new beam RS, where the latest PDCCH is before a first PUCCH associated with the second PUSCH. * Option-2: The current beam RS is the same as the RS derived by the indicated TCI state in the slot of the CSI reference resource corresponding to the report instance. * Option-3:   + For a single CC case and a UEI-BR carried in a second PUSCH of a CSI report configuration, the current beam RS is the same as the RS derived by the latest TCI state, applied [in a latest slot] before a first PUCCH associated with the second PUSCH.   + For a multi-CC case and a UEI-BR carried in a second PUSCH of a CSI report configuration, the current beam RS is the same as the RS derived by the latest TCI state, applied [in a latest slot] before a first PUCCH associated with the second PUSCH, for the serving cell of the new beam RS.   Option-1: Samsung  Option-2: ZTE, MediaTek, Google, Qualcomm, Spreadtrum, NEC, Ericsson, Apple, NTT DOCOMO, Huawei/HiSi’  Option-3: vivo, Lenovo, xiaomi, Fujitsu,  **Proposal 2.2 (Alt-2):**  Regarding UE-initiated/event-driven beam reporting, on both Mode-A and Mode-B, if the current beam is configured to always be reported, in a report instance, the current beam RS is the same as the RS derived by the indicated TCI state in the slot of the CSI reference resource corresponding to the report instance.  FL Note: Companies are encouraged to provide your views on whether/how to handle the case if current beam is updated after event-condition is satisfied, e.g., first/second channel transmission or not |
| 2.3 | L1-RSRP report format —— Capturing the condition of differential RSRP | FL Note: Per companies input [9], the condition of differential RSRP report does not captured.  **Proposal 2.3 (update):** Adopt the following changes in Clause 5.2.1.5.4 in TS38.214.   * **Reason for change:** The agreed condition of differential RSRP report and corresponding reference of differential value are not specified. * **Summary of change:**    + Clarify the condition of reporting differential L1-RSRP.   + Clarify the reference of deriving the differential RSRP in a report instance. * **Consequences if not approved:** The report format and corresponding definition of corresponding differential L1-RSRP field is incomplete, regarding event-1/2/7.  |  | | --- | | 5.2.1.5.4.1a UE Initiated CSI reporting for event 2  <Unchanged parts are omitted>  After transmitting UEIRI, the UE reports, as defined in Clause 6.3.2.1.2 of [5, TS 38.212], in a single reporting instance *nrofReportedRS-UEIBR* CRIs or SSBRIs corresponding to reference signals provided by the *newBeamResourceSet* that comprise at least one reference signal that triggers the UEIRI transmission. For each CSI or SSBRI, the CSI report includes the absolute L1-RSRP if *nrofReportedRS-UEIBR* is configured to be one, or absolute L1-RSRP for first CRI/SSBRI and differential RSRP for the rest if *nrofReportedRS-UEIBR* is configured to be larger than one~~or differential L1-RSRP and,~~ when *PresenceOfConditionMetIndicator* is configured, condition met indicator indicating whether the reference signal indicated by reported CRI or SSBRI triggers the UEIRI transmission, and, when *enabledCurrentBeamReport* is configured, the differential L1-RSRP corresponding to the reference signal in the indicated TCI state, or to the SS/PBCH block which is QCLed with the reference signal in the indicated TCI state. The differential L1-RSRP values are with a reference to the largest measured L1-RSRP value which is part of the same L1-RSRP reporting instance. The UE sends the CSI report  <Unchanged parts are omitted>  5.2.1.5.4.1b UE Initiated CSI reporting for event 1  <Unchanged parts are omitted>  After transmitting UEIRI, the UE reports, as defined in Clause 6.3.2.1.2 of [5, TS 38.212], in a single reporting instance *nrofReportedRS-UEIBR* CRIs or SSBRIs corresponding to reference signals provided by the *newBeamResourceSet*. For each CRI or SSBRI, the CSI report includes the absolute L1-RSRP if *nrofReportedRS-UEIBR* is configured to be one, or absolute L1-RSRP for first CRI/SSBRI and differential RSRP for the rest if *nrofReportedRS-UEIBR* is configured to be larger than one~~or differential L1-RSRPs and,~~, when *enabledCurrentBeamReport* is configured, the absolute L1-RSRPs, corresponding to the reference signal in the indicated TCI state, or to the SS/PBCH block which is QCLed with the reference signal in the indicated TCI state. The differential L1-RSRP values are with a reference to the largest measured L1-RSRP value which is part of the same L1-RSRP reporting instance. The UE sends the CSI report  <Unchanged parts are omitted>  5.2.1.5.4.1c UE Initiated CSI reporting for event 7  <Unchanged parts are omitted>  After transmitting UEIRI, the UE reports, as defined in Clause 6.3.2.1.2 of [5, TS 38.212] in a single reporting instance *nrofReportedRS-UEIBR* CRIs or SSBRIs corresponding to reference signals provided by the *newBeamResourceSet* that comprise at least one reference signal that triggers the UEIRI transmission. For each CRI or SSBRI, the CSI report includes the absolute L1-RSRP if *nrofReportedRS-UEIBR* is configured to be one, or absolute L1-RSRP for first CRI/SSBRI and differential RSRP for the rest if *nrofReportedRS-UEIBR* is configured to be larger than one~~or differential L1-RSRP and,~~, when *PresenceOfConditionMetIndicator* is configured a condition met indicator indicating whether the reference signal indicated by reported CRI or SSBRI triggers the UEIRI transmission and, when *enabledCurrentBeamReport* is configured, the differential L1-RSRP corresponding to the reference signal with the *valueOfQ* highest L1-RSRP out of the activated TCI state reference signals, or to the SS/PBCH block which is QCLed with the reference signal with the *valueOfQ* highest L1-RSRP out of the activated TCI state reference signals. The differential L1-RSRP values are with a reference to the largest measured L1-RSRP value which is part of the same L1-RSRP reporting instance. The UE sends the CSI report  <Unchanged parts are omitted> |   Supported by: Samsung, OPPO, vivo, Lenovo, Ofinno, Fujitsu, ZTE, Qualcomm, NEC, Ericsson, Apple, NTT DOCOMO,  Not supported by: MediaTek, Google, Spreadtrum, Huawei, |

Table 2-2 Company input for Issue 2

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| --- | --- |
| **Company** | **Input** |
| Mod V00 | * Please input your comment/preference to those proposals and questions on the issue 2.1~2.3, if needed. |
| Ofinno | **Proposal 2.1:**  From working procedure perspective, it is our understanding that reverting existing agreement in the maintenance phase should be done if and only if there is no way out. Option-2 provides method which does not require reverting, and the spec impact of it would be minimal which is adding one-bit indication.  Besides, if we go to the option-1, two absolute RSRP values will be included in the same report which was not supported until today. Considering the case we are discussing is real but not going to be frequently happened, making it to be reported is unnecessary.  **Proposal 2.2:**  When the current beam is updated after event-condition is satisfied, reporting it may induce misunderstanding to the gNB. gNB may understand that the updated current beam is not good enough therefore changing of it is required while updated current beam is good enough. To remove such ambiguity, the report should be canceled.  **Proposal 2.3:**  Support. |
| vivo | **Proposal 2.1: Support option 3**  **Proposal 2.2:**  **we have following agreement from RAN1#120b**  **[120b] Agreement**  Regarding triggering event determination for Event 2, on resetting the counting, the following modification on the agreed Candidate #2 in RAN1#120 is supported.   * Candidate#2: ~~[~~The measured current beam RS is updated based on~~]~~ indicated TCI state ~~is updated~~;   + In such case, the UE needs to reset the counting for all new beams.   + FFS: Further details on the update (if necessary)   **It is clear from the agreement that current beam RS changes according to indicated TCI state. If the CSI reference resource is used for deriving current beam RS, it could be several 10s of slots in past, for example RS periodicity is 80ms, the CSI reference resource may be more than 80ms before the PDCCH indicating the TCI state. Hence, option-2 doesn’t make sense.** |
| MediaTek | **Proposal 2.2:** If majority go with Option-2 to follow CSI-RS reference resource for determining RS ID of the current beam RS. It has been agreed in RAN1#121. No more agreement is needed.  If beam switching is indicated before UEIRI transmission, the counters will be reset and no UEIED beam reporting is triggered. If beam switching is indicated after UEIRI transmission and before the PUSCH for reporting, we think that is a corner case to have beam switching in such short time. We think there is no need to handle that.  **Proposal 2.3:** We understand the intention for clarification, but current TP seems premature to be agreed. If Clause 5.2.1.4.3 in TS38.214 is not referred for UEI CSI reporting, then we also need to mention how to quantize the L1-RSRP value about “value of L1-RSRP is quantized to a 7-bit value in the range [-140, -44] dBm with 1dB step size” and “and the differential L1-RSRP is quantized to a 4-bit value. The differential L1-RSRP value is computed with 2 dB step size with a reference to the largest measured L1-RSRP value which is part of the same L1-RSRP reporting instance”, according to the following agreement:   |  | | --- | | **118b] Agreement**  On UE-initiated/event-driven beam reporting, regarding L1-RSRP report format Option-3 depending on Event-2,   * The differential L1-RSRP is quantized to a 4-bit value with 2 dB step size |   We think Clause 5.2.1.4.3 in TS38.214 is more suitable to capture the UE behavior to determine absolute/differential L1-RSRP(s) for UEI beam reporting. A better/simple way is trying to cite Clause 5.2.1.4.3 in TS38.214 instead of specifying everything here. We think we need more time and discussion to finalize that. |
| Samsung | **Proposal 2.1:**  We prefer Option-3.  **Proposal 2.2 (Alt-1):**  We support Option 1. The intention of Option 1 is to clarify that there is no TCI state update between measurements and reports. For example, as shown in the figure below, if a DCI indicates TCI states update is received between the first PUCCH and 2nd PUSCH, what is the UE behaviour? In our understanding, the UE does not need to transmit the UEI-BR based on the outdated current beam. UE only needs to transmit the UEIBR if the current beam is the same as the one when UE did measurements.    **Proposal 2.2 (Alt-2):**  We don’t support. It does not resolve the issue we mentioned above.  **Proposal 2.3 (update):**  Support in principle. Besides, we do not think the following description is accurate or aligned with the legacy differential reporting format:  “absolute L1-RSRP for first CRI/SSBRI”  The “first” CRI/SSBRI should correspond to that having the largest measured value of L1-RSRP among all the reported CRIs/SSBRIs in the same reporting instance. Hence, the following change is proposed :  “absolute L1-RSRP for the CRI/SSBRI having the largest measured value of L1-RSRP among the reported CRIs/SSBRIs in part of the same L1-RSRP reporting instance” |
| Huawei, HiSilicon | Proposal 2.2 (Alt-2): We can support this for the sake of progress. |
| Mod | Capture companies input. |
| Google | **Proposal 2.3**: We still don’t think it’s needed. In each impacted paragraph, there is a reference to TS 38.212 in the first line. From TS 38.212, it’s clear when to report differential RSRP. |
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## Issue 3 – UL signaling medium/container

Table 3-1 Summary for Issue 3

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| **#** | **Issue** | **Companies’ view and Recommended Proposal** |
| 3.1.1 | First PUCCH for Mode-A and Mode-B —— multiplexing and/or dropping rule on Case-2: the 1-bit first PUCCH is collided/overlapped with a PUSCH | **[121] Agreement**  On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding the multiplexing/dropping rule(s) of 1-bit first PUCCH, support **Option-3** of the following rules for the Case-2: the 1-bit first PUCCH is collided/overlapped with a PUSCH   * Option-3: Piggyback 1-bit indication of first PUCCH into the PUSCH.   + The 1-bit indication is always multiplexed in the PUSCH, regardless that UEI beam report procedure is triggered.   FL Note: Per companies input, the details on the multiplexing rule is unclear. Then, first of all, we may need to clarify the format of this 1-bit indication (e.g., reusing a bit sequence corresponding to each of collided 1-bit indication or a multiplexing rule of a field of ⌈log\_2 (L+1)⌉ bits of representing at most one of positive UEIRI. Then, whether/how to perform the joint encoding ‘1-bit indication’ with other UCI should be clarified.  **Proposal 3.1.1A (updated after offline):** On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding the multiplexing a number of L (L>=1) first PUCCH(s) with UEIRIs collided/overlapped with a PUSCH, down select one of the following options:   * Option-1: A field of bit sequence with a length of L bit is piggyback into the PUSCH.   + Each of bits in the bit sequence corresponds to respective first PUCCH(s) by an ascending order of the values of PUCCH resource ID associated with the first PUCCHs. * Option-2: A field of bits of representing at most one of positive UEIRI   + The codepoints other than all-zero value in the field are ordered based on an ascending order of the values of PUCCH resource ID associated with the first PUCCHs to represent a positive UEIBR.   + An all-zero value for the bits represents a negative UEIRI value across all *L* UEIRIs.   **Option-1:** ZTE, OPPO, vivo, Google, Qualcomm, Spreadtrum, NEC, Ericsson, Apple, NTT DOCOMO, ETRI, Huawei/Hisi’, xiaomi, MediaTek, CATT  **Option-2:** Huawei/Hisi’, Lenovo, Samsung, xiaomi, Ofinno, Fujitsu, MediaTek, CATT,  FL Note: Per offline with Samsung, we have the following update for the first subbullet for Option-1.  **Proposal 3.1.1B:** On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding the multiplexing first PUCCH(s) with UEIRIs collided/overlapped with a PUSCH, down select one of the following options:   * Option-1: The field of UEIRI is jointly encoded with HARQ-ACK by appending the UEIRI to the HARQ-ACK information bits.   + Note: UE does not expect to multiplex UEIBR in a CG PUSCH with CG-UCI/UTO-UCI,   + Note: From spec perspective, multiplexing UEIRI in PUSCH reuses the same mechanism of CG-UCI. * Option-2: The field of UEIRI is jointly encoded with CSI Part-1 by adding the UEIRI before CSI part-1 information bits.   + Note: Multiplexing between first PUCCH and PUSCH is realized by assuming UEIRI as one type of CSI part-1.   Option-1: Huawei/Hisi’, Samsung, vivo, Lenovo, Ofinno, MediaTek, Google, Spreadtrum, CATT, Apple, NTT DOCOMO, Fujitsu,  Option-2: ZTE, OPPO, xiaomi, Qualcomm, NEC, ETRI,  FL Note: Besides, one more alignment TP from [5] is provided per the agreement.  **Proposal 3.1.1C:** Adopt the following changes in TS38.213 Section 9:   * **Reason for change:** In RAN1 #121 meeting, it was agreed that for UE-initiated/event-driven beam reporting, when the 1-bit first PUCCH is collided/overlapped with a PUSCH, the 1-bit first PUCCH is multiplexed in the PUSCH. This agreement has not been captured in TS38.213 currently. * **Summary of change:** Capture the agreement that for UE-initiated/event-driven beam reporting, when the 1-bit first PUCCH is collided/overlapped with a PUSCH, the 1-bit first PUCCH is multiplexed with PUSCH in TS38.213. * **Consequences if not approved:** The UE behavior in UE-initiated/event-driven beam reporting is not clear when the 1-bit first PUCCH is collided/overlapped with a PUSCH  |  | | --- | | **9 UE procedure for reporting control information**  <unrelated parts are omitted>  In the remaining of this clause, if a UE is provided *subslotLengthForPUCCH* for a cell for PUCCH transmission, a slot for an associated PUCCH resource of a PUCCH transmission with HARQ-ACK information on the cell includes a number of symbols indicated by *subslotLengthForPUCCH*, unless stated otherwise.  If a UE would transmit on a serving cell a PUSCH without UL-SCH that overlaps with a PUCCH transmission on a serving cell that includes positive SR information, the UE does not transmit the PUSCH.  If a UE would transmit CSI reports on overlapping physical channels, the UE applies the priority rules described in [6, TS 38.214] for the multiplexing of CSI reports.  If a UE  - would multiplex UCI in a PUCCH transmission that overlaps with a PUSCH transmission, and  - the PUSCH and PUCCH transmissions fulfil the conditions in clause 9.2.5 for UCI multiplexing,  the UE  - multiplexes only HARQ-ACK information, UEIRI, if any, from the UCI in the PUSCH transmission and does not transmit the PUCCH if the UE multiplexes aperiodic or semi-persistent CSI reports in the PUSCH;   * multiplexes only HARQ-ACK information, UEIRI and CSI reports, if any, from the UCI in the PUSCH transmission and does not transmit the PUCCH if the UE does not multiplex aperiodic or semi-persistent CSI reports in the PUSCH.   <unrelated parts are omitted> |   Supported by CATT, OPPO, vivo, Lenovo, xiaomi, Ofinno, Fujitsu, ZTE, MediaTek, Google, Qualcomm, Spreadtrum, CATT, NEC, ETRI,  Not supported/Postponed by: Samsung, Ericsson, Huawei, Apple, NTT DOCOMO, |
| 3.2 | Leftover on Step-2/3 in Mode-A | FL Note: Per companies input [6], the intra-UE multiplexing/prioritization rules of PUSCH with A-CSI for PUSCH is reused for UEI-BR for Mode A. However, in the current TS38.213, the corresponding description is absent. Hence, the UE behavior is not clear when PUSCH carrying UEI-BR for Mode A overlaps with other uplink channels/RSs, and the following TP we proposed.  **Proposal 3.2:** Adopt the following changes in TS38.213 Section 9:   * **Reason for change:** Reusing the intra-UE multiplexing/prioritization rules of PUSCH with A-CSI for PUSCH for UEI-BR for Mode A was agreed. However, it is not captured in the current specification. * **Summary of change:** In TS38.213 section 9, clarify the intra-UE multiplexing/prioritization rules of PUSCH with A-CSI for PUSCH is reused for UEI-BR for Mode A. * **Consequences if not approved:** UE behavior is not clear when PUSCH carrying UEI-BR for Mode A overlaps with other uplink channels/RSs.  |  | | --- | | **9 UE procedure for reporting control information**  < Unchanged parts are omitted >  For the remaining of this clause, when a UE  - is not provided *coresetPoolIndex* or is provided *coresetPoolIndex* with a value of 0 for first CORESETs, and is provided *coresetPoolIndex* with a value of 1 for second CORESETs, on active DL BWPs of serving cells, and  - is provided *sTx-2Panel*  the UE separately determines and resolves time overlapping among first PUSCH transmissions that use respective first spatial domain filters corresponding to first *TCI-State* or *TCI-UL-State* associated with the first CORESETs, and among second PUSCH transmissions that use respective second spatial domain filters corresponding to second *TCI-State* or *TCI-UL-State* associated with the second CORESETs.  For the remaining of this clause, reference to PUSCH with semi-persistent CSI reports includes a PUSCH with UE initiated report~~s~~ when *reportTransmissionMode* is configured as ‘ModeB’ in the CSI report configuration [6, TS 38.214].  For the remaining of this clause, reference to PUSCH with aperiodic CSI reports includes a PUSCH with UE initiated report when *reportTransmissionMode* is configured as ‘ModeA’ in the CSI report configuration [6, TS 38.214].  For the remaining of this clause, for a UE operating on an NTN serving cell, the timeline conditions for resolving time overlapping between a PUSCH transmission with repetitions in an OCC group [6, TS 38.214] and PUCCH transmissions are applicable with respect to the first repetition of the PUSCH transmission in the OCC group  - if the UE would multiplex UCI from the PUCCH transmissions in the PUSCH, the UE multiplexes the UCI in all repetitions of the PUSCH transmission in the OCC group  - if the UE would not transmit a repetition of the PUSCH transmission, the UE does not transmit all repetitions of the PUSCH transmission in the OCC group  - the UE does not expect to transmit in different slots more than one PUCCHs that provide HARQ-ACK information or CSI reports and would overlap with the PUSCH transmission in the OCC group  When a UE determines overlapping for PUCCH transmissions with SL HARQ-ACK reports and PUCCH of larger and/or smaller priority index, the UE resolves the overlapping for PUCCH transmissions with SL HARQ-ACK reports and PUCCH of each priority index as described in clause 9.2.5 and 9.2.6 before resolving the overlapping for PUCCH transmissions without SL HARQ-ACK or the overlapping for PUCCH transmissions and PUSCH transmissions.  < Unchanged parts are omitted > |   Supported by: vivo, Lenovo, Ofinno, Fujitsu, MediaTek, Google, Qualcomm, Spreadtrum, Ericsson, Huawei, Apple, NTT DOCOMO, ETRI,  Not supported by: OPPO, Samsung, xiaomi, ZTE, CATT, |
| 3.5 | Details on  the counting of occupied CPU(s) | **Proposal 3.5 (Updated after online):** On beam report transmission procedure for UE-initiated/event-driven beam reporting, occupation time of occupied CPU(s) starts when CSI report configuration for the UEI beam report is configured, and ends when it is released. |
| 3.6 | Details on candidate value for UEIRI PUCCH resource periodicity | **FL Note:** Per companies’ input, explicitly supporting symbol-level periodicity of PUCCH for UEIRI was not agreed. In legacy, sub-slot based PUCCH transmission and symbol-level PUCCH periodicity are mainly intended for URLLC. For both Mode-A and Mode-B, the necessity of symbol-level periodicity for UL-SCH transmission with low latency is questionable.  **Proposal 3.6:** Adopt the following changes in Section 9.2.4A in TS 38.213.   * **Reason for change:** In legacy, sub-slot based PUCCH transmission and symbol-level PUCCH periodicity are mainly intended for URLLC. While for UEI beam reporting mode-A, the PUSCH for carrying UEI-CSI report is scheduled by a DCI after the UEIRI-PUCCH transmission. A symbol-level PUCCH periodicity does not provide benefits in reducing the report latency but instead leads to frequent uplink channel collisions. Similarly, for mode-B, the periodicity of the first PUCCH and second PUSCH is the same. Although symbol-level periodicity can be configured for Type-1 CG-PUSCH, due to the Type-1 CG-PUSCH does not carry UL-SCH, the necessity of symbol-level periodicity for UL-SCH transmission with low latency is not identified. * **Summary of change:** Remove the description of periodicity of PUCCH for UEIRI being smaller than or equal to one slot. * **Consequences if not approved:** The candidate configuration for the periodicity of UEIRI report is unclear.  |  | | --- | | 9.2.4A UE procedure for indicating UE initiated report <Irrelevant part is omitted>  The UE is provided a periodicity in symbols or slots and an offset in slots by *periodicityAndOffset* for a PUCCH transmission with UEIRI. If is larger than one slot, the UE determines a transmission occasion of a PUCCH with UEIR indication to be in a slot with number [4, TS 38.211] in a frame with number if .  ~~If is one slot, the UE expects that and every slot is a transmission occasion of a PUCCH with UEIRI.~~  ~~If is smaller than one slot, the UE determines a transmission occasion of a PUCCH with UEIRI to start in a symbol with index [4, TS 38.211] if where is the value of~~ *~~startingSymbolIndex~~*~~.~~  <Irrelevant part is omitted> |   Supported by: ZTE, NEC, OPPO, vivo, Lenovo, xiaomi, Qualcomm, Spreadtrum, CATT, NEC, Apple, ETRI, NTT DOCOMO,  Not supported by: Samsung, Ofinno, MediaTek, Huawei, |
| 3.7 | Left-over on one PUCCH associated with multi-CSI report configuration | **FL Note:** Per companies’ input [2], [8,18], regarding UE-Initiated CSI reporting for multiple CSI configurations, there is no agreement on restricting that **the CSI report configurations for UE-initiated CSI reporting associated with the same PUCCH resource must be associated with the same event type**  **Proposal 3.7:**  Adopt the following changes in TS38.214 Section 5.2.1.5.4.1d:   * Reason for change: Current specification doesn’t align with Rel-19 outcomes. There is no conclusion/agreement in Rel-19 to restrict that CSI report configurations for UE-initiated CSI reporting associated with the same PUCCH resource must be associated with the same event type. * Summary of change: The restriction that CSI report configurations for UE-initiated CSI reporting associated with the same PUCCH resource must be associated with the same event type shall be removed due to no corresponding RAN1 conclusion/agreement. * Consequences if not approved: The corresponding specification doesn’t align with the outcomes of Rel-19 feature discussion.  |  | | --- | | 5.2.1.5.4.1d UE-Initiated CSI reporting for multiple CSI configurations For a UE configured with multiple *CSI-ReportConfig* with same ~~higher layer parameters~~ *~~eventType~~* ~~and~~ *PUCCHResource*, the UE expects  - the multiple *CSI-ReportConfig* to be configured in the same CC,  - the multiple *CSI-ReportConfig* to be associated with a same CSI trigger state if *reportTransmissionMode* is configured as ‘ModeA’, else  - the same *configuredPUSCHResourceOfModeB* if *reportTransmissionMode* is configured as ‘ModeB’.  The UE reports in a single reporting instance *nrofReportedRS-UEIBR* CRIs or SSBRIs corresponding to reference signals provided by the *newBeamResourceSet* in a *CSI-ReportConfig* that satisfies the event. The CSI report includes the corresponding *CSI-ReportConfigId* and is zero padded to a fixed payload size (when needed), with the fixed payload size given by the maximum payload size among all the multiple *CSI-ReportConfig*.  <Unchanged part is omitted> |   Supported by: Huawei/HiSi, MediaTek, Fujitsu, vivo, Lenovo, xiaomi, Ofinno, Fujitsu, ZTE, Google, Qualcomm, Spreadtrum, CATT, NEC, Huawei, Apple, NTT DOCOMO, ETRI,  Not supported by: OPPO, Samsung, Panasonic, |

Table 3-2 Company input for Issue 3

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| **Company** | **Input** |
| Mod V00 | Please input your comment/preference to those proposals and questions on the issues 3.1~3.7, if needed. |
| Ofinno | **Proposal 3.1.1A:**  Support option-2.  **Proposal 3.1.1B:**  Support option-1.  **Proposal 3.1.1C:**  Support.  **Proposal 3.2:**  Another possible way to capture reusing intra-UE multiplexing/prioritization rule of PUSCH with A-CSI for PUSCH for UEI-BR for Mode A is describe it in TS 38.214 as we proposed in our tdoc.   |  | | --- | | ============================unchanged omitted=============================  5.2.3 CSI reporting using PUSCH  A UE shall perform aperiodic CSI reporting using PUSCH on serving cell c upon successful decoding of a DCI format 0\_1 or DCI format 0\_2 which triggers an aperiodic CSI trigger state. A UE shall perform aperiodic CSI reporting using PUSCH on the serving cell with the smallest serving cell index scheduled by DCI format 0\_3 which triggers an aperiodic CSI trigger state.  When a DCI format 0\_1 or DCI format 0\_3 schedules two PUSCH allocations on the serving cell, the aperiodic CSI report or CSI report with *CSI-ReportConfig* with *eventType* and *reportTransmissionMode* configured as ‘ModeA’ is carried on the second scheduled PUSCH. When a DCI format 0\_1 or DCI format 0\_3 schedules more than two PUSCH allocations on the serving cell, the aperiodic CSI report or CSI report with *CSI-ReportConfig* with *eventType* and *reportTransmissionMode* configured as ‘ModeA’ is carried on the penultimate scheduled PUSCH.  ============================unchanged omitted=============================  6.1.2.1 Resource allocation in time domain  ============================unchanged omitted=============================  For PUSCH repetition Type B, when a UE receives a DCI that schedules aperiodic CSI report(s) or CSI report with *CSI-ReportConfig* with *eventType* and *reportTransmissionMode* configured as ‘ModeA’ or activates semi-persistent CSI report(s) on PUSCH with no transport block by a '*CSI request'* field on a DCI, the number of nominal repetitions is always assumed to be 1, regardless of the value of *numberOfRepetitions*. When the UE is scheduled to transmit a PUSCH repetition Type B with no transport block and with aperiodic or semi-persistent CSI report(s) or CSI report with *CSI-ReportConfig* with *eventType* and *reportTransmissionMode* configured as ‘ModeA’ by a '*CSI request'* field on a DCI, the first nominal repetition is expected to be the same as the first actual repetition. For PUSCH repetition Type B carrying semi-persistent CSI report(s) without a corresponding PDCCH after being activated on PUSCH by a '*CSI request'* field on a DCI, if the first nominal repetition is not the same as the first actual repetition, the first nominal repetition is omitted; otherwise, the first nominal repetition is omitted according to the conditions in Clause 9, Clause 11.1, Clause 11.2A, Clause 15 and Clause 17.2 of [6, TS 38.213], and Clause 5.34.3 of [10, TS 38.321].  For PUSCH repetition Type B, when a UE is scheduled to transmit a transport block and aperiodic CSI report(s), or CSI report with *CSI-ReportConfig* with *eventType* and *reportTransmissionMode* configured as ‘ModeA’ on PUSCH by a '*CSI request'* field on a DCI, the CSI report(s) is multiplexed only on the first actual repetition. The UE does not expect that the first actual repetition has a single symbol duration.  ============================unchanged omitted============================= |   **Proposal 3.6:**  We do not think this is urgent.  **Proposal 3.7:**  Support. |
| MediaTek | **Proposal 3.5**: we have some wording suggestion on unit(s) as follows:  [Mod]: Thanks for nicely suggestion. But for last minutes, I prefer to keep the current words (being acceptable for the group) for avoiding unnecessary discussion.   |  | | --- | | **Proposal 3.5 (Updated after online):** On beam report transmission procedure for UE-initiated/event-driven beam reporting, occupation time of an ~~occupied~~ CPU~~(s)~~ for a CSI report configuration configured with *eventType* starts when the CSI report configuration ~~for the UEI beam report~~ is configured, and ends when it is released. | |
| Samsung | **Proposal 3.1.1A (updated after offline):**  Support Option 2 which is beneficial for overhead reduction as required by WID objectives.  Option 2 is as a unified design as the case when multiple PUCCHs with UEI-RI overlaps with a PUCCH with HARQ-ACK. Proponents of Option 1 should justify using the different solution for the two cases.  In Rel-15, similar issue was discussed for overlapping multiple SRs and other PUCCH, the current design is to save the UCI payload considering the probability of positive SR is not high. Now, the situation is similar, more than one positive UEIRI is not very likely, to reduce the overhead, we think Option 2 is the good choice.  More importantly, Option 1 would result in additional UE implementation complexity. Consider the example below, in step 2, UE first multiplexes UEI-BR in PUCCH with HARQ-ACK only one positive UEIBR is selected.  In step 4, UE multiplexes HARQ-ACK and UEI-BR in the PUSCH, Option 1 requests UE to keep all the original information of UEI-BR after performing step 2, which means it requires a go back operation which is not friendly for UE implementation. On the contrary, Option 2 only requires the result of step 2.     |  | | --- | | When a UE determines overlapping for PUCCH and/or PUSCH transmissions of the same priority index other than PUCCH transmissions with SL HARQ-ACK reports before considering limitations for UE transmission due to cell DRX operation [11, TS 38.321] or as described in clauses 11.1, 11.1.1, 11.2A, 15 and 17.2 including repetitions if any,  - first, the UE resolves the overlapping for PUCCHs with repetitions as described in clause 9.2.6, if any  - second, the UE resolves the overlapping for PUCCHs without repetitions as described in clauses 9.2.5  - third, the UE resolves the overlapping for PUSCHs and PUCCHs with repetitions as described in clause 9.2.6  - fourth, the UE resolves the overlapping for PUSCHs and PUCCHs without repetitions as is subsequently described in this clause. |   **Proposal 3.1.1B: Support.**  **Proposal 3.1.1C: Prefer to deprioritize.**  **Proposal 3.2:** This is non-essential correction. CSI reports include UEI-BR, no need further clarification.  **Proposal 3.5 (Updated after online): OK**  **Proposal 3.6:** do not support. The intention of the first PUCCH/UEIRI is to follow SR. At least for mode A, we don’t see any issues of symbol level periodicity. More importantly, the WID request to reduce latency, symbol level periodicity can be beneficial for latency reduction. Therefore, we don’t see the necessity to remove the agreed texts.  **Proposal 3.7:** Not support, joint configuration of different event types is not essential and should not be considered. |
| Huawei, HiSilicon | Proposal 3.1.1C: Not support.  We think 3.1.1A and 3.1.1B together fully address the UE behavior in the case of UEIRI collision with PUSCH and there is no need for 3.1.1C  Proposal 3.5: We can be flexible about this and accept the proposal.  [Mod]: Thanks for being flexible. |
| Mod | Companies’ input is captured |
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## Issue 4 – Cross-CC measurement/report

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## Issue 5 – LS on measurement restriction from RAN4

This meeting, one LS on event triggered L1-RSRP reporting (R1-2506520/R4-2511656) is received. The details are provided in the following. Then, companies are encouraged to provide your feedback in **Table 5-1**

|  |
| --- |
| 1 Overall description RAN4 is discussing measurement requirements for event-triggered L1-RSRP reporting. It is RAN4 common understanding that NW can configure “*timeRestrictionForChannelMeasurement*” for event-triggered L1-RSRP reporting. For Event-2, RAN4 agreed to define separate requirements for measurement period when the UE is configured or not configured with“*timeRestrictionForChannelMeasurement*”, similar to existing measurement period requirements. Specifically, for SSB-based and periodic and semi-persistent CSI-RS based L1-RSRP measurement, if *timeRestrictionForChannelMeasurement* is configured, the measurement period is based on M = 1, and event evaluation should be based on the most recent result from both new beam and current beam; If *timeRestrictionForChannelMeasurement* is not configured, the measurement period for current and new beam is based on M = 3. For aperiodic CSI-RS based L1-RSRP, M is always equal to 1. 2 Actions **To RAN1**  **ACTION:** RAN4 respectfully asks RAN1 to take above information into account and provide feedback if there is any issue with the above RAN4 agreement. |

The RAN4 related agreement on this topic is the following one:

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| **Agreement [RAN4#115]**   * RAN4 define different separate for measurement period for the UE is configured or not for “timeRestrictionForChannelMeasurement” * To check with RAN1 whether the parameter can be configured if RAN1 identify any issue |

Table 5-1 Company input for LS

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| **Company** | **Input** |
| Mod V00 | Per offline, although the majority supports to have the configuration of *timeRestrictionForChannelMeasurement* for UEI beam report as agreed in RAN4, then the following should be clarified.   * #1 *timeRestrictionForChannelMeasurement* can be also applied to Event-1 and Event-7, besides for Event-2 * #2 The value of M determined for measurement period of the new beams by *timeRestrictionForChannelMeasurements* in the UEIBR CSI report configuration is also used for the current beam RS measurement, besides for new beam RS(s).   @all, please review the above. Then, I will try to draft the reply LS per your input. |
| vivo | For #1. it can be further clarified with RAN4  For #2, it seems the LS from RAN4 already captures both new beam and current beam in following sentence as highlighted by yellow below.  Specifically, for SSB-based and periodic and semi-persistent CSI-RS based L1-RSRP measurement, if *timeRestrictionForChannelMeasurement* is configured, the measurement period is based on M = 1, and event evaluation should be based on the most recent result from both new beam and current beam; |
| Huawei, HiSilicon | Agree with vivo about #2. FL suggestion for #1 is good. |
| MediaTek | To our understanding, if *timeRestrictionForChannelMeasurement* is configured, then the UE must use the most recent RS measurement, no later than CSI reference resource, to determine L1-RSRP.  **#1:** Yes. This configuration can be applied to all the events.  **#2:** Yes. In general, UE uses the equal number of RS measurement instance(s) for those L1-RSRP(s) in one report, regardless that is current beam RS or new beam RS. So, we think that should be applied to both current beam RS measurement and new beam RS measurement if configured. |
| NEC | We are OK to support configuration of *timeRestrictionForChannelMeasurement* as in RAN4’s LS.  And it shall apply to all events, and both current beam RS and new beam RS. |
| Ericsson | Agree with vivo. |
| Mod | FL Note: Per companies’ input, we can further clarify the above #1 with RAN4. Then, we have the following proposal according. @all, please review the following.  **Proposal 5.1:** RAN1 further clarifies that, in a CSI report configuration for UE-initiated/event-driven beam reporting, NW can configure “*timeRestrictionForChannelMeasurement*” for **all supported event-types**, including Event-1, Event-2 and Event-7.   * Send a reply LS on the above to RAN4 |
| Google | Do not support. We also think Event-1 and Event-7 can be further clarified by RAN4.  In addition, we have one clarification about the Proposal 5.1. If time window and *timeRestrictionForChannelMeasurement* are both configured, and the most recent RS occasion is after the end of the time window, should UE also use the measurement result? |
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1. Proposals for Wednesday Online Discussion

This meeting, one LS on event triggered L1-RSRP reporting (R1-2506520/R4-2511656) is received. The details are provided in the following. Then, companies are encouraged to provide your feedback in **Table 5-1**

|  |
| --- |
| 1 Overall description RAN4 is discussing measurement requirements for event-triggered L1-RSRP reporting. It is RAN4 common understanding that NW can configure “*timeRestrictionForChannelMeasurement*” for event-triggered L1-RSRP reporting. For Event-2, RAN4 agreed to define separate requirements for measurement period when the UE is configured or not configured with“*timeRestrictionForChannelMeasurement*”, similar to existing measurement period requirements. Specifically, for SSB-based and periodic and semi-persistent CSI-RS based L1-RSRP measurement, if *timeRestrictionForChannelMeasurement* is configured, the measurement period is based on M = 1, and event evaluation should be based on the most recent result from both new beam and current beam; If *timeRestrictionForChannelMeasurement* is not configured, the measurement period for current and new beam is based on M = 3. For aperiodic CSI-RS based L1-RSRP, M is always equal to 1. 2 Actions **To RAN1**  **ACTION:** RAN4 respectfully asks RAN1 to take above information into account and provide feedback if there is any issue with the above RAN4 agreement. |

The RAN4 related agreement on this topic is the following one:

|  |
| --- |
| **Agreement [RAN4#115]**   * RAN4 define different separate for measurement period for the UE is configured or not for “timeRestrictionForChannelMeasurement” * To check with RAN1 whether the parameter can be configured if RAN1 identify any issue |

**Proposal 5.1:** RAN1 further clarifies that, in a CSI report configuration for UE-initiated/event-driven beam reporting, NW can configure “*timeRestrictionForChannelMeasurement*” for **all supported event-types**, including Event-1, Event-2 and Event-7.

* Send a reply LS on the above to RAN4

**Proposal 3.5 (Updated after online):** On beam report transmission procedure for UE-initiated/event-driven beam reporting, occupation time of occupied CPU(s) starts when CSI report configuration for the UEI beam report is configured, and ends when it is released.

**Proposal 3.1.1A (updated after offline):** On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding the multiplexing a number of L (L>=1) first PUCCH(s) with UEIRIs collided/overlapped with a PUSCH, down select one of the following options:

* Option-1: A field of bit sequence with a length of L bit is piggyback into the PUSCH.
  + Each of bits in the bit sequence corresponds to respective first PUCCH(s) by an ascending order of the values of PUCCH resource ID associated with the first PUCCHs.
* Option-2: A field of bits of representing at most one of positive UEIRI
  + The codepoints other than all-zero value in the field are ordered based on an ascending order of the values of PUCCH resource ID associated with the first PUCCHs to represent a positive UEIBR.
  + An all-zero value for the bits represents a negative UEIRI value across all *L* UEIRIs.

**Option-1:** ZTE, OPPO, vivo, Google, Qualcomm, Spreadtrum, NEC, Ericsson, Apple, NTT DOCOMO, ETRI, Huawei/Hisi’, xiaomi, MediaTek, CATT

**Option-2:** Huawei/Hisi’, Lenovo, Samsung, xiaomi, Ofinno, Fujitsu, MediaTek, CATT,

**Proposal 3.1.1B:** On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding the multiplexing first PUCCH(s) with UEIRIs collided/overlapped with a PUSCH, down select one of the following options:

* Option-1: The field of UEIRI is jointly encoded with HARQ-ACK by appending the UEIRI to the HARQ-ACK information bits.
  + Note: UE does not expect to multiplex UEIBR in a CG PUSCH with CG-UCI/UTO-UCI,
  + Note: From spec perspective, multiplexing UEIRI in PUSCH reuses the same mechanism of CG-UCI.
* Option-2: The field of UEIRI is jointly encoded with CSI Part-1 by adding the UEIRI before CSI part-1 information bits.
  + Note: Multiplexing between first PUCCH and PUSCH is realized by assuming UEIRI as one type of CSI part-1.

Option-1: Huawei/Hisi’, Samsung, vivo, Lenovo, Ofinno, MediaTek, Google, Spreadtrum, CATT, Apple, NTT DOCOMO, Fujitsu,

Option-2: ZTE, OPPO, xiaomi, Qualcomm, NEC, ETRI,

**Proposal 1.1 (Updated after online):** Regarding triggering event determination, besides for Candidate#2, at least Candidate #1, and Candidate#7 are additionally supported for resetting the counting.

* Candidate#1: Regarding Event-2 and 7, RS reconfiguration for new beam is received;
  + In such case, the UE only needs to reset the counting of the removed new beams by RS reconfiguration, and stops the timers for those new beams.
    - FFS: Whether/how to have any spec impact on the resetting the counting of the removed new beams by RS reconfiguration and stopping the timers for those new beams.
* Candidate#7: The RRC parameter(s) of the threshold for event evaluation in Event-1/2 value of Q in Event-7, *eventInstanceCount* and *eventDetectionTimeWindowLength* are reconfigured for the CSI report configuration for UEI beam report.
  + In such case, the UE need to reset the counting and stop the timers for all new beams.

When Candidate#2 is satisfied, the timers for all new beams should be stopped, besides for resetting counting.

Note: Candidate#2: The measured current beam RS is updated based on indicated TCI state

**Supported by:** Apple, Ericsson, Huawei/HiSi, ZTE, NTT DOCOMO, Spreadtrum (at least #1), UNISOC, xiaomi, ofinno, Fujitsu, google, vivo, Lenovo, CATT(#1,5,7), NEC, ETRI,

**Not supported by:**

* Option-1 concerned by: OPPO, Samsung, MTK

Option-7 concerned by: Samsung

**Proposal 3.7:**

Adopt the following changes in TS38.214 Section 5.2.1.5.4.1d:

* **Reason for change:** Current specification doesn’t align with Rel-19 outcomes. There is no conclusion/agreement in Rel-19 to restrict that CSI report configurations for UE-initiated CSI reporting associated with the same PUCCH resource must be associated with the same event type.
* **Summary of change:** The restriction that CSI report configurations for UE-initiated CSI reporting associated with the same PUCCH resource must be associated with the same event type shall be removed due to no corresponding RAN1 conclusion/agreement.
* **Consequences if not approved:** The corresponding specification doesn’t align with the outcomes of Rel-19 feature discussion.

|  |
| --- |
| 5.2.1.5.4.1d UE-Initiated CSI reporting for multiple CSI configurations For a UE configured with multiple *CSI-ReportConfig* with same ~~higher layer parameters~~ *~~eventType~~* ~~and~~ *PUCCHResource*, the UE expects  - the multiple *CSI-ReportConfig* to be configured in the same CC,  - the multiple *CSI-ReportConfig* to be associated with a same CSI trigger state if *reportTransmissionMode* is configured as ‘ModeA’, else  - the same *configuredPUSCHResourceOfModeB* if *reportTransmissionMode* is configured as ‘ModeB’.  The UE reports in a single reporting instance *nrofReportedRS-UEIBR* CRIs or SSBRIs corresponding to reference signals provided by the *newBeamResourceSet* in a *CSI-ReportConfig* that satisfies the event. The CSI report includes the corresponding *CSI-ReportConfigId* and is zero padded to a fixed payload size (when needed), with the fixed payload size given by the maximum payload size among all the multiple *CSI-ReportConfig*.  <Unchanged part is omitted> |

Supported by: Huawei/HiSi, MediaTek, Fujitsu, vivo, Lenovo, xiaomi, Ofinno, Fujitsu, ZTE, Google, Qualcomm, Spreadtrum, CATT, NEC, Huawei, Apple, NTT DOCOMO, ETRI,

Not supported by: OPPO, Samsung, Panasonic,

1. Previous agreements
   1. RAN1#121

**[121] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding the multiplexing a number of L (L>=1) PUCCH format 0/1 with UEIRIs are collided/overlapped with a PUCCH format 2/3/4 carrying **HARQ/CSI**, reuse the legacy SR multiplexing rule.

* The value of bits is based on an ascending order of the values of PUCCH resource ID associated with the first PUCCHs.

**[121] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding the multiplexing a number of L (L>=1) first PUCCH is collided/overlapped with a PUCCH format 2/3/4 carrying HARQ/CSI/SR.

* Option-1: Extend the SR field of bits to a field of bits of representing at most one of positive SR or positive UEIRI
  + The value in the field is based the ascending order of SR ID first and then the ascending order of the PUCCH resource ID associated with the first PUCCHs.
  + If one of the SRs is a positive LRR, the value of the bits indicates the positive LRR, else, if one of the UEIBRs is a positive UEIBR, the value of the bits indicates the positive UEIBR.
  + An all-zero value for the bits represents a negative SR and UEIRI value across all LRR/SRs and/or *L* UEIRIs.

**[121] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding occupied CPU(s), OCPU = 1 is occupied for a CSI report configuration.

* Note: That is the same number of occupied CPU for legacy L1-RSRP measurement.

**[121] Agreement**

Regarding triggering event determination, on candidate values of supported RRC parameters,

* Support the following as RRC candidate values for a threshold value *eventThreshold-r19* for trigger event detection regarding Event-2 or Event-7.
  + Option-2: 0, 1, …, 30, 31 dB
* Support the following as RRC candidate values for a threshold value *eventThreshold-Event1-r19* for trigger event detection regarding Event-1.
  + Reusing *RSRP-Range* in RRC
    - Note: only values 14, …,113 in *RSRP-Range* are valid
* Support the following as RRC candidate values for the time window length for triggering event determination *eventDetectionTimeWindowLength-r19*
  + 4, 5, 8, 10, 16, 20, 40, 80, 160, 320, 640, 1280 ms
* Support the following as RRC candidate values for the counting threshold *eventInstanceCount-r19*
  + Option-1: 2, …, 16

**[121] Agreement**

On cross-CC beam report measurement for UE-initiated/event-driven beam reporting, regarding Event-2, introduce an RRC parameter to indicate one from {SpCell, PUCCH-Scell} as the cell of the configured PUCCH.

* Note: It is up to NW implementation to configure same or different PUCCH resource IDs in different serving cells

**[121] Agreement**

On cross-CC beam report measurement for UE-initiated/event-driven beam reporting, regarding the evaluation periodicity for determining event instance, the periodicity of the current beam RS should be the same as that of the new beam RS(s).

* The evaluation periodicity is the same as the periodicity of the current and new beam RS(s).

Above applies for all events.

**[121] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding the value of X symbols for determining available transmission occasion of the second UL channel on Mode-B

* Support Option-1 of the following as RRC candidate values for X symbols
  + Option-1: 0, 1, 2, 4, 8, 16, 32, 64, 128, 256, 512
  + Note: X is based on the SCS of the first PUCCH.
  + Minimum value of X is subject to UE capability
* Regarding ‘available’ transmission occasion of the second UL channel, the transmission restriction for of the second UL channel reuses the legacy rule of PUSCH with SP-CSI.

**[121] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding the multiplexing/dropping rule(s) of 1-bit first PUCCH, support **Option-3** of the following rules for the Case-2: the 1-bit first PUCCH is collided/overlapped with a PUSCH

* Option-3: Piggyback 1-bit indication of first PUCCH into the PUSCH.
  + The 1-bit indication is always multiplexed in the PUSCH, regardless that UEI beam report procedure is triggered.

**[121] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding CSI reference resource definition for a UEI beam report, the CSI reference resource for a CSI reporting is defined by a single downlink slot *,* where slot n is determined according to the uplink slot *n’* in which the second PUSCH is transmitted, and

* For mode-A, the legacy CSI reference definition of aperiodic CSI reporting is used.
* For mode-B, *nCSI\_ref* is the smallest value greater than or equal to , such that slot *n*- *nCSI\_ref* corresponds to a valid downlink slot, where *Z'* corresponds to the delay requirement as defined in Clause 5.4.

In the report, a condition met indicator for new beam RS is determined according to the measurement(s) triggering the first PUCCH transmission.

Note: Strong concern was raised by vivo on the necessity of the above proposal especially considering the RAN4 status.

**[121] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding Event-1 and Event-7, one PUCCH resource of first PUCCH can be associated with one or multiple CSI report configurations.

**[121] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding priority rules for CSI report multiplexing/dropping, UEI beam report for both mode-A and mode-B is prioritized over Semi-persistent CSI reports on PUCCH and Periodic CSI reports on PUCCH

* UEI beam report for mode-A > Aperiodic CSI report > UEI beam report (for mode-B) > Semi-persistent CSI reports on PUSCH

Note-1: The intra-UE multiplexing/prioritization rules of PUSCH with A-CSI for PUSCH is reused for UEI-BR for Mode A.

Note-2: How to capture the above is up to Editor.

* 1. RAN1#120-bis

**[120b] Agreement**

On cross-CC beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding Event-2, the following working assumption is confirmed with the following modification.

* The first PUCCH and the second PUSCH associated for UE-initiated/event-driven beam reporting are from different PUCCH groups
  + Subject to separate UE capability
* Note: From RAN1 perspective, the above does NOT introduce any spec impact except for UE capability signaling

**[120b] Agreement**

Regarding triggering event determination for Event 2, on resetting the counting, the following modification on the agreed Candidate #2 in RAN1#120 is supported.

* Candidate#2: ~~[~~The measured current beam RS is updated based on~~]~~ indicated TCI state ~~is updated~~;
  + In such case, the UE needs to reset the counting for all new beams.
  + FFS: Further details on the update (if necessary)

**[120b] Agreement**

On UE-initiated/event-driven beam reporting, support the following interpretation on each of the codepoints of the ‘1-bit’ condition met indicator as follows:

* ‘0’ – indicating that the Event-2 instances for corresponding CRI/SSBRI within the time window doesn’t reach the configured number M.
* ‘1’ – indicating that the Event-2 instances for corresponding CRI/SSBRI within the time window reach the configured number M.

FFS: whether/how to introduce the ‘1-bit’ condition met indicator for Event 7.

**[120b] Agreement**

On cross-CC beam report measurement for UE-initiated/event-driven beam reporting, regarding Event-2, introduce an RRC parameter to indicate *ServCellIndex* on which the indicated TCI state used to determine the current beam RS is applied

* FFS: Indication of the cell that corresponds to the configured first PUCCH resource in CSI report config including whether it is necessary

**[120b] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, for the case the pre-configured Type-1 CG PUSCH carry the beam report, for the second UL channel in Mode-B, reuse the intra-UE multiplexing/prioritization rules of PUSCH with SP-CSI for Type-1 CG PUSCH with UEI-BR for Mode B

**[120b] Agreement**

Regarding triggering event determination for Event 2, on the measurement window for initiating the UE-initiated/event-driven beam reporting procedure, down-select **one** of the following options in RAN1#120bis.

* Option-1: The measurement window is from T\_PUCCH – T\_proc – T\_window to T\_PUCCH – T\_proc, where T\_PUCCH is a transmission occasion of a first PUCCH, and T\_proc is RRC configured.
* Option-3: The length, slot offset and periodicity of a measurement window are configured per CSI report configuration by NW.
* Option-4: If an Event-2 instance for a new beam is obtained at the time [and the time for the new beam is not running], UE (re)starts the timer for the new beam, where the expiry time of the timer is equal to the NW-configured length of the time window (T\_window)
* Note: T\_window is the agreed time window parameter for measurement.

**[120b] Agreement**

On UE-initiated/event-driven beam reporting, support the following for Event 1

* Regarding report format of L1-RSRP value of current beam,
  + Option-A2: L1-RSRP of current beam is absolute L1-RSRP (7-bit quantized, rather than 4-bit as in Event-2).

**[120b] Agreement**

On UE-initiated/event-driven beam reporting, regarding current beam report on Event 1, reuse RRC parameter *enabledCurrentBeamReport-r19* to enable/disable the RSRP report of current beam.

**[120b] Conclusion**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding the case that one PUCCH resource of first PUCCH can be associated with one or multiple CSI report configurations, there is NO RAN1 consensus on supporting multiple UEI beam reports carrying in a second PUSCH.

**[120b] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding the multiplexing/dropping rule(s) of 1-bit first PUCCH, support the following rule for the Case-4: the 1-bit first PUCCH is collided/overlapped with a PUCCH format 0/1 carrying HARQ.

* Option-1: Follow legacy SR multiplexing rule.
  + Note: There is no further enhancement on additional phase offset/constellation point(s).

**[120b] Conclusion**

Regarding resource mapping/configuration between first and second UL channel associated with a same CSI report configuration in Mode-B, there is NO consensus on further supporting the case that first PUCCH resource and pre-configured resource for second UL channel can have different periodicities (in ms).

**[120b] Agreement**

Regarding triggering event determination for Event 2, on the measurement window for initiating the UE-initiated/event-driven beam reporting procedure, support Option-4.

* Option-4: If an Event-2 instance for a new beam is obtained at the time and the timer for the new beam is not running, UE starts the timer for the new beam, where the expiry time of the timer is equal to the NW-configured length of the time window (T\_window)
  + Note: Timer is new beam specific.
* Note: T\_window is the agreed time window parameter for measurement.
* Introduce separate UE capability to limit the number of timers. There is only 1 timer per new beam.

Above agreement is captured in RAN1 specifications.

**[120b] Agreement**

On UE-initiated/event-driven beam reporting, the procedure of triggering event determination is captured in RAN1 spec.

**[120b] Conclusion**

There is no RAN1 consensus on the following proposal:

*On UE-initiated/event-driven beam reporting, support at least Option-1 of following for Event 7 as an extension on report format for Event-2*

* *Option-1: Additional field to indicate the codepoint of the activated TCI state with Q-th best quality.*
  + *FFS: Further report codepoints of other activated TCI state(s) [, e.g., from {Q+1}-th best quality to the worst one];*
  + *FFS: Details of the additional indication.*
* *Option-2: Extending the maximum number of reported RS(s) to 8.*
  + *[Note: If Option 2 is agreed, RAN1 can revisit the agreed maximum value of N for event-2.]*
* *Above is applicable only if time window and a configurable value M for event counting on Event-7 are not configured.*

**[120b] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting for a CSI report configuration, down-select at least one of the following candidates in RAN1#121:

* Candidate#1: To introduce a prohibit timer for mode-A and/or mode-B
  + Option-1A: In the case that triggering-event associated with the CSI report configuration is determined [by the same triggering beams(s) as the last transmitted PUCCH], if the prohibit timer is NOT running, the UE can transmit first PUCCH;
    - At the first symbol after the end of the PUSCH transmission, the UE starts the prohibit timer
  + Option-1B: In the case that triggering-event associated with the CSI report configuration is determined, if the prohibit timer is NOT running, the UE can transmit first PUCCH;
    - At the first symbol after the end of the first PUCCH transmission, the UE starts the prohibit timer
  + If the prohibit timer is running, the first PUCCH is not allowed to be transmitted.
* Candidate#2: To introduce a time interval for mode-A and/or mode-B
  + Option-2A: For a first PUCCH transmission occasion, if there is a transmission of another second PUSCH [corresponding to the CSI report determined by the same triggering beam(s) as the first PUCCH] within a configurable time interval before the first PUCCH transmission occasion, the UE should not transmit the first PUCCH.
  + Option-2B: For a first PUCCH transmission occasion, if there is a transmission of another first PUCCH(s) within a configurable time interval before the first PUCCH transmission occasion, the UE should not transmit the first PUCCH.
* Candidate#3: No further enhancement.

**[120b] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding the multiplexing/dropping rule(s) of 1-bit first PUCCH, down-select one of the following rules for the Case-2: the 1-bit first PUCCH is collided/overlapped with a PUSCH, in RAN1#121

* Option-1: Prioritize first PUCCH over PUSCH, i.e., PUSCH is dropped.
  + FFS: If the PUSCH should be with UL-SCH or not for UEI beam report
* Option-3: Piggyback 1-bit indication of first PUCCH into the PUSCH.
  + FFS: The 1-bit indication is always multiplexed in the PUSCH, regardless that UEI beam report procedure is triggered.
  + FFS: If the PUSCH should be with UL-SCH or not for UEI beam report
* Option-4: Reuse the SR dropping rules.
* FFS: whether/how to handle the case of different PHY priorities.

**Conclusion**

There is no RAN1 concensus on the following. No spec change needed.

On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding the multiplexing/dropping rule(s) of 1-bit first PUCCH, support one of the following rule for the Case-3: the 1-bit first PUCCHs corresponding to different CSI configuration for UE-initiated/event-driven beam reporting are overlapping in the time domain

* Option-1: Per CSI report configuration.
* Option-2: Up to implementation.
* Option-3: UE transmits the first PUCCH with higher priority (e.g., PUCCH resource with lower PUCCH resource ID, or event-type)
* Option-4: Multiplexing all 1-bit indications

**[120b] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, confirming the following working assumption with the following modification.

* For Mode-A, the multiple CSI report configurations associated with the same PUCCH resource should be associated with a same *CSI-AperiodicTriggerState*.
* FFS: For Mode-A, the multiple CSI report configurations associated with the same *CSI-AperiodicTriggerState* should be associated with a same PUCCH resource.

**[120b] Conclusion**

There is no RAN1 concensus on the following. No spec change needed.

For event 2, when one PUCCH resource of first PUCCH can be associated with one or multiple CSI report configurations, and if multiple UE initiated beam report procedures occur, down-select one of the following options:

* Option-1: It is up to UE implementation to select one of configuration.
* Option-2: The UEI beam report with highest priority is reported
  + FFS: priority, e.g., lowest *CSI-ReportConfigId*, event-type or based on legacy CSI report priority rule
* Option-3: The report triggered in the latest measurement is reported in PUSCH
  1. RAN1#120

**[120] Agreement**

On cross-CC beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding Event-2, the following working assumption is confirmed with the following modification.

* The first PUCCH and the second PUSCH associated for UE-initiated/event-driven beam reporting are from different PUCCH groups
  + Subject to separate UE capability
* Note: From RAN1 perspective, the above does NOT introduce any spec impact except for UE capability signaling

**[120] Agreement**

On cross-CC beam report measurement for UE-initiated/event-driven beam reporting, regarding Event-2, the following is supported

* The current beam RS and new beam RS(s) are in the same CC
  + The above does NOT imply to preclude the cross-CC TCI indication.
* The CC on which the indicated TCI state is applied, and the CC in which new beam RS(s) are can be the same or different.
  + FFS: Whether/how to introduce an RRC parameter to indicate the CC on which the indicated TCI state is applied.

**[120] Agreement**

On UE-initiated/event-driven beam reporting, for Event 7, the candidate value of RRC parameter *Q* = {1, 2, 3, 4, 5, 6, 7, 8}

* Note: The UE does not expect that the configured Q is greater than the number of the activated DL/joint TCI state(s).

**[120] Conclusion**

There is no RAN1 consensus on the following proposal:

* On beam report transmission procedure for UE-initiated/event-driven beam reporting, multi-bit indication in the first PUCCH is supported.

**[120] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding Mode-B, the value of X symbols for determining available transmission occasion of the second UL channel is configured by RRC (FFS: subject to a corresponding UE capability)

**[120] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, support the following option of dropping rule for the Case-1: the 1-bit first PUCCH is collided/overlapped with a PUCCH carrying normal SR and/or a PUCCH with normal LRR

* Option-1: LRR > first PUCCH > normal SR

Note: When the 1-bit first PUCCH is collided/overlapped with a PUCCH carrying normal SR and/or a PUCCH with normal LRR, only one of them is transmitted based on the above priority rule

**[120] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding the triggering procedure in Step-2 of Mode-A, the following Option-1 is supported.

* Option-1: A CSI trigger state corresponding to UE-initiated/event-driven beam reporting can NOT be associated with legacy AP-CSI report configuration.

**[120] Agreement**

Regarding triggering event determination for Event 2, at least Candidate #2 is supported for resetting the counting.

* Candidate#1: RS reconfiguration/update or MAC-CE signaling (if supported) for new beam is received;
  + FFS: whether to reset the counting for all new beams.
  + FFS: whether to maintain the counting whose new beam is NOT updated.
* Candidate#2: [The measured current beam based on] indicated TCI state is updated;
  + In such case, the UE need to reset the counting for all new beams.
* Candidate#3: UEI beam report is transmitted;
  + FFS: Only reset the counting of new beams fulfilling triggering condition and reported by the UEI beam report
* Candidate#4: NW response (e.g., DCI in step-2 of Mode-A) is detected.
* Candidate#5: The time window expires
* Candidate#6: The threshold for event evaluation is re-configured by RRC signaling
* (FFS) Candidate#7: The RRC parameter(s) associated with the CSI report configuration for UEI beam report is reconfigured.
  + FFS: RRC parameter(s)
* FFS: Other candidates

Note: Whether this proposal is captured in RAN1 or RAN2 is a separate discussion point.

**[120] Agreement**

On UE-initiated/event-driven beam reporting, for Event 1, support **Option-2** for RS measurement:

* Option-2: RS resource set for new beam is configured in the CSI reporting configuration, and the following implicit manner for enabling one of either scheme-1 or scheme-2 is used:
  + If the RS(s) for new beam are CSI-RS configured in a CSI-RS resource set configured with *repetition*, Scheme-1 is enabled; otherwise, Scheme-2 is enabled.
  + In such case, the report format for Event-2 is reused unless critical technical issue is identified
    - FFS: How to report the RSRP value of the current beam
    - FFS: RSRP of the current beam is always reported

**[120] Agreement**

Regarding triggering event determination for Event 2, on the measurement window for initiating the UE-initiated/event-driven beam reporting procedure, further study the following options for possible down-selection

* Option-1: The measurement window is from T\_PUCCH – T\_proc – T\_window to T\_PUCCH – T\_proc, where T\_PUCCH is a transmission occasion of a first PUCCH, and T\_proc is RRC configured.
* Option-2: The measurement window is from T\_Instance – T\_window to T\_Instance, where T\_Instance is an evaluation occasion of event instance, and T\_proc is RRC configured.
  + The UEI beam report in the second PUSCH is based on the most recent measurement for new/current beam RS(s).
* Option-3: The length, slot offset and periodicity of a measurement window are configured per CSI report configuration by NW.
* Option-4: If an Event-2 instance for a new beam is obtained at the time , UE (re)starts the timer for the new beam, where the expiry time of the timer is equal to the NW-configured length of the time window (T\_window)
* Note: T\_window is the agreed time window parameter for measurement.
* Note: Other options are not precluded.

**[120] Agreement**

On UE-initiated/event-driven beam reporting, **Option-1** is supported as an extension on L1-RSRP report format depending on Event-2.

* Option-1: For each of reported CRI/SSBRI, to introduce additional indication of whether the CRI/SSBRI satisfies the condition of Event-2.
  + The presence of this field is enabled by RRC with subjective to UE capability.
  + Note: The presence of this field is only for the case that N > 1 and the time window and M are configured

Above is NOT applicable for event 1.

**[120] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, one PUCCH resource of first PUCCH can be associated with one or multiple CSI report configurations, regarding Event-2.

* Only a single UEI beam report is carried in the second PUSCH.
  + Additional indication of one ‘CSI report configuration’ is provided in the report format.
    - The CSI report configurations associated with the same PUCCH resource are ordered in ascending order of corresponding *CSI-ReportConfigId*, the number of bits of the additional indication field is ceil(log2(N\_CSIconfig)), where the N\_CSIconfig denotes the number of CSI report configurations associated with the same PUCCH resource.
  + The payload size of the single UEI beam report is determined according to the max payload size among the associated CSI report configurations.
    - Zero-padding can be appended if the payload size of the UEI beam report is less than the max report payload.
  + The reported UEI beam report should satisfy the triggering condition.
  + If multiple UE initiated beam report procedures occur, down-select one of the following options:
    - Option-1: It is up to UE implementation to select one of configuration.
    - Option-2: The UEI beam report with highest priority is reported
    - Option-3: The report triggered in the latest measurement is reported in PUSCH
  + The multiple CSI report configurations associated with the one first PUCCH resource should be configured in the same CC.
  + **Working Assumption**: For Mode-A, the multiple CSI report configurations associated with the same PUCCH resource should be associated with a same *CSI-AperiodicTriggerState*.
  + For Mode-B, the multiple CSI report configurations associated with the same PUCCH resource should be associated with the same second configured PUSCH

FFS: Alt-2 Multiple UEI beam reports associated with the same PUCCH resource for first PUCCH can be transmitted in the second PUSCH.

* If RAN1 cannot converge on the support of Alt-2 in RAN1#120bis, this alternative will be dropped from Rel-19

**[120] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding the multiplexing/dropping rule(s) of 1-bit first PUCCH, down-select one of the following rule for the Case-2: the 1-bit first PUCCH is collided/overlapped with a PUSCH

* Option-1: Prioritize first PUCCH over PUSCH, i.e., PUSCH is dropped.
* Option-3: Piggyback 1-bit indication of first PUCCH into the PUSCH.
  + FFS: If the PUSCH should be with UL-SCH or not for UEI beam report
* Option-4: Reuse the SR dropping rules, i.e., the first PUCCH is dropped.
* FFS: whether/how to handle the case of different PHY priorities.
  1. RAN1#119

**[119] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, for the case the pre-configured Type-1 CG PUSCH does NOT carry the beam report, for the second UL channel in Mode-B, Option-2 is supported:

* Option-2: Type-1 CG PUSCH can NOT be transmitted

**[119] Agreement**

On cross-CC beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding Event-2, the following is supported

* the first PUCCH and the second PUSCH associated for UE-initiated/event-driven beam reporting are from the same PUCCH group.
* (working assumption) the first PUCCH and the second PUSCH associated for UE-initiated/event-driven beam reporting are from different PUCCH groups
  + Subject to separate UE capability

**[119] Conclusion**

On cross-CC beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding Event-2, the case that the first PUCCH and the second PUSCH are from the different CG is NOT supported.

**[119] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding first PUCCH channel configuration, down-select one of Alt-1 and Alt-2 for **both mode-A and mode-B.**

* Alt-1 (dedicated SR): Introduce RRC parameter, e.g., *reportResourceRequest-UEIBR/reportNotification-UEIBR*, corresponding to the one-bit indication in the first PUCCH channel
  + The RRC parameter is associated with the dedicated *SchedulingRequestId*.
    - Note: The detailed signaling is up to RAN2.
  + FFS: whether/how to enhance legacy SR to support notification of beam report transmission in Mode-B
* Alt-2 (new UCI type): Introduce RRC parameter, e.g., *firstPUCCHResourceConfig- UEIBR*, for the periodic PUCCH resource configuration.
  + Note: The RRC parameter is NOT associated with *SchedulingRequestId*.
  + 1-bit to PUCCH resource is encoded by reusing the encoding mechanism of positive/negative SR.
  + The dedicated RRC parameter at least comprises the following:
    - *periodicityAndOffset*
    - *PUCCH-ResourceID*
* Above applies at least for the single CC case.
* Reuse multiplexing/dropping rule(s) of SR as baseline
  + FFS: overlapping with SR/LRR or PUSCH

Note: Further details on first PUCCH retransmission for mode A and mode B will be separately discussed.

**[119] Agreement**

On UE-initiated/event-driven beam reporting, for Event 7, the scheme-1 and scheme-2 for deriving ‘RS for current beam’ on Event-2 is reused with the following further interpretation:

* Scheme-1: ‘RS for current beam’ is the QCL RS in the activated TCI state with the Q-th best quality.
* Scheme-2: ‘RS for current beam’ is the SSB which is QCLed with the QCL RS in the activated TCI state with the Q-th best quality.
* Basic feature of **the triggering event determination** for Event-7: Once quality of at least one new beam becomes a threshold value better than the RS derived from the activated TCI state with the Q-th best quality, UE initiated beam report occurs

Note: For Event-2, we have the following definition for scheme-1 and scheme-2

* Scheme-1: RS for current beam is the QCL RS in the indicated TCI state
* Scheme-2: RS for current beam is the SSB which is QCLed with the QCL RS in the indicated TCI state.

**[119] Agreement**

On UE-initiated/event-driven beam reporting, for Event 1, down-select at least one among the following options for RS measurement

* Option-1: RS resource set for new beam is NOT configured in the CSI reporting configuration, and an explicit RRC selection for scheme-1 and scheme-2 is introduced.
* Option-2: RS resource set for new beam is configured in the CSI reporting configuration, and the following implicit manner for enabling one of either scheme-1 or scheme-2 is used:
  + If the RS(s) for new beam are CSI-RS configured in a CSI-RS resource set configured with *repetition*, Scheme-1 is enabled; otherwise, Scheme-2 is enabled.

**[119] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding first PUCCH channel configuration, Alt-2 is supported for both mode-A and mode-B: the first PUCCH channel is a new UCI type

* Alt-2 (new UCI type): Introduce RRC parameter, e.g., *firstPUCCHResourceConfig- UEIBR*, for the periodic PUCCH resource configuration.
  + It is RAN1’s understanding that the RRC parameter is NOT associated with *SchedulingRequestId*.
  + 1-bit to PUCCH resource is encoded by reusing the encoding mechanism of positive/negative SR.
  + The dedicated RRC parameter at least comprises the following:
    - *periodicityAndOffset*
    - *PUCCH-ResourceID*
* Above applies at least for the single CC case.
* Reuse multiplexing/dropping rule(s) of SR as baseline
  + FFS: overlapping with SR/LRR or PUSCH

Note: Further details on first PUCCH retransmission (if supported) for mode A and mode B will be continue to be separately discussed in RAN1.

**[119] Agreement**

Confirm the following working assumption in RAN1#117:

On beam report transmission procedure for UE-initiated/event-driven beam reporting

* For mode-A, at least support one-bit indication in the first PUCCH channel to request a resource for a second UL channel to carry beam report.
  + In such case, a periodic PUCCH resource (with PUCCH format 0/1) is configured by dedicated RRC signaling.
* For mode-B, at least support one-bit indication in the first PUCCH channel to notify a second UL channel to carry beam report.
  + In such case, a periodic PUCCH resource (with PUCCH format 0/1) is configured by dedicated RRC signaling.
* FFS: Whether/how to support multi-bit indication in the first PUCCH for mode-A and mode-B, e.g., when multi-event(s) are approved.
* FFS: details on the dedicated RRC signaling
* Above applies at least for the single CC case.

**[119] Agreement**

On UE-initiated/event-driven beam reporting, at least one of the following is supported as an extension on L1-RSRP report format depending on Event-2.

* Option-1: For each of reported CRI/SSBRI, to introduce additional indication of whether the CRI/SSBRI satisfies the condition of Event-2.
  + The presence of this field is enabled by RRC with subjective to UE capability.
  + The presence of this field is only for the case that N > 1 and the time window and M are configured
* Option-2: For each of reported CRI/SSBRI, to introduce additional indication of the number of Event-2 instances for the CRI/SSBRI(s) within a time window.
  + The presence of this field is enabled by RRC with subjective to UE capability.
  + The presence of this field is only for the case that N > 1 and the time window and M are configured.
* Option-3: No further enhancement.

Note: As agreed in RAN1#117, at least one of the reported CRI/SSBRI(s) should satisfy the condition of Event-2

FFS: Whether/how to handle the case if UE has not sent any first PUCCH associated for UE-initiated/event-driven beam reporting, for Mode-A.

**[119] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding the triggering procedure in Step-2 of Mode-A, down-select one of the following options in RAN1#120

* Option-1: A CSI trigger state is dedicated to UE-initiated/event-driven beam reporting, i.e., not associated with legacy AP-CSI report configuration.
* Option-2: A CSI trigger state can be associated with
  + only UE-initiated/event-driven beam reporting
  + or only legacy AP-CSI configuration
  + or UE-initiated/event-driven beam reporting and legacy AP-CSI configuration

**[119] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding the multiplexing/dropping rule(s) of 1-bit first PUCCH, further study at least the following cases:

* Case-1: The 1-bit first PUCCH is collided/overlapped with a PUCCH carrying normal SR and/or a PUCCH with normal LRR
* Case-2: The 1-bit first PUCCH is collided/overlapped with a PUSCH
* Case-3: The 1-bit first PUCCHs corresponding to different CSI configuration for UE-initiated/event-driven beam reporting are overlapping in the time domain.

**[119] Agreement**

Study the following to reduce beam application latency after a UEI/ED beam report is sent

* + Alt-1: After confirmation/acknowledgement from NW, apply new beam without RRC configuration signaling or MAC-CE signaling
    - after sending a UE-initiated beam report, the UE could store the QCL properties of the SSB associated with the reference signal reported in the beam report
    - update TCI state(s) with the reported new beam(s)
    - activate new beam(s) without additional SSB reception
  + Alt-2: After receiving a TCI state activation command to activate a TCI state(s), if the new beam(s) associated with the TCI state(s) is reported as synchronized in the UEI/ED beam report, the TCI state(s) becomes applicable for DL reception without additional SSB reception.
    - Note: A reported new beam is determined as synchronized by UE, if the UE stores the QCL properties associated with the reported new beam(s) after the UEI/ED beam report is sent
    - FFS: How to inform a reported new beam in a UEI/ED beam report (i.e., introducing one-bit indicator for each reported new beam or all the reported new beam are assumed to be synchronized)
  + Alt-3: After sending a UE-initiated beam report, the UE could store the QCL properties of the SSB associated with the reference signal reported in the beam report.
    - In such case, at the reception of a subsequent reception of Unified TCI States Activation/Deactivation MAC CE, the UE activates new beam(s) without additional SSB reception
  + Other alternatives are not precluded

**[119] Agreement**

On UE-initiated/event-driven beam reporting, regarding trigger events, the following working assumption in RAN1#118bis is confirmed:

On UE-initiated/event-driven beam reporting, regarding trigger events, besides for Event-2, Event-1 and Event-7 are both supported.

* Event-1: Quality of the current beam is worse than a certain threshold.
* Event-7: Quality of at least one new beam, such as L1-RSRP, becomes a threshold value better than the RS derived from the activated TCI state with the Q-th best quality.
  + Q is RRC configured with subjective to UE capability signalling
    - UE may only indicate a single candidate value or not support Event-7.
* The additionally supported events will reuse the same design as event 2 – unless there is consensus to do otherwise
* The additionally supported events will be lower priority compared to event 2.

**[119] Agreement**

Regarding for the evaluation periodicity for determining Event-2 instance [at least when DRX is not configured], at least **Alt-1** is supported for the single-CC beam reporting (for case that the CSI report configuration and RS for the current beam and new beam(s) are in the same CC).

* Alt-1: The periodicity of the current beam RS should be the same as that of the new beam RS(s).
  + The evaluation periodicity is the same as the periodicity of the current and new beam RS(s).
* Alt-2: The periodicity of the current beam RS can be different from that of the new beam RS(s)
  + Alt-2\_1: The evaluation periodicity is the same as the periodicity of the current beam RS.
  + Alt-2\_2: The evaluation periodicity is the same as periodicity of the new beam RS.
  + Alt-2\_3: The evaluation periodicity is the same as shortest periodicity of the current beam RS and new beam RS(s).
  + Alt-2\_4: The evaluation periodicity is the maximum of {X ms, shortest periodicity of the current beam RS and new beam RS(s)}.
  + Alt-2\_5: The evaluation periodicity is the same as largest periodicity of the current beam RS and new beam RS(s).

Note: There is the same periodicity for the new beam RS(s).

FFS: Down-selection among above Alt(s) for cross-CC beam reporting.

Strong concerns were expressed by Huawei and CATT that if only Alt-1 is supported in the end, the feature will not be practical.

Send an LS to RAN4. Final LS in R1-2410914.

* 1. RAN1#118-bis

**[118b] Agreement**

On UE-initiated/event-driven beam reporting, regarding L1-RSRP report format Option-3 depending on Event-2,

* The differential L1-RSRP is quantized to a 4-bit value with 2 dB step size

**[118b] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding the triggering procedure in Step-2 of Mode-A

* Reuse CSI request field in DCI format 0\_1/0\_2 to trigger the transmission of the UEI beam report
  + If a CSI trigger state associated with UEI beam report configuration(s) is indicated by the CSI request field in DCI format 0\_1/0\_2, the UE transmits the corresponding UEI beam report(s) in the second PUSCH scheduled by the DCI format 0\_1/0\_2
  + FFS: DCI format 0\_3
* FFS: Whether a CSI trigger state should be dedicated to UE-initiated/event-driven beam reporting, i.e., not associated with legacy AP-CSI report configuration.

**[118b] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, resource mapping/configuration between first and second UL channel in Mode-B, at least Option-1 is supported

* Option-1 (one-to-one): Only one periodic PUCCH resource for the first channel and only one pre-configured resource for second UL channel can be associated with the CSI report configuration for UE-initiated/event-driven beam reporting.
  + Down-select one of the following in RAN1#118bis
    - Option-1A: Same periodicity between first PUCCH resource and pre-configured resource for second UL channel.
    - Option-1B: No restriction in terms of periodicity.

**[118b] Agreement**

On cross-CC beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding Event-2, for both Mode-A and Mode-B, the first PUCCH and the second PUSCH can be from the same or different CC(s)

* FFS: whether the first PUCCH and the second PUSCH should be from the same PUCCH group
* The first PUCCH and the second PUSCH should be in the same CG
  + FFS: Different CGs

**[118b] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, for the case the pre-configured Type-1 CG PUSCH carry the beam report, for the second UL channel in **Mode-B**, at least option3 is supported:

* Option-1: The same Type-1 CG PUSCH can carry UL-SCH, any other UCI, and the beam report.
* Option-2: The Type-1 CG PUSCH is a dedicated type-1 CG PUSCH for carrying the beam report
  + Note: This PUSCH can NOT carry UL-SCH. This PUSCH can NOT carry any other UCI.
* Option-3: The Type-1 CG PUSCH is a type-1 CG PUSCH for carrying the beam report
  + Note: This PUSCH can NOT carry UL-SCH. This PUSCH can carry any other UCI.

FFS: whether Type-1 CG PUSCH can be transmitted if the pre-configured Type-1 CG PUSCH does NOT carry the beam report

**[118b]Working Assumption**

The following working assumption in RAN1#118 is revised in red.

On UE-initiated/event-driven beam reporting, regarding trigger events, besides for Event-2, Event-1 and Event-7 are both supported.

* Event-1: Quality of the current beam is worse than a certain threshold.
* Event-7: Quality of at least one new beam, such as L1-RSRP, becomes a threshold value better than the RS derived from the activated TCI state with the ~~M-th~~ Q-th best quality.
  + ~~M~~ Q is RRC configured with subjective to UE capability signalling
    - UE may only indicate a single candidate value or not support Event-7.
* The additionally supported events will reuse the same design as event 2 – unless there is consensus to do otherwise
* The additionally supported events will be lower priority compared to event 2.

**[118b] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding resource mapping/configuration between first and second UL channel associated with a same CSI report configuration in Mode-B,

* The UE expects that there is the same periodicity (in ms) between first PUCCH resource and pre-configured resource for second UL channel.
  + FFS: Whether first PUCCH resource and pre-configured resource for second UL channel can have different periodicities (in ms)

**[118b] Agreement**

Regarding RS measurement for the current beam for Event 2, for Option-2a, besides for scheme-1 and scheme-2, there is no RAN1 consensus on the following enhancement for handling the case that only one TRS is configured in the indicated TCI state in RAN1#118bis

* Option-1: Introducing additional scheme: the RS for current beam can be a CSI-RS for beam management derived from the QCL RS in the indicated TCI state;
* Option-2: Further support TRS as measurement RS of current beam for determining L1-RSRP
* Option-3: Introducing additional scheme: The RS for current beam is explicitly configured by RRC or MAC-CE (Option-2C in RAN1 116b agreement).

Note 3: When only one TRS is configured in the indicated TCI state, either Scheme-1(working assumption) or Scheme-2 is used where enabling one of either Scheme-1 or Scheme-2 is selected by NW.

When the Scheme-1 is used, the UE assumes that the CSI-RS resource in the indicated TCI state is configured in a CSI-RS resource set configured with repetition.

**[118b] Agreement**

Regarding RS measurement for the current beam for Event 2, for Option-2a, confirm the following working assumption

* Note 3: When only one TRS is configured in the indicated TCI state, either Scheme-1~~(working assumption)~~ or Scheme-2 is used where enabling one of either Scheme-1 or Scheme-2 is selected by NW.

**[118b] Agreement**

Regarding RS measurement for the current beam for Event 2, for Option-2a, the following working assumption in RAN1#117 is confirmed with modification:

* (**Working Assumption**) Enabling of either Scheme-1 or Scheme-2 should ensure the same RS type for RS measurement for current beam and new beam.
  + Note: In such case, the RS type comprises SSB and CSI-RS configured in a CSI-RS resource set configured with *repetition*.

**[118b] Agreement**

Regarding RS measurement for the current beam for Event 2, for enabling one of either Scheme-1 or Scheme-2 by NW in Option-2a, the following implicit manner is supported:

* If the RS(s) for new beam are CSI-RS configured in a CSI-RS resource set configured with *repetition*, Scheme-1 is enabled; otherwise, Scheme-2 is enabled.

**[118b] Agreement**

Regarding the triggering event determination for Event 2, the event instance(s) counting is per new beam. Further study candidate condition(s) of resetting the counting including whether resetting is needed.

**[118b] Agreement**

Regarding the triggering event determination for Event 2, down-select among the following alternatives for the evaluation periodicity for determining Event-2 instance [at least when DRX is not configured]

* Alt-1: The periodicity of the current beam RS should be the same as that of the new beam RS(s).
  + The evaluation periodicity is the same as the periodicity of the current and new beam RS(s)
* Alt-2: The periodicity of the current beam RS can be different from that of the new beam RS(s)
  + Alt-2\_1: The evaluation periodicity is the same as the periodicity of the current beam RS;
  + Alt-2\_2: The evaluation periodicity is the same as periodicity of the new beam RS;
  + Alt-2\_3: The evaluation periodicity is the same as shortest periodicity of the current beam RS and new beam RS(s):
  + Alt-2\_4: The evaluation periodicity is the maximum of {X ms, shortest periodicity of the current beam RS and new beam RS(s)}:
  + Alt-2\_5: The evaluation periodicity is the same as largest periodicity of the current beam RS and new beam RS(s):

Note: There is the same periodicity for the new beam RS(s).

**[118b] Agreement**

On cross-CC beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding Event-2, the following is supported

* For new beam measurement, in a CSI report configuration, configure legacy RRC parameter *carrier* that indicates the CC that the RS resource set associated with the CSI reporting configuration can be found
* FFS: Whether the current beam RS and new beam RS(s) can be in the same CC or in different CCs, regarding cross-CC beam measurement.
* FFS: Whether the indicated TCI state and new beam RS(s) can be in the same CC or in different CCs, regarding cross-CC beam measurement.

**[118b] Conclusion**

There is no RAN1 consensus on the following proposal:

On UE-initiated/event-driven beam reporting, regarding L1-RSRP report format Option-3 depending on Event-2, the candidate value of ‘N’ can further comprise {5, 6, 7, 8}, besides for previously agreed candidate value of {1, 2, 3, 4}.

* 1. RAN1#118

**[118] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, for regarding Mode-B, the pre-configured resource(s) for the second channel in Step-2 is at least type 1 CG-PUSCH.

* FFS: PUCCH as the second channel
* FFS: Whether the PUSCH can be with UL data

**[118] Agreement**

Regarding explicit RS configuration for new beam measurement for Event 2, at least Option-1 is supported

* + Option-1: The RS(s) for new beam(s) are explicitly configured in one RS resource set associated with an CSI reporting configuration
  + If legacy UE capability signaling cannot be reused, introduce a UE capability signaling of indicating the maximum number of the configured RS(s) in the RS resource set.
  + FFS: The RS in the RS resource set can be updated by MAC-CE

**[118] Agreement**

On UE-initiated/event-driven beam reporting, regarding L1-RSRP report format Option-3 depending on Event-2, the following differential L1-RSRP report format is supported.

|  |
| --- |
| CRI or SSBRI #1 |
| CRI or SSBRI #2 |
| … |
| CRI or SSBRI #N |
| L1-RSRP #1 |
| Differential L1-RSRP #2 |
| … |
| Differential L1-RSRP #N |
| Differential L1-RSRP for current beam, if report mode that current beam is always reported is enabled by RRC |
| Note: Other contents are not precluded |

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* + - Differential L1-RSRP #2~#N/current beam is determined based on the difference between measured L1-RSRP corresponding to the CRI/SSBRI #2~#N/current beam and the measured L1-RSRP corresponding to CRI/SSBRI #1
      * L1-RSRP#1 is the largest measured RSRP among reported ones, and an absolute L1-RSRP.
      * FFS: range and step size of differential L1-RSRP
    - FFS: Whether/how to report additional indication of which CRI/SSBRI(s) satisfy the condition of Event-2.
    - FFS: Additional report content(s) (e.g., reporting configuration ID, indication for synchronization state, event ID, or cell ID).

**[118] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding the dedicated RRC signaling for first PUCCH channel configuration for **Mode-A**, down-select one of the following

* Alt-1 (dedicated SR for mode-A): Introduce RRC parameter, e.g., *reportResourceRequest-UEIBR*, corresponding to the one-bit indication in the first PUCCH channel
  + The RRC parameter is associated with the dedicated *SchedulingRequestId*.
    - Note: The detailed signaling is up to RAN2.
* Alt 2 (new UCI type): Introduce RRC parameter, e.g., *firstPUCCHResourceConfig-ModeA-UEIBR*, for the periodic PUCCH resource configuration.
  + Note: The RRC parameter is NOT associated with *SchedulingRequestId*.
  + FFS: how to encode 1-bit to PUCCH resource, e.g., reuse encoding mechanism of positive/negative SR.
  + The dedicated RRC parameter at least comprises the following:
    - *periodicityAndOffset*
    - *PUCCH-ResourceID*
* Above applies at least for the single CC case.

**[118] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding the dedicated RRC signaling for first PUCCH channel configuration for **Mode-B**, down-select one of the following

* Alt 1 (dedicated SR for mode-B): Introduce RRC parameter, e.g., *reportNotification-UEIBR*, corresponding to the one-bit indication in the first PUCCH channel
  + The RRC parameter is associated with the dedicated *SchedulingRequestId*.
    - Note: The detailed signaling is up to RAN2.
* Alt 2 (new UCI type): Introduce RRC parameter, e.g., *firstPUCCHResourceConfig-ModeB-UEIBR*, for the periodic PUCCH resource configuration.
  + Note: The RRC parameter is NOT associated with *SchedulingRequestId*.
  + FFS: how to encode 1-bit to PUCCH resource, e.g., reuse encoding mechanism of positive/negative SR.
  + The dedicated RRC parameter at least comprises the following:
    - *periodicityAndOffset*
    - *PUCCH-ResourceID*
* Above is at least applied to a single CC case.

**[118] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding the triggering procedure in Step-2 of Mode-A, select one of the following options

* Option-1: Introduce a new 1-bit field in DCI format 0\_1/0\_2 to trigger the transmission of the UEI beam report
  + FFS: DCI format 0\_3
* Option-2: Reuse CSI request field in DCI format 0\_1/0\_2 to trigger the transmission of the UEI beam report
  + FFS: DCI format 0\_3
* FFS: Whether/how to handle the case that multiple CSI report configuration(s) for the UE-initiated/event-driven beam report are associated with the same first PUCCH resource and/or the same scheduled PUSCH

**[118] Conclusion**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding Mode-A, there is no RAN1 consensus on additionally supporting that the DCI format in Step-2 comprises DL-grant DCI format, and the second channel in Step-3 is PUCCH.

**[118] Agreement**

On UE-initiated/event-driven beam reporting, regarding L1-RSRP report format Option-3 depending on Event-2, the candidate value of ‘N’ at least comprises {1, 2, 3, 4}

* FFS: additional candidate value(s) of {5, 6, 7, 8}
* FFS: If ‘N’ is not RRC configured, only one L1-RSRP and CRI/SSBRI are reported by default.

**[118] Agreement**

Regarding RS measurement for the current beam for Event 2, for Option-2a, besides for scheme-1 and scheme-2, further down-select one of the following for handling the case that only one TRS is configured in the indicated TCI state in RAN1#118bis

* Option-1: Introducing additional scheme: the RS for current beam can be a CSI-RS for beam management derived from the QCL RS in the indicated TCI state;
* Option-2: Further support TRS as measurement RS of current beam for determining L1-RSRP
* Option-3: Introducing additional scheme: The RS for current beam is explicitly configured by RRC or MAC-CE (Option-2C in RAN1 116b agreement).
* Option-4: No further enhancement

Note: If there is no consensus in RAN1 on one of Options 1/2/3, Option 4 will be taken.

**[118] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, for the case the pre-configured Type-1 CG PUSCH carry the beam report, for the second UL channel in **Mode-B**, at least one or both of the following should be supported:

* Option-1: The same Type-1 CG PUSCH can carry UL-SCH and the beam report.
* Option-2: The Type-1 CG PUSCH is a dedicated type-1 CG PUSCH for carrying the beam report
  + Note: This PUSCH can NOT carry UL-SCH. This PUSCH can NOT carry any other UCI.

**[118] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding Mode-B, UEI beam report is carried on a first available transmission occasion of the second UL channel X symbols after sending the last symbol of report notification on the first PUCCH channel.

**[118] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding resource mapping/configuration between first and second channel in Mode-B, for a given CSI report configuration, the following is provided for down-selection.

* Option-1 (one-to-one): Only one first PUCCH resource and only one pre-configured resource for second UL channel can be associated with the CSI report configuration for UE-initiated/event-driven beam reporting.
  + Option-1A: Same periodicity between first PUCCH resource and pre-configured resource for second UL channel.
  + Option-1B: No restriction in terms of periodicity.
* Option-2 (one-to-M): Only one first PUCCH resource and one or more pre-configured resource(s) for second UL channel can be associated with CSI report configuration for UE-initiated/event-driven beam reporting.

**[118] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding Event-2, for at least Mode-B, the beam report should be carried in the second UL channel in the CC where the corresponding CSI report configuration is configured.

* Above applies to both cross-CC and same-CC beam report.
* Note: Above is applied to the case that second UL channel is PUSCH.
* FFS: Whether the first and second channels can be from the same/different CC.

**[118] Working Assumption**

On UE-initiated/event-driven beam reporting, regarding trigger events, besides for Event-2, Event-1 and Event-7 are both supported.

* Event-1: Quality of the current beam is worse than a certain threshold.
* Event-7: Quality of at least one new beam, such as L1-RSRP, becomes a threshold value better than the RS derived from the activated TCI state with the M-th best quality.
  + M is RRC configured with subjective to UE capability signalling
    - UE may only indicate a single candidate value or not support Event-7.
* The additionally supported events will reuse the same design as event 2 – unless there is consensus to do otherwise
* The additionally supported events will be lower priority compared to event 2.

**[118] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding **Mode-A and/or Mode-B**, further study the following for first PUCCH transmission

* UCI multiplexing/dropping/prioritization rule
* Conditions for the transmission of the first PUCCH.
* Whether the PUCCH resource in the first PUCCH channel can be associated with multiple CSI report configurations for UE-initiated/event-driven beam reporting from one or multiple CC(s).
* Whether/how to re-transmit the first PUCCH channel.

Whether/how to apply prohibit-timer or maximum number of (re)transmission(s) for first PUCCH channel.

* 1. RAN1#117

**[117] Agreement**

On UE-initiated/event-driven beam reporting, regarding UL signaling content(s) of L1-RSRP report depending on Event-2, in a report instance, at least Option-3 is supported

* Option-3: N ≥ 1 beam(s) are reported in the report instance,
  + At least one of N reported beam(s) should satisfy the condition of Event-2
  + N is configured by gNB
    - FFS: candidate value of ‘N’.
  + FFS: RRC can enable or disable whether current beam is always reported in addition to the N beams
* FFS: Option-1/1a/1b/2.
* Above applies at least for the single CC case

**[117] Working Assumption**

On beam report transmission procedure for UE-initiated/event-driven beam reporting

* For mode-A, at least support one-bit indication in the first PUCCH channel to request a resource for a second UL channel to carry beam report.
  + In such case, a periodic PUCCH resource (with PUCCH format 0/1) is configured by dedicated RRC signaling.
* For mode-B, at least support one-bit indication in the first PUCCH channel to notify a second UL channel to carry beam report.
  + In such case, a periodic PUCCH resource (with PUCCH format 0/1) is configured by dedicated RRC signaling.
* FFS: Whether/how to support multi-bit indication in the first PUCCH for mode-A and mode-B, e.g., when multi-event(s) are approved.
* FFS: details on the dedicated RRC signaling
* Above applies at least for the single CC case.

**[117] Agreement**

Regarding RS measurement for the current beam for Event 2, for Option-2a, support the both schemes as follows.

* Scheme-1: RS for current beam is the QCL RS in the indicated TCI state
  + FFS: Whether/How to handle the case if only one TRS is configured in the indicated TCI state.
* Scheme-2: the RS for current beam is the SSB which is QCLed with the QCL RS in the indicated TCI state.
* Enabling one of either Scheme-1 or Scheme-2 is selected by NW.
  + FFS: The above selection is via an explicit RRC parameter or an implicit manner, e.g., if the RS(s) for new beam are CSI-RS, Scheme-1 is enabled; otherwise, Scheme-2 is enabled.
  + (**Working Assumption**) Enabling of either Scheme-1 or Scheme-2 should ensure the same RS type for RS measurement for current beam and new beam.
* The above QCL RS is the RS w.r.t. QCL-TypeD, if there are two QCL RSs in the indicated TCI state.

**[117] Agreement**

Regarding RS measurement for the new beam for Event 2, at least Option-3a is supported

* Option-3a (explicit manner): The RS(s) for new beam(s) are explicitly configured
* FFS: Option-3b/3c
  + Option-3b: The RS(s) for new beam(s) are implicitly derived from QCL RS(s) of activated TCI state(s).
  + Option-3c: The RS(s) for new beam(s) are implicitly derived from QCL RS(s) of TCI state(s) in a configured subset of the legacy RRC-configured TCI state list

**[117] Agreement**

On UE-initiated/event-driven beam reporting, regarding L1-RSRP report format Option-3 depending on Event-2, for a report instance where N ≥ 1 beam(s) are reported, the following is supported.

* RRC can enable or disable whether current beam is always reported
  + - When enabled by RRC, the current beam + N beams from the measurement RSs for new beam(s) are reported
      * Note: The reported current beam is NOT counted in the N reported beams.
    - When disabled by RRC, N beams are reported.

**[117] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, regarding Mode-A, the DCI format in Step-2 comprises UL-grant DCI format, and the second channel in Step-3 is at least PUSCH.

* The UL-grant DCI format at least comprises DCI format 0\_1/0\_2.
  + FFS: DCI format 0\_3
* FFS: How to trigger the UEI beam report by the UL-grant DCI format
* FFS: the DCI format in Step-2 comprises DL-grant DCI format, and the second channel in Step-3 is PUCCH.
  + - 1-bit field in the DL-grant DCI format is introduced to indicate the transmission of the UEI beam report
      * The PUCCH resource for HARQ-ACK transmission can be reused to carry both the HARQ-ACK and UEI beam report.
    - The DL-grant DCI format at least comprises DCI format 1\_1/1\_2.
      * FFS: DCI format 1\_3

**[117] Agreement**

Regarding the triggering event determination for Event 2:

* If within a time window (which is configurable), the number of Event-2 instance(s) for at least one same new beam is greater than or equal to a configurable number M, UE initiated beam report occurs.
  + Note: Event-2 instance for a new beam is determined if the L1-RSRP of the new beam becomes a threshold value better than the current beam

Above feature is subject to UE capability.

* Basic feature: Once the L1-RSRP of the new beam becomes a threshold value better than the current beam, UE initiated beam report occurs

FFS: Whether the above is captured in RAN1 or RAN2 specification.

**[117] Agreement**

On UE-initiated/event-driven beam reporting, regarding trigger events, the following Event-1 and 7a/7b, are provided for down-selection or combination in RAN1#118 (possible outcome is that no new event is supported)

* Event-1: Quality of the current beam is worse than a certain threshold.
* Event-7a: Quality of at least one new beam, such as L1-RSRP, becomes a threshold value better than the RS derived from the activated TCI state with the **worst** quality.
* Event-7b: Quality of at least one new beam, such as L1-RSRP, becomes a threshold value better than the RS derived from the activated TCI state with the **best** quality.

**[117] Agreement**

Regarding explicit RS configuration for new beam measurement for Event 2, down-select the following options in the RAN1#118:

* Option-1: The RS(s) for new beam(s) are explicitly configured in one RS resource set associated with an CSI reporting configuration;
  + FFS: The RS in the RS resource set can be updated by MAC-CE.
* Option-2: A list of RS(s) for new beam measurement can be configured by RRC, and a subset can be activated for new beam measurement by MAC-CE.
  + FFS: If a list size is small, MAC-CE activation is not needed
* Option-3: A list of RS resource(s) for new beam measurement can be configured by RRC, and a subset of RS resource(s) in the list can be provided for new beam measurement by indicated TCI state.
* Others are not precluded.
* FFS: Each RS for new beam measurement should be associated with a configured joint/DL TCI state which can be used as the indicated TCI state

**[117] Agreement**

Regarding RS measurement for the current beam for Event 2, for Option-2a, besides for scheme-1 and scheme-2, further study the following for handling the case that only one TRS is configured in the indicated TCI state.

* Option-1: Introducing additional scheme: the RS for current beam can be a CSI-RS for beam management derived from the QCL RS in the indicated TCI state;
* Option-2: Further support TRS as measurement RS of current beam for determining L1-RSRP
* Option-3: Introducing additional scheme: The RS for current beam is explicitly configured by RRC or MAC-CE (Option-2C in RAN1 116b agreement).
* Option-4: No further enhancement (i.e., in such case, Scheme-2 is used)
* Others are not precluded.
  1. RAN1#116-bis

**[116b] Agreement**

On beam report transmission procedure for UE-initiated/event-driven beam reporting, following modes are supported:

* Mode A (dynamically scheduling UCI by gNB):
  + Step 1: UE transmits a first PUCCH (one-bit/multi-bit) to request a resource for a second UL channel to carry beam report
    - FFS: Request format, e.g., SR or a new UCI type.
  + Step 2: UE detects the DCI format to indicate a resource for a second UL channel to carry beam report.
  + Step 3: Beam report is transmitted in second UL channel.
    - FFS: Details on the second UL channel, e.g., whether the second UL channel is PUCCH, PUSCH or both
  + This mode is basic UE capability (i.e. all UE supporting UE-initiated/event-driven beam reporting should support this feature).
  + No new DCI format is introduced.
* Mode B (UCI in pre-configured resource(s) for second UL channel):
  + Step 1: UE transmits a first PUCCH (one-bit/multi-bit) notifying a second UL channel to carry beam report
    - FFS: Notification format, e.g., SR or a new UCI type.
  + Step 2: UE transmits the beam report in the second UL channel.
    - FFS: Details on the second UL channel, e.g., whether the second UL channel is PUCCH, PUSCH or both
  + The notification in Step1 is in a separate reporting instance from the beam report in Step 2.

FFS: Whether UE receives acknowledge information with response to each step for all modes

For above procedures, cross-CC beam reporting is supported for both modes.

* FFS: Details.

**[116b] Agreement**

On UE-initiated/event-driven beam reporting, regarding trigger-event detection for beam reporting, at least support Event-2: Quality of at least one new beam, such as L1-RSRP, becomes a threshold value better than the current beam.

* At least L1-RSRP is supported as quality metrics used for Event-2
  + FFS: How the L1-RSRP is used to determine the triggering event (e.g. timer, counter, filter coefficient)
  + FFS: Whether the network controls how the L1-RSRP is used to determine the triggering event
* Regarding RS measurement for the new beam for Event-2, down-select one or more of the following:
  + Option-3a (explicit manner): The RS(s) for new beam(s) are explicitly configured by RRC (e.g., reusing legacy configuration of RS measurement or in *TCI-State*) or MAC-CE
  + Option-3b (implicit manner): The RS(s) for new beam(s) are implicitly derived from QCL RS(s) of activated TCI state(s).
  + Option-3c (implicit manner): The RS(s) for new beam(s) are implicitly derived from QCL RS(s) of configured TCI state(s).
* Note-1: ‘New/current beam’ is for discussion purpose.
* Note-2: Other trigger events/quality metrics (e.g., L1-SINR) are not precluded.
* Note-3: For above implicit manner(s), if there are two QCL RSs in a TCI state, the measurement RS is derived from RS w.r.t. QCL-TypeD, if applicable.

**[116b] Agreement**

On UE-initiated/event-driven beam reporting, regarding Event-2, the threshold value is RRC configured

**[116b] Agreement**

On UE-initiated/event-driven beam reporting, regarding Event-2, ‘current beam’ is a beam corresponding to the indicated TCI state.

* Regarding RS measurement for the current beam for Event-2, Option-2a is supported:
  + Option-2a (implicit manner): The RS for current beam is implicitly derived from a QCL RS of indicated TCI state.
    - FFS: The RS for current beam can be either the QCL RS in the indicated TCI state or the SSB which is QCLed with the QCL RS in the indicated TCI state.
  + FFS: Option-2c (explicit manner): The RS for current beam is explicitly configured by RRC or MAC-CE.
    - Note: SSB or CSI-RS can be configured

**[116b] Agreement**

On UE-initiated/event-driven beam reporting, further study the following trigger events:

* Event-1: Quality of the current beam is worse than a certain threshold.
* Event-3: Quality of a new beam is better than a certain threshold.
* Event-4: Quality of the current beam is worse than a threshold 1, and quality of at least one new beam is better than a threshold 2.
* Event-5: Absolute value of the difference between the quality of the current beam and the quality of at least one new beam is lower than a threshold.
* Event-6: When the current beam is not in the best K>1 beams (out of configured beams for measurement and reporting).
* Event-7a: Quality of at least one new beam, such as L1-RSRP, becomes a threshold value better than the RS derived from the activated TCI state with the **worst** quality.
* Event-7b: Quality of at least one new beam, such as L1-RSRP, becomes a threshold value better than the RS derived from the activated TCI state with the **best** quality.
* Event-8: Quality of M>1 new beams, such as L1-RSRP, become a threshold value better than the current beam.
* Event-9: Quality of at least one new beam, such as L1-RSRP, becomes a threshold value better than the configured reference RS (can be SSB or CSI-RS).

**[116b] Agreement**

On UE-initiated/event-driven beam reporting, regarding UL signaling content(s) of L1-RSRP report depending on Event-2, in a report instance, the following options are provided for down-selection (other options are not precluded) in RAN1#117

* Option-1 (variable size): N beam(s) are reported in the report instance, where N {1, 2, ..., Nmax}
  + The N beam(s) should satisfy the condition of Event-2
  + Nmax is configured by gNB
  + FFS: Whether the indication of payload size should be provided additionally.
* Option-1a (variable size): N beam(s) are reported in the report instance, where N {1, 2, ..., Nmax}
  + At least one of N reported beam(s) should satisfy the condition of Event-2
  + Nmax is configured by gNB
  + FFS: Whether the indication of payload size should be provided additionally.
  + FFS: Details on how value of N is determined by the UE
* Option-1b: N beam(s) are reported in the report instance, where N {1, 2, ..., Nmax}
  + The N beam(s) should satisfy the condition of Event-2
  + Nmax is configured by gNB
  + Payload size does not vary as a function of N
  + FFS: Zero-padding can be provided if N is less than Nmax.
* Option-2: Only N=1 beam is reported in the report instance
  + The reported beam should satisfy the condition of Event-2
* Option-3: N ≥ 1 beam(s) are reported in the report instance,
  + At least one of N reported beam(s) should satisfy the condition of Event-2
  + N is configured by gNB
* Other options are not precluded.
* FFS: Whether the measurement results for current beam is always reported or can be enabled by RRC.
* FFS: When current beam is reported, whether the current beam is counted in the N reported beams.
* The selected option shall satisfy Event-2.
  1. RAN1#116

**[116] Agreement**

On UE-initiated/event-driven beam report, at least of following aspects should be included:

* Trigger-event detection for beam reporting by UE
  + UE monitors RS to assess if a beam-reporting trigger condition has been met
  + FFS: Trigger condition for declaring beam-reporting event
* Beam-report transmission by UE
  + Signaling contents in the beam report
  + Down-selection one or more options (strive for one) between the following options as signaling medium/container for beam report transmission
    - MAC-CE
    - UCI
    - Others are not precluded.

On UE-initiated/event-driven beam report, the following aspects may be included:

* UE requesting UL resource(s) for the beam report
* UE notifying transmission of beam report
* gNB preconfigured resources

Other procedure(s) as required

**[116] Agreement**

On UE-initiated/event-driven beam reporting, regarding trigger-event detection for beam reporting, RAN1 further study at least the following aspects: quality metrics, event-definition and threshold.

* Further study trigger events, including the following example as a starting point
  + Event-1: Quality of the current beam is worse than a certain threshold.
  + Event-2: Quality of at least one new beam, such as L1-RSRP, becomes a threshold value better than the current beam.
  + Event-3: Quality of a new beam is better than a certain threshold.
  + Event-4: Quality of the current beam is worse than a threshold 1, and quality of at least one new beam is better than a threshold 2.
  + Others are not precluded.
* Note: Companies are encouraged to provide details on procedure (e.g. how it is used) related to their preferred event

**[116] Agreement**

On UE-initiated/event-driven beam reporting, at least support L1-RSRP as a measurement quantity on SSB for intra-cell and inter-cell, and periodic CSI-RS for beam management

* Notes: measurement results may be contained in the beam report and/or used as quality metric(s) to initiate/trigger the reporting.
* FFS: Semi-persistent CSI-RS and aperiodic CSI-RS.
* FFS: Whether/how to support L1-SINR measurement, assuming legacy RS or RS combination (e.g., CMR only, CMR+ZP/NZP-IMR) for Rel-16 SINR is reused.
* FFS: Whether/how to specify filtering operation for L1-RSRP.

**[116] Agreement**

On UE-initiated/event-driven beam reporting, regarding signaling content(s), at least support DL RS resource indicator and L1-RSRP

* FFS: Study and decide whether additional contents can be supported.
* FFS: L1-RSRP format, e.g., absolute and/or differential value.
* Note: Above does not imply to preclude discussion on L1-RSRP filtering.
* The actual reported content depends on the triggering event
  + Support of one or multiple events will be discussed separately

# References

|  |  |  |  |
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