**3GPP TSG-RAN WG2 Meeting #109 electronic Draft R2-2001728**

**Elbonia, 24 Feb – 6 Mar 2020**

**Agenda item: 6.9.3.6**

**Source: Intel Corporation**

**Title: Report of [AT109e][212][MOB] CHO configuration and execution details (Intel)**

**Document for: Discussion and Decision**

# Introduction

This is the email discussion report on below email discussion:

* [AT109e][212][MOB] CHO configuration and execution details (Intel)

Scope:

* + - Agreeing on the proposals as per [R2-2002040](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2002040.zip).
		- Discuss open items as per [R2-2002040](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2002040.zip) to seek companies feedback on open issues of CP for CHO.

 Intended outcome:

* + - Proposals with consensus that can be incorporated (if needed) in the running CR(s) (aim to agree to those over email)
		- List of remaining open issues that need to be pursued in next meeting (if any).
		- Issues that should no longer be pursued

 Deadline for providing comments and for rappporteur inputs:

* + - Companies input: Thursday, Feb. 27th 3:00 CET
		- Rapporteur proposals: Friday, Feb. 28th 12:00 CET
		- Comments on proposals: Monday March 2nd by 17:00 CET

# Discussion

### 2.1 Agreements proposed to be agreed in this meeting (from all sub-topics)

As proposed in [38], below proposal is considered as easy agreement.

**Proposal S4\_1::**The UE shall autonomously remove measObject(s) only associated to CHO upon suspend/release, CHO/HO execution and re-establishment;

**Question 1: Do companies agree the proposal S4\_1 listed above? If no, pls indicate your reason.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Remark**  |
| MediaTek | Yes | Not sure if network configures measObjects in this way, but if yes, measObject(s) only associated to CHO upon suspend/release, CHO/HO execution and re-establishment |
| ZTE | Yes  |  |
| OPPO | Yes |  |
| Futurewei | Yes | The measObject only linked to the reportConfig for the CHO is released. |
| Huawei, HiSilicon | Yes |  |
| Intel | Yes |  |
| Sharp | Yes |  |
| CATT | Yes | Upon release, the UE will release the measConfig autonomously, so the UE will also remove the measobject associated to CHO. Any further enhancement can be discussed in a future release. |
| Lenovo&MM |  | We agreed that ‘It is up to UE implementation whether the measurement on other candidate cell shall be continued during CHO execution period’. That means that UE may autonomously perform measurement, which could be helpful for cell selection if CHO/HO fail. Therefore, the UE may not remove measObject(s) only associated to CHO upon CHO/HO execution.In addition, we agreed that ‘measID and reportConfig associated with CHO config shall be removed when CHO configuration is autonomously removed.’ So, the proposal can be changed to ‘measObject(s) only associated to CHO shall be removed when CHO configuration is autonomously removed. |
| Samsung | No | There is no need to add UE complexity, also noting that it seems highly likely the same MO will be used again for RRM or CHO after CHO execution |
| vivo | Yes |  |
| Ericsson | Yes | As most companies says, not doing that causes trouble and leads to a very specific network implementation. |
| ETRI | Yes |  |
| LG |  | We are wondering that hanging measObjects is a serious problem. Since As-config will be transferred to the target, we wonder if the target can figure out the CHO configuration exactly. Then the target will know the measObject which is only linked to the CHO, and the measObject can be handled by the target. Therefore, since, in our view, there is not ambiguous UE action related to the measObject, we don’t think the UE shall autonomously remove the measObject for CHO. |
| Nokia |  | In general, it is safer to remove just the measID (which is unique and not used for other measurements), MeasObjects should be deconfigured by the NW in all cases other than failure scenarios. |
| Apple | Yes |  |

Based on companies’ inputs (17):

UE shall autonomously remove measObject: 13

UE shall not autonomously remove measObject : 3

Change to measObject(s) only associated to CHO shall be removed when CHO configuration is autonomously removed: 2

There is clear majority on how to handle measObject. Rapporteur suggest:

**Proposal 1:**The UE shall autonomously remove measObject(s) only associated to CHO when CHO configuration is autonomously removed;

### 2.2 Open items proposed to be further discussed in this meeting (from all sub-topics)

**DISC S1\_1:**For “and” condition, further discussion on which option should be selected, Option A, B, C, D or E.

Option A: event 1 still satisfy entry condition after its TTT expires when event 2 TTT expires.

* This option has the most companies support during email discussion. However, there are no contribution submission in this meeting.

Option B: consider event satisfies entry condition during TTT as fulfilled and consider event not satisfies entry condition during TTT as not fulfilled. Only both events fulfilled starts CHO.

* This option is in the email discussion and have some support. However, there are no contribution submission in this meeting.

Option C: Similar to Option B, but “not fulfilled” is determined based on leaving condition instead of entry condition; [1] [7];

* Supporting companies: Ericsson, Intel

Option D: based on single TTT. “Not fulfilled” similar to C. The second event satisfy entry condition to start single TTT [5]

* Supporting company: futureWei
* This is also same as original Ericsson proposal in the email discussion

Option E [20]: CHO is executed when both events fulfil its entry condition for corresponding TTTs preceding the time of triggering CHO execution.

* Samsung

**Question 2: For “and” condition, which option should be selected, Option A, B, C, D or E.?**

|  |  |  |
| --- | --- | --- |
| **Company** | **A, B, C, D, E?** | **Remark**  |
| MediaTek | E | When two events are configured, CHO can be triggered only if both events are triggered, i.e. each entry condition is satisfied for corresponding TTT preceding the time of triggering CHO execution. Even if cond1 was satisfied for TTT1, UE leaves event1 immediately when cond1 is not satisfied.To make configuration simpler, we can have a single TTT. |
| ZTE | C | Considering more that two triggering conditions may be allowed to configure for a single candidate cell in later releases, we prefer to define fulfill condition for each event to avoid the complexity and ambiguity of text description. And the measurement report like mechanism can be reused for the definition of fulfill condition. |
| OPPO | A | For CHO execution, we think the condition that matters most should be the entering condition. Option A means that the earlier fulfilling event has a larger TTT than its configured one.  |
| Futurewei | D | An event is holding after its entering condition has been fulfilled and leaving condition is not met. The AND execution triggering condition is fulfilled if the first event has been entered and holds till the entering of the second event and both two events are holding over a TTT\_joint. The starting point of the TTT\_joint is the moment that the second event entering condition is fulfilled. The TTT2 configured for the second event is used as the TTT\_joint of the two event AND triggering. Comments: Only use entering condition is not enough, leaving condition have to be included. Two events each with their TTT can not be AND together since two TTTs have different durations and the events entering time is different. Only one TTT is needed and started upon entering the second event.  |
| Huawei, HiSilicon | C |  |
| Intel | C | We would prefer to reuse existing solution as much as possible. TO our understanding, for Option C, the checking on whether cho trigger event is still met or not based on Leaving condition that was used in measurement report. .  |
| CATT | A or E | Option D will introduce restriction on the configuration of TTT, option C is based on the leaving condition which is not algin with the initial intention, comparing with option B, option A and option E is straightforward. |
| Lenovo&MM | A | The intention of introducing TTT is to improve the reliability and reduce HO failure. The expiry of both TTTs for two events should be considered in the CHO.  |
| Samsung | E | The simplest one while sufficient and necessary for the required operation. |
| Vivo | C | We prefer the simple approach, and “not fulfilled” is determined based on leaving condition.  |
| Ericsson | CA is not acceptable (not clear) | Concerning A) We don’t want to sound repetitive, especially after such a long and exciting debate with Intel but I’ll try once more: A does not work, hence is not acceptable. I guess one company suggested reverting the agreement for the “AND” condition if A is not agreed, nto sure what to say, except that it sounds akward to be considered as a serious proposal.Concerning B/C): Both work, hence acceptable. No strong view what way we should go, but slightly more preference to C since it looks somewhat like the measurement framework in current specs i.e. probably facilitates UE implementation. One advantage of B/C: we know what we are agreeing since we have see a Text Proposal.Concerning D) This option simplifies modelling in RRC and most important: it works (differently from A or E that requires further work to solve the ambiguity). However, we understand that going this way would not allow different TTTs for combined events, i.e., we would need to revert the agreement from RAN2#108. This was our original proposal and is acceptbale anyways.Concerning E) We appreciate the efforts trying to address the issues we raised in the lengthy discussion with Intel, but we still see the same ambiguities. |
| ETRI | E | We have a concern that “and” condition of two events with each TTT is too complex and how useful it is. We prefer that a TTT is configured for only one event even with “and” condition.Anyway, same view as CATT. However, Option A is different from Option E. In our view, Option E is the most correct interpretation for “and” condition.However, we do not support the text proposal either Alt1 or Alt2 in R2-2001637. We suggest another alternative based on option 3b as below, highlighting the change in yellow:The UE shall:1. for each *CHO-ConfigId* within the *VarCHO-Config*:

2> consider the cell which has a physical cell identity matching the value indicated in the *ServingCellConfigCommon* in the received *cho-RRCReconfig* to be applicable cell;2> for each *measId* included in the *measIdList* within *VarMeasConfig* indicated in the *triggerCondition* associated to *CHO-ConfigId:*3> if the entry condition(s) applicable for this event associated with the *CHO-ConfigId*, i.e. the event corresponding with the *cho-eventId(s)* of the corresponding *cho-TriggerConfig* within *VarCHO-Config*, is fulfilled for the applicable cells for all measurements after layer 3 filtering taken during the corresponding *timeToTrigger* defined for this event within the *VarCHO-Config*:4> consider the event associated to that *measId* to be fulfilled;3> if the entry condition(s) applicable for this event associated with the *CHO-ConfigId*, i.e. the event corresponding with the *cho-eventId(s)* of the corresponding *cho-TriggerConfig* within *VarCHO-Config*, is not fulfilled for the applicable cells for all measurements after layer 3 filtering:4> consider the event associated to that *measId* to be not fulfilled;2> if execution/trigger conditions for all associated *measId*(s) within *cho-TriggerConfig* are fulfilled for all associated *measId*(s) in *cho-TriggerConfig*☺:4> consider the target cell candidate within the stored *cho-RRCReconfig*, associated to that *CHO-ConfigId*, as a triggered cell;4> initiate the conditional handover execution, as specified in 5.3.5.x.5; |
| BT | C | We prefer option C as it allow different TTT for combined events. Proposal A and E are not clear for us. |
| LG | C | We also think option C has less impact on specification including measurement principle. In the legacy measurement procedure, the UE regards any event that is not valid only when the leaving condition is met. |
| Nokia | A | In 108#66 there was a significant support for this option and this is the most intuitive way of combining two events, as each can have its own TTT and TTT may be started at different time (as the event entry criteria will be satisfied at different time instances) + each need to be fulfilled at least for the duration of TTT. We think either option A is adopted or ‘AND’ shall not be considered for linking CHO execution triggering events.[Ericsson] Options A and Option C are not necessarily mutually exclusive. In fact, options C and B model that behaviour in RRC, don’t you think? The model proposed for A in a previous email discussion was not clear and had ambiguities. In fact, I thought Nokia also agreed that the text for option A was lacking clarity/was ambiguous. |
| Apple | C | We prefer simpler solution.  |

Based on companies’ inputs (18):

Option A: event 1 still satisfy entry condition after its TTT expires when event 2 TTT expires.

Option B: consider event satisfies entry condition during TTT as fulfilled and consider event not satisfies entry condition during TTT as not fulfilled. Only both events fulfilled starts CHO.

Option C: Similar to Option B, but “not fulfilled” is determined based on leaving condition instead of entry condition; [1] [7];

Option D: based on single TTT. “Not fulfilled” similar to C. The second event satisfy entry condition to start single TTT [5]

Option E [20]: CHO is executed when both events fulfil its entry condition for corresponding TTTs preceding the time of triggering CHO execution.

Option A: 5

Option B: 0

Option C: 9

Option D: 1

Option E: 3

Most companies prefer option C, i.e. based on leaving condition. Rapporteur suggest:

**Proposal 2:** consider event satisfies entry condition during TTT as fulfilled and consider event satisfies leaving condition during TTT as not fulfilled. Only both events fulfilled starts CHO. Agree the text proposal shown as below:

The UE shall:

1. for each *CHO-ConfigId* within the *VarCHO-Config*:

2> consider the cell which has a physical cell identity matching the value indicated in the *ServingCellConfigCommon* in the received *cho-RRCReconfig* to be applicable cell;

2> for each *measId* included in the *measIdList* within *VarMeasConfig* indicated in the *triggerCondition* associated to *CHO-ConfigId:*

3>  if the entry condition(s) applicable for this event associated with the *CHO-ConfigId*, i.e. the event corresponding with the *cho-eventId(s)* of the corresponding *cho-TriggerConfig* within *VarCHO-Config*, is fulfilled for the applicable cells for all measurements after layer 3 filtering taken during the corresponding *timeToTrigger* defined for this event within the *VarCHO-Config*:

4> consider the event associated to that *measId* to be fulfilled;

3>  if the leaving condition(s) applicable for this event associated with the *CHO-ConfigId*, i.e. the event corresponding with the *cho-eventId(s)* of the corresponding *cho-TriggerConfig* within *VarCHO-Config*, is fulfilled for the applicable cells for all measurements after layer 3 filtering taken during the corresponding *timeToTrigger* defined for this event within the *VarCHO-Config*:

4> consider the event associated to that *measId* to be not fulfilled;

2> if execution/trigger conditions for all associated *measId*(s) within *cho-TriggerConfig* are fulfilled for all associated *measId*(s) in *cho-TriggerConfig*:

4> consider the target cell candidate within the stored *cho-RRCReconfig*, associated to that *CHO-ConfigId*, as a triggered cell;

4> initiate the conditional handover execution, as specified in 5.3.5.x.5;

Note: Samsung (Option E), FutureWei (Option D) expressed concern on proposal 2 in the reflector.

Illustration of how event triggered measurement report works



Illustration of how this is applicable in option C:



**DISC S1\_2:**Further discussion on whether different measurement object in A3+A5 combination is supported or not.

**Issue 2: [1] raised for A3/A5 combination, whether original agreements “same RS type” for multiple trigger events is still valid or not, in addition whether different measurement Object is allowed.**

* Is different RS type in A3+A5 combination supported?
* Is different measurement object in A3+A5 combination supported?

Contribution [1] indicated that whether different measurement objects are allowed to be configured with CHO has not been discussed before. For same/different RS type, RAN2 have spent lots of time on this. It would be good not revise agreement unless it is necessary. It would be good to only have further discussion on measObject.

**Question 3: Should different measurement object be supported or not in A3+A5 combination?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Remark**  |
| MediaTek | No | We should stick to the agreement of “the same RS type”, and a reasonable interpretation is that UE should also evaluate the two events based on the same measObject. |
| ZTE | No | Considering the limited time, we prefer not to revise the agreement of “the same RS type” and correspondingly only allow to configure two execution conditions based on the same measObject. |
| OPPO | No | We don’t see the need of different measurement objects. |
| Futurewei | NO | Two events already pretty complicated. The benefit may not worth the efforts. |
| Huawei, HiSilicon | No |  |
| Intel | No | Agree others’s view indicated above.  |
| Sharp | No | Two events based on the same measObject is sufficient for most mobility scenario. |
| CATT | No | There is no needed to support different measurement object, the measurement monitoring is performed on the appointed cell i.e. the PCI in the reconfigurationWithSync, so there is no need to support different measurement object for one appointed cell measurement monitoring. |
| Lenovo&MM | No | We don’t see the benefit to introduce the different RS. |
| Samsung | No | We don’t see any motivation to this. So don’t want to discuss. |
| vivo | No | There is no motivation for different MO. |
| Ericsson | No for RS type.Yes for MOs. | In our understanding, the agreements of single RS type were per event, not discussed for combinations. We are fine though to have a single RS type for combinations, but maybe we need a specific agreement for the combinations (which we don’t have).Saying NO to measurement objects would mean restrictions to the CHO framework once more. Is there any additional complexity involved in that? For example, compared to the confiugation of two measIds with different MOs associated, what is the extra complexity here? |
| ETRI | No |  |
| BT  | No |  |
| LG | No | We don’t think the network is able to configure different measurement objects for a single candidate target cell. As we already agreed multiple conditions are used for a single candidate, it is not reasonable to allow to take different measurement objects as an execution condition |
| Nokia | No | Just to clarify, we consider triggering conditions for a single CHO candidate cell? In such case, it is enough to rely on a single MO. |
| Apple | No |  |

Based on companies’ inputs (19):

**Different measurement object is supported in A3+A5 combination**

* Yes: 1
* No: 18

There is clear majority that no support different measurement object for A3+A5 combination. Rapporteur suggest:

**Proposal 3:** Only same measurement object is allowed for a candidate cell when 2 trigger events are configured for the execution condition for the candidate cell.:

**DISC S2\_1:**To discuss whether the UE shall stop the evaluating the execution condition during legacy HO/CHO. Or the UE shall not apply CHO configuration when a new execution condition is met during HO/CHO;

**CHO execution condition is not fulfilled when T304 is running:**

* Supporting companies: **LG**

|  |
| --- |
| In contribution [32], According to the previous agreement, the network can send the HO command after sending CHO configuration. However, in our view, there is a leak point in the stage-3 running CR in that the CHO can be triggered while performing the HO [3]. The reason why the UE faces a situation that the CHO execution condition is met while performing the HO is due to the time difference between receiving the HO command and detaching the source cell. Because of the time difference, the UE can monitor candidate cells until the source cell configuration is replaced by the target cell configuration. Then, according to the current Running CR, the CHO monitoring procedure leads to the CHO execution procedure regardless of whether the HO is performed. To avoid unexpected UE ehaviour, we propose to mandate UE behaivor in this case. There may be various ways to mandate UE ehaviour, but we think the most proper and simple way is to mandate the UE not to perform CHO while performing HO. It can be achieved by specifying the UE to perform CHO only when the T304 is not running.  |

The relevant agreements are:

*Agreement 1: 3 If UE receives conventional handover command, it will execute the handover command regardless of stored (configured) conditional handover command. This applies if the HO cmd is received before any CHO triggering condition is satisfied.*

*Agreement 2“UE is not required to continue evaluating the triggering condition of other candidate cell(s) during CHO execution”.*

So far, agreement 2 is UE implementation, i.e. the UE may still continue the evaluating the execution condition when T304 is running (i.e. during legacy HO or CHO). To address the issue raised by LG:

**Option 1**: change agreement 2 to ““UE shall stop evaluating the triggering condition of other candidate cell(s) during CHO/HO execution”..

* We still need to capture it in the specification.

**If not:**

**Option 2** [32]: the UE shall not apply CHO configuration when a new execution condition is met during HO/CHO.

Ask RAN2 to discuss whether the UE shall stop the evaluating the execution condition during legacy HO/CHO. Or the UE shall not apply CHO configuration when a new execution condition is met during HO/CHO. .

**Question 4: Shall the UE stop the evaluating the execution condition during legacy HO/CHO,i.e. option 1? Or shall the UE not apply CHO configuration when a new execution condition is met during HO/CHO, i.e. option 2?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option 1 or 2?** | **Remark**  |
| MediaTek | Option 2 | We think current Agreement 2 is fine. We also agree that * When there are multiple CHO candidates, UE can choose the candidate
* UE executes legcy HO when receiving legacy HO command, even if CHO configured.

Thus, evaluating another candidate cell (when this is still possible) does not mean the UE will terminates HO/CHO execution if the conditions are met for that cell. This is most likely for failure handling, i.e., if HO/CHO fails, UE can peform CHO to the candidate.However, if companies have concern about unexpected behaviour, we can have some clarification as in Option 2. |
| ZTE | Option 1 | We prefer the UE stops evaluating the triggering condition of other candidate cell(s) during CHO/HO execution. Even if the execution of CHO fails, the UE shall trigger the CHO based failure handling if allowed, which is based on the cell selection, rather than the evaluation result of other candidate cells. |
| OPPO | Option 1 | During legacy HO/CHO execution, UE has released the source cell and thus shall not evaluate any execution condition configured in the source cell. |
| Futurewei | Option 2 | Agree with MediaTek. In order to minimize the delay for failure handling, it should be allowed that UE implementation may perform the measurement and evaluation of other candidates as long as the currently on-going execution is not interrupted. |
| Huawei, HiSilicon | Option 2 | Share the same view as MediaTek. |
| Intel | Option 2 | Current agreement is“*UE is not required to continue evaluating the triggering condition of other candidate cell(s) during CHO execution*”. It is also leave the freedom to the UE, i.e. the UE may or may not perform the evaluation. The only thing we need to do is, avoid the UE to perform execution condition when T304 is running.  |
| Sharp | Option 1 | Agree with ZTE’s view. |
| CATT | Option 2 | We think the UE check T304 before executing HO. If the T304 is running, the UE shall not apply CHO configuration when a new execution is met. |
| Lenovo&MM | Option 2 | Agree with MTK. Don’t need to stop evaluation, which can be used for the potential HO/CHO failure handling. |
| Samsung  |  | It is enough to say that UE does not trigger CHO during HO/CHO. It is not good to overspecify the other details. The rest is upto UE implementation.  |
| Vivo | Option 2 | We think the current agreement 2 is enough. It is up to UE implementation whether to evaluate triggering condition during CHO execution. The possible evaluation will be helpful for the failure handling. Regarding comments from other companies that the CHO based failure handling is should be based on cell selection, but the cell selection is also UE implementation. Thus, there is no motivation to restrict the UE ehaviour for this case.  |
| Ericsson | Option 1 or skip this discussion | This is all very vague and not productive discussion in our view.Can proponents explain how option 2 could be tested? If it cannot be tested, is there a point in specifying? If there is no point in specifying, is there a point in discussing/agreeing?We don’t find option 2 acceptable, unless proponents show how that “agreement” is captured in RRC. We are ok of not having option 1, but at least I can see a clear impact to the RRC text based on that (which I cannot see in Option 2).[Rap] The changes will be, see highlighted sentence and if T304 is not running :5.3.5.x.4 Conditional handover monitoringThe UE shall:xxxx2> if entry conditions for all associated *measId*(s) within *cho-TriggerConfig* are fulfilled and if T304 is not running:4> consider the target candidate cell within the stored *cho-RRCReconfig*, associated to that *CHO-ConfigId*, as a triggered cell;4> initiate the conditional handover execution, as specified in 5.3.5.x.5; |
| ETRI | Option 2 |  |
| LG | Option 2 | We share with Intel. Performing evaluation of candidates is up to UE implementation. According to TS 38.300, it said: “How and when the UE exactly performs the required measurements is implementation specific to the point that the output at B fulfils the performance requirements set in TS 38.133.” In addition, in this meeting, RAN2 also agreed that it is up to UE implementation whether the measurement on other candidate cells shall be continued during the CHO execution period.Thus, considering the above reasons and consistency with legacy principle, we don’t think that specifying not to evaluation i.e., option 1, is justified and we think to perform evaluation leaves as UE implementation.Moreover, regarding ZTE’s comment, if we specify not to apply CHO configuration when a new execution condition is met during mobility i.e., T304 is running, there is no problem because the UE doesn’t consider any candidate cell as a target cell and doesn’t store it to *cho-RRCReconfig.* |
| Nokia | Option 1 | Not sure what this discussion is actually about? Option 1 is written in a strict manner (with ‘shall not’), but – as Intel described – actually the UE can be free to do whatever the UE wants (including monitoring other candidates). What only matter is that the UE cannot apply a new CHO configuration/candidate cell when it is already executing CHO. We thought this is already obvious, as we decided UE can try once and then recover via cell selection and possibly CHO… |
| Apple | Option 2 | We think it is up to UE implementation. UE can continue or stop evaluating the execution condition. |

Based on companies’ inputs (18):

**Option 1:The UE stop the evaluating the execution condition during legacy HO/CHO;**

**Option 2: The UE does not apply CHO configuration when a new execution condition is met during HO/CHO.**

**Option 1: 5**

**Option 2: 12**

There is clear majority that the UE shall not apply CHO configuration when a new execution condition is met during HO/CHO. Rapporteur suggest:

**Proposal 4:** The UE shall not apply CHO configuration when a new execution condition is met during HO/CHO and agree below text proposal.

##### 5.3.5.x.4 Conditional handover monitoring

The UE shall:

xxx

2> if entry conditions for all associated *measId*(s) within *cho-TriggerConfig* are fulfilled and if T304 is not running:

4> consider the target candidate cell within the stored *cho-RRCReconfig*, associated to that *CHO-ConfigId*, as a triggered cell;

4> initiate the conditional handover execution, as specified in 5.3.5.x.5;

**DISC S3\_2:** to discuss whether the cho-ExecutionCond is also OPTIONAL, Need S?

**Yes [1] Ericsson**

The issue was not discussed in the email discussion 108#66. It would be good to confirm in RAN2.

**Question 5: Shall the cho-ExecutionCond also be OPTIONAL, Need S?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Remark**  |
| MediaTek | Yes |  |
| ZTE | Yes  | It’s beneficial for signalling overhead reduction when the NW just wants to modify the CHO configuration included in the cho-RRCReconfig but not for the CHO execution condition. |
| OPPO | Yes |  |
| Futurewei | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Intel | No | cho-ExecutionCond at most contains two measIDs, totoal 12 bits. Do we really need to support delta signalling on this? |
| Sharp | Yes |  |
| CATT | Yes | the NW may only update the configuration of the candidate cell without update the execution condition. |
| Lenovo&MM | Yes |  |
| Samsung  | NO | Q5 seems against convention i.e. within CellGroupConfig spCellConfig is just need M (while also this field is mandatory to signal at setup).We would also be fine to not have delta ignalling in particular for the condition i.e. seems just a minor optimization. We would also be fine to have both mandatory, which would be even simpler (change of condition seems infrequent so no problem to signal target config once more) |
| vivo | Yes |  |
| Ericsson | Yes | This is not as critical as the cho-RRCReconfig, which may be larger (as Intel points out). But we also see no issue to assume Optional need S (perhaps it would simplify the procedure text?!).Having the cho-RRCReconfig mandatory is non-sense in our view. That would mean that the source shall always store the RRCReconfiguration prepared by a CHO target candidate, just in case it wants to update trigger conditions! Also, Need M is non-sense as it mean the new cho-RRCReconfig applied on top of the previous cho-RRCReconfig, unless we define some complex procedure where UE contructs a complete message to be stored (option that has been previously excluded). |
| ETRI | Yes |  |
| LG | No | We have same understanding with Intel |
| Nokia | Yes | Agree with ZTE. |
| Apple | Yes | It can be used for the change of the target CHO configuration without execution condition change. |

Based on companies’ inputs (18):

**cho-ExecutionCond is OPTIONAL, Need S:**

* **Yes:15**
* **No: 3**

There is clear majority that the field cho-ExecutionCond is OPTIONAL, Need S. Rapporteur suggest:

**Proposal 5:** The field cho-ExecutionCond is OPTIONAL, Need S.

**DISC S3\_3:** should we allow CHO configuration without cho-ExecutionCond?

The issue is raised in [3]. Company wants to have CHO candidate cell only for failure handling instead of normal CHO.

* Supporting company: vivo

**Question 6: should we allow CHO configuration without cho-ExecutionCond?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Remark**  |
| MediaTek | No | We agreed that CHO candidate can be access when HO/CHO fails, even if execution conditions are not met. This implies that the network may configure a strict execution condition (e.g., A3 with a large offset) for CHO, but the candidate cell is indeed usable even if the conditions are not met, so we agree to use it as a kind of failure handling. But this doesn’t mean that the network should configure a CHO candidate which is intentionally for failure handling case. It is “irresponsible” for a network to configure a CHO candidate without giving corresponding execution conditions. |
| ZTE | No | Share the same view with MediaTek. |
| OPPO | No | We also think CHO configuration is intentionally done for normal CHO execution and failure handling via CHO is just an add-on feature. We should allow CHO configuration without cho-ExecutionCond. |
| Futurewei | No | If doing so, it defeats the purpose. A configured CHO candidate should be prepared for CHO at first… Network implementation can prepare some close neighbors for possible reestablishment to minimize delay and avoid context fetch. But it is a separate topic. We don’t need to mix reestablishment enhancement with CHO configuration. |
| Huawei, HiSilicon | No |  |
| Intel | No |  |
| Sharp | No | Share the same view with MediaTek. The main purpose for CHO is for actual handover not for failure recovery. |
| CATT | No | No need to introduce extra impact on current running CR, the current configuration supports the failure handling. |
| Lenovo&MM | No | The main target of CHO is to improve the HO reliability rather than failure hanldling. |
| Samsung  | no | Please refere the answer of Q5. |
| Vivo | Yes | We think in some cases, some cells may be not good target cells for handover, but is good enough for fallback to avoid performing re-establishment, which will lead to data loss and long data interruption. We think such cells can be included as candidate cell in CHO command without handover trigger condition configured, i.e. UE will never try to hand over to the cells when the connection to serving cell is good, but may perform CHO handover to the cells after HOF or RLF.Regarding the comment from MediaTek, I think it is true for other cells, but not so reasonable for serving cell. In case the UE is in central of one cell, network can configure the serving cell as the CHO candidate cell. If RLF occurs due to temporarily blocking, the UE can choose serving cell to perform CHO based failure handling. Otherwise, UE should either choose another poor neighboring cell for CHO execution or perform re-establishment on the serving cell.  |
| Ericsson | No | We see this as an interesting optimization, but not most critical. The way we understood the idea is that this is stored just in case an RLF occurs and, if UE selects a cell for which CHO configuration is stored, UE executes CHO. I wonder if a network implementation could make that possible e.g. by configuring some specific measId(s). |
| ETRI | No | We think that for this case, the network can configure an extremely high condition. |
| BT | No |  |
| LG | No | This may be up to network decisions. But, because it seems kind of a corner case and generally the CHO configuration will be present for enhancing HO robustness, we don’t need to make an additional case. Moreover, this reverses the previous agreement that CHO configuration should be fully present for the first time. |
| Nokia | No | Definitely not. CHO configuration + execution condition is not primarily meant for recovery, but for CHO execution, where condition is mandatory.  |
| Apple | No |  |

Based on companies’ inputs (19):

**Allow CHO configuration without cho-ExecutionCond**

* **Yes:1**
* **No: 18**

There is clear majority that CHO configuration without cho-ExecutionCond is not allowed. Rapporteur suggest:

**Proposal 6:** The UE needs to have valid cho-ExecutionCond when CHO configuration is configured.

**DISC S5\_1:** to discuss whether CHO (MCG) can work together with MR-DC, i.e. receive CHO when MR-DC is configured, and receive SCG addition WHEN CHO condition is configured;

Two cases are raised in contribution [2]:

* Case 1) UE operating in MR-DC receives a CHO configuration (from MN, so this is not about PSCell change, but about handover);
* Case 2) UE monitoring CHO conditions is configured to start operating in MR-DC (e.g. SCG addition).
* Supporting company: Ericsson

The question is whether these two cases are allowed or not. **If yes, to avoid RAN3 impact, the UE shall autonomously release MR-DC upon execution of CHO.** It would be good to discuss this in the meeting.

**Question 7: Can CHO (MCG) work together with MR-DC, i.e. receive CHO when MR-DC is configured, and receive SCG addition WHEN CHO condition is configured;?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Remark**  |
| MediaTek | Yes |  |
| ZTE | Yes |  |
| OPPO | Yes | For simplicity, the target of CHO should only be MCG and no SCG is involved. |
| Futurewei | Not this release | Since the time of CHO execution is not certain. Autonomously release MR-DC may introduce surprise to network MR-DC operations. We need more time to evaluate and cannot make decision for this release. Can be discussed in future release. |
| Huawei, HiSilicon | Yes |  |
| Intel | No | It is questionable whether the network will establish the link between SCG and candidate MCGs. If not, the SCG shall be released upon successful CHO. But how to release SCG? Seems more considerations are needed to support it.  |
| Sharp  | Yes | No need to restrict. And it is fine that UE releases MR-DC upon CHO execution to avoid much impact. |
| CATT | Yes | We don’t see the need to restrict DC when CHO is configured. The two features have two different purposes. |
| Lenovo&MM | Yes | It is not complicated to support two cases if ‘release MR-DC upon execution of CHO’. |
| Samsung  | Yes  | Seems not really essential for R16, but anyhow see no need for specification changes i.e. ignalling allows and can leave this up to network implementation |
| vivo | Yes | This is a straight forward approach.  |
| Ericsson | Yes | Whatever we need to do is minor in the specs, perhaps the autonomous release of SCG configurations upon CHO execution as Intel points out, if we want to avoid further RAN3 impact. |
| LG | Yes | It seems up to network’s decision. We are OK if there is no serious problem. |
| Nokia | Yes |  |
| Apple | Yes | For simplicity, UE can release MR-DC upon executing the CHO.  |

Based on companies’ inputs (17):

**CHO (MCG) work together with MR-DC, i.e. receive CHO when MR-DC is configured, and receive SCG addition WHEN CHO condition is configured**

* **Yes:15**
* **No: 2**

There is clear majority that to allow CHO (MCG) work together with MR-DC, i.e. receive CHO when MR-DC is configured, and receive SCG addition when CHO condition is configured. Rapporteur suggest:

**Proposal 7:** CHO (MCG) can work together with MR-DC, i.e. receive CHO when MR-DC is configured, and receive SCG addition when CHO condition is configured.

**DISC S5\_2:**To discuss whether CHO (MCG) configuration can contain SCG configuration or not; If yes, we need to clarify only Pcell can be candidate cell.

**Question 8: Can CHO (MCG) configuration contain SCG configuration or not?; If yes, do you agree that we need to clarify only Pcell can be candidate cell?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Remark**  |
| MediaTek | Yes | It’s good to clarify only Pcell can be candidate cell |
| ZTE | Yes | It’s good to clarify only Pcell can be candidate cell |
| OPPO | No | We prefer to keep it simple and do not involve DC as target configuration of CHO. |
| Futurewei | NO | Maybe considered in next release. |
| Huawei, HiSilicon | Yes | It’s good to clarify only Pcell can be candidate cell |
| Intel | No | It is questionable whether/how to establish the connection between candidate MCG and candidate SCG, it also needs RAN3 evaluation whether it can be supported in RAN3. Therefore, we prefer to make it simple in Rel-16.  |
| Sharp | Yes | It’s good to clarify only Pcell can be candidate cell |
| CATT | yes |  |
| Lenovo&&MM | Yes | It should clarify only Pcell can be candidate cell. |
| Samsung  | Yes  | Please refer the above answer in Q7.  |
| Vivo | Yes | It’s good to clarify only Pcell can be candidate cell. |
| Ericsson | Yes, if we at least allow different Mos in different measId(s), or further considerations in the measurement framework, otherwise No. | I think this should be considered in Rel-17, unless we specify in the measurement framework conditions related to the SCG. How can the decision for adding MR-DC be based on measurements only related to the MN? This also contradicts a previous opinion from most companies that one cannot configure different Mos in the different measId(s) for the trigger condition, or? |
| LG | No | It’s good to clarify only Pcell can be candidate cell but we prefer to discuss later. |
| Nokia | Yes | Agree with MTK and ZTE. |
| Apple | No | If supported, it will have container (for target SCG config) in container (for CHO target config). It seems the ASN.1 is too complex. In addition, it will require more discussion and spec impact in RAN3.  |

Based on companies’ inputs (17):

**CHO (MCG) configuration contain SCG configuration:**

* **Yes: 11**
	+ Clarify only Pcell can be candidate cell: 9
* **No: 6**

There is clear majority that to allow CHO (MCG) configuration contains SCG configuration and clarify in the specification only PCell can be candidate cell. Rapporteur suggest:

**Proposal 8:** CHO (MCG) configuration contains SCG configuration and clarify in the specification only PCell can be candidate cell.

### 2.3 Rel-16 Mob can work without these optimization, and proposed not be treated in this meeting

In [38], some issues are considered as non-essential issues, and suggested not treated in this meeting. But it would be good to take this chance to check companies’ view since anyway we have email discussion on open issues.

**Optimization S16\_1:**Discuss whether signalling optimization on legacy HO command is needed or not based on the solution if the network wants to trigger a conventional handover to one of the configured CHO candidate cells, one target cell indication (e.g. candidate cell index) can be included in the conventional HO command to trigger the ~~CHO execution~~normal handover of the indicated candidate cell. **[13][20]**

* **Supporting companies: ZTE, Saumsung:**

**Question 9: Is the solution described above needed? i.e. if the network wants to trigger a conventional handover to one of the configured CHO candidate cells, a target cell indication (e.g. candidate cell index) can be included in the conventional HO command to trigger the normal handover of the indicated candidate cell.?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Remark**  |
| MediaTek | No | In most CHO execution conditions are similar to the conditions for legacy HO. Configuring CHO is to allow UE to execute HO at better tining. We don’t see the need of such signalling optimization. |
| ZTE | Yes | The NW may want to trigger a conventional HO to one of the configured CHO candidate cells due to overload control. Considering the signaling overhead of conventional HO command is large and the UE may fail to receive a big RRC message from the NW when the source quality deteriorates dramatically, we see some benefits to just indicate the candidate cell index in the HO command to trigger the normal HO of the indicated candidate cell. |
| OPPO | Yes | We have some sympathy with this proposal and think it can save signalling overhead.  |
| Futurewei | No | CHO candidate configuration maybe already out of date when the new HO is requested by the network especially in the case new HO is needed. |
| Huawei, HiSilicon | No | We do not want to couple the configurations of legacy HO and CHO too much, because it may bring extra complexity. In addition, if we agree on it, we may need more time on details and potential impacts to RAN2.We think it is an optimization but not critical issues for CHO, so we suggest to discuss it in later releases. |
| Intel | No | We assume, anyway the source has to communicate with target again to trigger the convential HO. And then the target will provide the HO command again. It is not nice to let the source to check whether the configuration in HO command is exact same as the configuration in CHO or not unless we ask the target node to add additional indication that will have RAN3 impact. In addition, we are not so sure how likely the configuration could be same for CHO and convential HO.  |
| Sharp | No | We share MediaTek’s view. |
| CATT | No | this optimization will introduce impact on the current running CR e.g. which signalling will be used |
| Lenovo&MM | No | For this case, source can reconfigure the condition. |
| Samsung  | Yes  | We think this is not just signalling optimization but also increasing HO reliability by reducing the HO command size drastically. And already in failure case UE autonomously uses the given CHO configuration. So there is no need to block the usage of normal cases. Regarding * Futurewei comment: we design CHO configuration is up-to-date based on the source cell configuration. If there is any need to update the source, network should ensure also update the Cho target config too. This fresh target configuration is already coming for free by CHO.
* Intel comment: there is no need to check the configuration of target since already CHO target configuration is ready to be used at anytime. That is the principle of CHO now.
* MTK comment: there is no restriction of legacy HO command. If network wants it can command at any time. And there is up-to-date configuration to be used.

Huawei comment: reducing the size of HO command is used as the ground for signalling design in DAPS DRB configuration issues. We think eMOB WI level requirement (i.e., increasing reliability of HO) can be achieved by reducing HO command size, not only signalling optimization in CHO area. For further effort on RAN2, it is very intuitive and simple as in our Tdoc TP. RRCReconfiguration msg can include cho config index.  |
| vivo | No | We share the same view as Intel.  |
| Ericsson | No | The alternative to this, which is already available in the spec (important to remember), would be the network to send the whole HO command, that overhides CHO. Hence, the solution is a signalling optimization that may indeed improve reliability as Samsung hints as the size of the HO message is reduced. However, as Samsung also pointed out, in case of RLF or failure, the UE would perform cell selection and, a smart UE implementation would likely select the best candidate i.e. this would not really lead to a re-establishment unless the UE selects an unprepared cell. But if the selected cell is unprepared and that is really the best of the best, so the source would have chosen that one, it would anyway require a whole HO command?! Hum…we are not convinced anymore this provides that much more reliability. In the best of the cases, being generous to the feature, it could give some reliability with a little bit more network controlled (so Ue does not trigger RLF to then perform CHO). |
| ETRI | No | We think that for this case, the network can re-configure the configured condition as an extremely low condition. |
| BT | No | Agree with Huawei |
| LG | No | We don’t understand the motivation. Why does the network want to move the UE to a cell which is still not good to perform handover in the UE perspective?Furthermore, this is just an optimisation for the UE not for the network because it is a less complex behavior that the network will just reuse the HO command without additional inter-node signaling. |
| Nokia | No | We see some merit in such approach, but think it is a bit too late in Rel-16 to consider it. |
| Apple | No | We would like to keep the same HO command format (legacy format) to trigger legacy HO for all cases.  |

Based on companies’ inputs (19):

**A target cell indication (e.g. candidate cell index) is included in the conventional HO command to trigger the normal handover of the indicated candidate cell:**

* **Yes: 3**
* **No: 16**

There is clear majority that do not optimize the conventional handover command by introducing candidate cell index. Rapporteur suggest:

**Proposal 9:** Do not introduce CHO candidate cell index for conventional handover;

**Optimization S16\_2:**Discuss whether CHO execution condition is defined based on the existing measID+additional a3-Offset or a5-Threshold in CHO-ExecutionCond, i.e. we do not need to introduce cho-trigger event in reportConfig.

**to reduce the overhead on measurement configuration, the network can configure the existing measID with additional a3-Offset or a5-Threshold as the CHO execution condition in the RRCReconfiguration/RRCConnectionReconfiguration message, for instance:[14]**

* **Supporting company: ZTE**

CHO-ExecutionCond-r16 ::= SEQUENCE {

measID MeasID,

a3-Offset MeasTriggerQuantityOffset, OPTIONAL, -- Need R

a5-Threshold1 MeasTriggerQuantity, OPTIONAL, -- Need R

a5-Threshold2 MeasTriggerQuantity, OPTIONAL, -- Need R

...

}

-- TAG-CHO-CONFIGTOADDMODLIST-STOP

-- ASN1STOP

**Question 10: Is the solution described above needed? that is CHO execution condition is defined based on the existing measID+additional a3-Offset or a5-Threshold in CHO-ExecutionCond, i.e. we do not need to introduce cho-trigger event in reportConfig?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Remark**  |
| MediaTek | Yes | Can be adopted if such signalling optimization does not cause other troubles. |
| ZTE | Yes | Generally, the CHO execution condition is similar with the conventional HO condition except the threshold/offset is set a little bit higher than baseline (i.e. the conventional handover). So we can consider to reuse the existing measID configured for other RRM purpose with additional a3-Offset or a5-Threshold as CHO execution condition. In this way, no CHO specific reportConfig and new measID are required. Given that at most 8 candidate cells (if agreed) and corresponding at most 16 execution conditions may be configured for the UE, reusing the existing measID with additional a3-Offset or a5-Threshold can greatly reduce the signaling overhead. |
| OPPO | No | This will make existing ASN.1 less readable. |
| Futurewei | Yes | It is a simple approach. |
| Huawei, HiSilicon | Yes |  |
| Intel | No | The only difference between extending reportCOnfig or add offset in measID is where the threshold is put. But to have the whole picture on execution condition, the network still needs to configure reportConfig, i.e. with this new approach, the network needs to configure threshold in CHO-ExecutionCond and other parameters in reportConfig.From signalling overhead perspective, there is no big difference since anyway the reportConfig is needed to indicate other configurations. We still prefer the way in the running CR, i.e. put all trigger related configuration in the reportConfig, that is clearer to us.  |
| Sharp | Yes | We also think the CHO execution condition is similar with the conventional HO condition except the threshold/offset, such optimization is reasonable. But if we go this way i.e. using existing measID, we need to ensure the measID used here should not be autonomously released by UE at e.g. successful handover, RRC reestablishment cases, if this existing measID is used for other RRM purpose. |
| CATT | No  | This will reduce the overhead of the measConfig, but will increase the execution condition configuration overhead. |
| Lenovo&MM | No | According to the discussion, we assume measID for CHO is cho specific. For example, measID will be removed if cho config is removed. If we support this, some agreement need to be revisited. |
| Samsung  | No  | We have some sympathy (main benefit of re-use seems to be that CHO evaluation would not result in additional measurement ID to count for RRM performance requirements), but anyhow prefer to defer |
| vivo | No | We think the current running CR approach is enough, and this is the most clean way. There is not too much difference.  |
| Ericsson | No | In general we would like to avoid modifications to the text in the running CR, escexpt some additions. We also don’t see much benefit. |
| ETRI | Yes | Same view as ZTE. |
| LG | No | At least for R16, current running CR is fine for us. |
| Nokia | No | We have discussed how to describe CHO execution condition in ASN.1 for a couple of meetings already. Thus, we are not eager to consider such changes now. |
| Apple | No |  |

Based on companies’ inputs (18):

**CHO execution condition is defined based on the existing measID+additional a3-Offset or a5-Threshold in CHO-ExecutionCond:**

* **Yes: 7**
* **No: 11**

There is no clear majority on whether CHO execution condition shall be defined based on the existing measID+additional a3-Offset or a5-Threshold in CHO-ExecutionCond. Rapporteur suggest:

**Proposal 10:** Do not change the running CR unless there is clear majority on the new signalling structure ( CHO execution condition shall be defined based on the existing measID+additional a3-Offset or a5-Threshold in CHO-ExecutionCond);

**Optimization S16\_3:**Discuss whether multiple CHO execution condition (using or) of a single candidate cell is allowed.

**Allow configuring multiple CHO execution conditions (using “or”) of a single candidate cell. [14][5]**

* **Supporting company: ZTE, FW:**

|  |
| --- |
| ***[14] Although the current ignalling structure allows to configure multiple CHO candidates with the same CHO container but different execution conditions (i.e. actually triggering CHO execution of the same candidate cell under different execution conditions), the redundant CHO container configuration shall largely increase ignalling overhead. Thus, we think it’s better to allow configuring multiple triggering conditions (using “or”) linked with a single candidate cell (i.e. a single CHO container). Besides, based on proposal 1, it’s easy to configure multiple execution conditions for a single candidate cell by just configuring different threshold/offset values with the same measID.*** |

**Question 11: Is the network allowed to configuring multiple CHO execution conditions (using “or”) of a single candidate cell?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Remark**  |
| MediaTek | Yes | We think this makes sense. However, the configuration may be complicated if we want to allow both “and” and “or” configurations. |
| ZTE | Yes | We see some benefits to allow the NW to configure multiple CHO execution conditions using “or”. An indicator can be introduced to indicate the relationship between multiple triggering conditions (i.e. either “and” or “or”). |
| OPPO | No | We wonder whether multiple conditions are realistic. |
| Futurewei | Yes | “Or” operation is also explained and supported in Futurewei contribution [5]  |
| Huawei, HiSilicon | Yes |  |
| Intel | No | DO not see the need to configure 2 executino condition “or” for the UE. If to support it, we also need to discuss whether the execution condition still contains two or one cho trigger event, and whether the maximum number of the execution condition is still one? |
| Sharp | No |  |
| CATT | No | if the NW want make the CHO execution is relaxed, the NW can only configure one execution condition |
| Lenovo&MM | No | Multiple conditions can be flexible. What is use case to introduce multiple conditions? |
| Samsung  | No  | Can be discussed in the future release. |
| Vivo | No | We donot see any motivation for this kind of configuration.  |
| ETRI | No | Same view as Samsung. |
| LG | No | At least in R16, we don’t want to clouds the original purpose of multiple events |
| Nokia | No | This was already discussed in 108#66. We do not see any use for that. When multiple execution conditions were discussed in one of the RAN2 meetings, companies clearly said they see a use case when those conditions are linked with “AND”. We think multiple conditions are not needed in general, but if supported, ‘AND’ should be the only relationship between them. |
| Apple | No | We cannot see the use case of such configuration. |

Based on companies’ inputs (17):

**Multiple CHO execution conditions (using “or”) of a single candidate cell:**

* **Yes: 5**
* **No: 12**

There is clear majority that do not introduce multiple CHO execution conditions (using “or”) of a single candidate cell. Rapporteur suggest:

**Proposal 11:** Do not introduce multiple CHO execution conditions (using “or”) of a single candidate cell;

**Optimization S16\_4:**Discuss whether introduce measurements results (including beam level results) in HO complete message.

**measurement results (including beam leavel) in HO complete message. [23]**

* **Ericsson**

|  |
| --- |
| ***[23] One way to mitigate that could be to include measurements in an RRCReconfigurationComplete transmitted from the UE to the target upon CHO execution, so the target has a chance to immediately re-configure the UE’s e.g. by adding and/or removing and/or activating/deactivating SCell(s).*** |

**Question 12: Is it needed to contain the measurement results (including beam level results) in HO complete message?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Remark**  |
| MediaTek | No | Target cell knows which beam is the best for UE from random access procedure. Other re-configurations can be done later. If CHO complete message can carry measurement results, can legacy HO also do this?[Ericsson] True, target knows best beam, but that’s it. In legacy, it may know much more as beam results are reporting in HO preparation, right? However, these would be outdated in CHO preparation. Hence, providing these in RRCReconfigurationComplete gives a quick update to the target of current situation upon execution. As explained here, this is not that critical in legacy HO because target may already have up to date results. Otherwise, how would a target configure an SCG? Have you ever thought about that? |
| ZTE | No | Upon the execution of CHO, the UE shall apply the target measurement configuration. The measurement results based on the source configuration may be not valid for the target cell.[Ericsson] Well, this is not a problem, but more a modelling in the spec e.g. put some available content of VarMeasResults in RRCReconfigurationComplete perhaps before applying new measConfig? |
| OPPO | No | This is not a CHO-specific issue and legacy HO works well without this.[Ericsson] Legacy does, but CHO is not legacy right? In legacy, it may know much more as beam results are reporting in HO preparation, right? However, these would be outdated in CHO preparation. Hence, providing these in RRCReconfigurationComplete gives a quick update to the target of current situation upon execution. As explained here, this is not that critical in legacy HO because target may already have up to date results. Otherwise, how would a target configure an SCG? Have you ever thought about that? |
| Futurewei | No | The benefit of doing this is still not very clear. It is also not clear if the source cell configured measurement results is useful for the target. Wouldn’t the L1 report is required at the target for BM? [Ericsson] I tried to clarify. If there are further questions, please let us know. |
| Huawei, HiSilicon | No |  |
| Intel | No |  |
| Sharp | No |  |
| CATT | No | this seems to be a eDCCA problem, not belong to the topic of mobility |
| Lenovo&MM | No | It is not CHO specific issue. |
| Samsung  | No  | Can be discussed in the future release. |
| vivo | No |  |
| Ericsson | Yes | Based on the input above, other companies have not understood the proposal, otherwise they would love it, it makes lot of sense. Think about: currently the target receiving a HO preparation may receive RRM measurements in inter-node message. Hence, when preparing UE configuration, target can take that into account e.g. to select SCells, SCG, beam management parameters, RLM. In CHO, even though the source may also provide these, when UE performs execution this may be outdated. Providing up to date measurements in *RRCReconfigurationComplete* after CHO execution gives the chance to target to quickly react to it e.g. by removing/Adding/modifying an SCG, SCell, etc. Anyways, considering that the release is sadly getting to an end, and that this would require discussion on what exactly is report, capability, blah, blah, we understand the lack of support for the feature. However, we would like this to be re-considered at some point as that is something that could be really useful for a target node. |
| ETRI | No | Same view as MediaTek. |
| LG | No |  |
| Nokia | No | Agree with MTK and OPPO. CHO alone is not a justification for introducing such measurement results in Complete message. Like others asked, why there is no such reporting for legacy HO?  |
| Apple | No | It can be discussed in later release.  |

Based on companies’ inputs (18):

**Contain the measurement results (including beam level results) in HO complete message:**

* **Yes: 1**
* **No: 17**

There is clear majority that do not introduce measurement results (including beam level results) in HO complete message. Rapporteur suggest:

**Proposal 12:** Do not introduce measurement results (including beam level results) in HO complete message;

**Optimization S16\_5:**Discuss whether an RRCReject is allowed in response to an RRCReconfigurationComplete upon CHO execution.

**Reject CHO for load reason or race condition [23]**

* **Supporting company: Ericsson**

|  |
| --- |
| ***[23] The main purpose of that was to minimize signalling in overload situations where the target decides to release its allocate resources for CHO. It is indeed possible that a target candidate accepts an incoming UE for CHO and after some time decides not to accept. It may also happen that while the target tries to cancel a CHO, the UE fulfils an execution condition and tries to access that same target.*** ***Observation 1 Upon CHO execution, UE may try to access target that is trying to cancel the procedure e.g. due to overload.******One simple solution for that could be if the target simply responds an RRCReconfigurationComplete upon CHO execution with an RRCReject.*** |

**Question 13: Upon CHO execution, Is it allowed that the network sends RRCReject message in resonse to an RRCReconfigurationComplete message?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Remark**  |
| MediaTek | No | This is an optimization for a rare case. If we introduce this for CHO, we should also allow RRCReject for legacy HO? |
| ZTE | No | The NW can’t indicate a UE in RRC\_CONNECTED state into RRC \_IDLE state by using RRCReject message since the message is not protected by the security key. If needed, the NW can send a RRCRelease message to release the UE into RRC\_IDLE state. |
| OPPO | Yes | We think this has some benefit in case where target already releases the configuration, but UE has not received the release ignalling. |
| Futurewei | No | Normally HO rejection should be happened at the preparation phase. HO access is never blocked due to overload. Network also normally does not select an overloaded cell as the target (candidates in CHO). |
| Huawei, HiSilicon | No |  |
| Intel  | No | Same question as MediaTek.  |
| Sharp | No | We do not think this optimization is needed, can rely on RRC release message in overload case as legacy. |
| CATT | No | if the target still has the UE context, the target cell can send the RRCRelease when the UE complete the HO, if the target cell has deleted the UE context, the NW can reject to respond with MSG2 to let the RACH procedure fail. |
| Lenovo&MM | Yes | Race condition could happen. |
| Samsung  | No  | Can be discussed in the future release. |
| Vivo | No |  |
| Ericsson | Yes | At some point, many companies above proposed to have a validity timer where target indicates for how long CHO resources are valid/Reserved. Tha reaoning was that load in target may vary/change and perhaps not be as low as when CHO was configured. One one can argue that in this case the target may simply cancel CHO with source, but perhaps that is more cumbersome than simply reject an incoming UE. In addition to this load control aspect, the target has some potential to also address race conditions. |
| ETRI | No | Same view as MediaTek. |
| LG | No |  |
| Nokia | No | As pointed out by Sharp and ZTE, in case of overload, the NW can send RRC Release soon after the UE completes CHO. |
| Apple | No | Since UE only performs the CHO in the candidate cell which is well prepared in NW side, then this case is more like an error case. |

Based on companies’ inputs (18):

**RRCReject message in resonse to an RRCReconfigurationComplete message for CHO:**

* **Yes: 4**
* **No: 14**

There is clear majority that RRCReject message in resonse to an RRCReconfigurationComplete message for CHO is not allowed. Rapporteur suggest:

**Proposal 13:** RRCReject message in resonse to an RRCReconfigurationComplete message for CHO is not allowed;

**Optimization S16\_6:**Discuss whether add serving radio link status information in measurement report.

**Extending the measurement report with serving radio link status information [28]**

* **Supporting company: Nokia**

|  |
| --- |
| ***[28]*** To mitigate the risk described in the preceding subsection, measurement reports may contain more information to help the serving node in taking the appropriate decision. In the simplest form, the indication could say whether T310 or T312 has been initiated for this serving link. Such knowledge is currently not available to the NW together with the MR, whereas it could seriously impact the final decision whether it is still acceptable and safe to configure the CHO, or the quality of the link is already so bad that the immediate HO shall be commanded. |

**Question 14: Is it needed to add serving radio link status information in measurement report?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Remark**  |
| MediaTek | Yes | This may be helpful. |
| ZTE | No | Different measurement reports (e.g. different thresholds) can be configured to trigger CHO preparation and legacy HO. The NW can decide the right mobility triggering decision based on the measurement results (e.g. the RSRP/RSRQ value). |
| OPPO | No | No sure about the value of doing so since measurement report anyway includes serving cell measurement results. |
| Futurewei | Yes | Helpful for network to know radio link status. |
| Huawei, HiSilicon | No | Not clear on the benefits. |
| Intel | No | This is not CHO specific issue, should be discussed in general for measurement.  |
| Sharp | No | The benefit of introducing serving radio link status is not convinced. Current measurement reports works well. |
| CATT | No |  |
| Lenovo&MM | No | Serving cell measurement result is sufficient for souce cell to decide. |
| Samsung  | No  | Can be discussed in the future release. |
| Vivo | No | We don’t see much benefit.  |
| Ericsson | ? | This could be helpful, just wonder whether that belongs to CHO discussion? |
| ETRI | No | Same view as OPPO. |
| LG | No  | We think this issue is rather discussed in NR main session. |
| Nokia | Yes | Well, this is a CHO-specific thing, as before Rel-16 the NW did not have a choice whether to trigger immediate HO or there is still time for preparing CHO, considering serving cell’s link status. Additionally, this is not about reporting measurement results (what obviously exists in the legacy specification), but informing the NW about UE-specific aspects, not normally known to the NW, such as T310 running or not (which can have a fundamental importance in deciding if HO or CHO shall be configured). Not everything can be inferred based on measurement results.  |
| Apple | No | NW can track UE’s radio quality of the serving cell via legacy way, e.g. measurement report or L1 CSI reporting. |

Based on companies’ inputs (18):

**Add serving radio link status information in measurement report:**

* **Yes: 3**
* **No: 12**
* **Out of Scope:2**

There is clear majority that do not introduce serving radio link status information in measurement report. Rapporteur suggest:

**Proposal 14:** Do not introduce serving radio link status information in measurement report;

**Optimization S16\_7:**Discuss whether return CHO is supported or not;

This is new proposal and not aligned with agreements “UE autonomously releases CHO configuration upon successful HO/CHO or reestablishment”.

The proposal is [8]:

* Supporting company: Apple

Enabling RCHO requires following enhancements:

* If RCHO is enabled, the UE will record full configurations of the serving cell and keep it after CHO to a target cell.
* UE shall inform the target cell if it has RCHO configured when sending *RRCReconfigurationComplete* to the target cell
* Network can provide CHO conditions for return CHO back to the previous serving cell right after receiving *RRCReconfigurationComplete* message by sending a new *RRCReconfiguration* message
* Target cell informs the source about utilizing RCHO based on RAN3 decision.

The question is whether we support it in Rel-16 or not.

**Question 15: Is it needed to support retrun CHO?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Remark**  |
| MediaTek | No | This may be considered in later releases, but not now. |
| ZTE | No | Share the same view with MediaTek. |
| OPPO | No | This may introduce a lot of work to do. |
| Futurewei | No | Not sure the benefit of quickly back and forth switching the serving cell. |
| Huawei, HiSilicon | No |  |
| Intel | No | Same view as MediaTek.  |
| Sharp | NO |  |
| CATT | No |  |
| Lenovo&MM | No | Alternative better option is that UE keep source configuration for a duration after HO. For the case too-early-handover, UE can re-establish in the source cell upon RLF. |
| Samsung  | No  | Can be discussed in the future release. |
| Vivo | No |  |
| ETRI | No | Same view as MediaTek. |
| LG | No | Not in R16 |
| Nokia | No |  |
| Apple | Yes | This proposal is not against the agreement that mentioned above. It is proposed that the UE records configurations of the serving cell in *VarReturnCHO-Config* which is different from *varCHO-Config.* As we have shown in previous contributions, the number of HO attempts in FR2 is very high and the purpose is to reduce the amount of signalling needed for CHO in Uu and also in the network. |

Based on companies’ inputs (17):

**Support of return CHO:**

* **Yes: 1**
* **No: 16**

There is clear majority that do not introduce return CHO. Rapporteur suggest:

**Proposal 15:** Do not introduce return CHO;

**Optimization S16\_8:**To discuss whether CHO can be configured in the resume message;

As discussed in the email discussion 108#66,

|  |
| --- |
| **Proposal 12** CHO configuration stored in UE shall be removed by the UE when entering IDLE or INACTIVE; |

[2] proposed to support CHO configuration in resume message. It would be good to discuss this in the meeting. .

Supporting company: Ericsson

**Question 16: Is it needed to add CHO configuration in the resume message?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Remark**  |
| MediaTek | No | We don't see the need. Upon resume, there's no latest measurement report. Resumption may even happen in another cell so early measurement reports are useless.[Ericsson] Not a problem. As you probably know, measurement reporting and handover are independent RRC procedures e.g. today we have blind handovers, so what is the problem to allow a network implementation toconfigure blind CHO? It is even safer. |
| ZTE | No | Considering that the UE shall delete CHO related configuration upon entering RRC\_INACTIVE state and no available measurement results is received by the NW upon sending RRCResume message to the UE, it may have no meaning to configure CHO at this time.[Ericsson] The fact we delete CHO configuration in inactive does not at all prevent the target to configure CHO in RRCResume, except that it would need to add a configuration instead of resume it. And, as you probably know, measurement reporting and handover are independent RRC procedures e.g. today we have blind handovers, so what is the problem to allow a network implementation toconfigure blind CHO? It is even safer. |
| OPPO | No | Without up-to-date measurement report, network may not find appropriate candidate cells for CHO configuration.[Ericsson] Network can do things you cannot imagine as a UE. |
| Futurewei | No | When the RRC Resume is issued, even early measurement is not available, not sure how CHO configuration could be conducted by the network.[Ericsson] Not a problem. As you probably know, measurement reporting and handover are independent RRC procedures e.g. today we have blind handovers, so what is the problem to allow a network implementation toconfigure blind CHO? It is even safer. |
| Huawei, HiSilicon | No |  |
| Intel | No | Do not see the use case. [Ericsson] Haven’t you read the paper, Yi? 😊 |
| Sharp | No | We share ZTE’s view. |
| CATT | No | NW will be lack of the measurement on the neighbour cells. And it also requires extra standard work.[Ericsson] Not a problem. As you probably know, measurement reporting and handover are independent RRC procedures e.g. today we have blind handovers, so what is the problem to allow a network implementation toconfigure blind CHO? It is even safer. |
| Lenovo&MM | No | Don’t see the benefit. |
| Samsung  | No  | Can be discussed in the future release. |
| vivo | No |  |
| Ericsson | Yes | Use case is the following: UE sends resume request and target decides to configure CHO (same way as it could decide to configure measurements), without the need to first finish the whole resume procedure to then perform a reconfiguration procedure. Thanks to the inactive security framework, RRCResume is encrypted, hence, there is no issue in carrying CHO if target wants to. |
| ETRI | No | Same view as Samsung. |
| LG | No | The gain is marginal. It would be the very rare case the network decide to configure mobility command as soon as the UE complete RRC Resume procedure.In addition, there is an additional specification impact to NR because the network cannot present further configuration except cell group configuration in the RRC Resume message. |
| Nokia | No | Agree with preceding opinions. NW has no up-to-date measurements for prepring meaningful CHO candidates after resuming the connection.  |
| Apple | No |  |

Based on companies’ inputs (18):

**CHO configuration in resume message:**

* **Yes: 1**
* **No: 17**

There is clear majority that do not introduce CHO configuration in resume message. Rapporteur suggest:

**Proposal 16:** Do not introduce CHO configuration in resume message;

### 2.4 Open items proposed not be treated

As proposed in [38], below issues should not be treated since they have been solved or not aligned with agreements.

**2.1 Issue 2: [1] raised for A3/A5 combination, whether original agreements “same RS type” for multiple trigger events is still valid or not**

**2.4 Issue 3 [21]: to reverse the agreements, the UE shall not autonomously remove CHO configuration upon successful HO;**

**2.7 [4] raised issue on UE context discard upon successful reestablishment or CHO**

**2.9 [10] UE reports the CHO reconfiguration failure related information to the network side, e.g. the failure indication, the failure target cell ID, the specific failure configuration..**

**2.11 [12] ask RAN2 to define a list of reconfigurations that require and do not require coordination with the target cell. A corresponding signalling is expected to be designed by RAN3**

**2.13 Issue 1: continue the measurement reporting after receiving cho-config [25]**

**2.13 Issue 2: Modification of the measurement configuration in cho-config [25]**

**2.13 Issue 3: Leaving condition based CHO reporting to allow the network to de-configure the CHO candidate(s) [25]**

**2.13 Issue 4: handling when multiple cells meet the execution condition [26]**

**UE should ignore the difference of the measurement results derived from different rsType when more than one candidate cells meet each execution condition**

**The UE should evaluate candidate cells based on the RSRP, when more than one candidate cells meet each CHO execution condition, independent of the trigger quantity configured for them**

**The UE should ignore the number difference between different rsType when evaluates the number of the beam above the threshold if multiple cells meet each CHO execution condition**

**2.3 Issue, whether the restriction on cho-RRCReconfig should be captured in the procedure or as field description**

**2.14 Issue 1: the UE should only derive/update the security keys when conditional handover is being executed;**

**2.15 issue 1:** **whether CHO is supported for NR-U, and if yes whether introduce a new event based on the channel occupancy;**

**Question 17: Do companies agree that the issues listed above should not be treated? If no, pls indicate your reason.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Remark**  |
| MediaTek | Agree |  |
| ZTE | Yes |  |
| OPPO | Yes |  |
| Futurewei | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Intel | Yes |  |
| Sharp | Yes |  |
| Lenovo&MM | Yes |  |
| Samsung  | Yes  |  |
| vivo | Yes |  |
| ETRI | Yes |  |
| LG | Yes except **2.15** | In the NR-U session, they are still under discussion for this issue. Thus, since we should address the NR-U issue in here, the MOB session if there is agreement on CHO in the NR-U, we strongly prefer not to conclude now i.e., not be treated and wait for their result. |
| Nokia | Agree |  |
| Apple | Yes |  |

Based on companies’ inputs (15):

* **CHO+NR-U: 1 company would like to wait for the conclusion in NR-U session.**

There is clear majority that the issues do not need to be treated. Rapporteur suggest:

**Proposal 17:** below issues should not be treated since they have been solved or not aligned with agreements.

2.1 Issue 2: [1] raised for A3/A5 combination, whether original agreements “same RS type” for multiple trigger events is still valid or not

2.4 Issue 3 [21]: to reverse the agreements, the UE shall not autonomously remove CHO configuration upon successful HO;

2.7 [4] raised issue on UE context discard upon successful reestablishment or CHO

2.9 [10] UE reports the CHO reconfiguration failure related information to the network side, e.g. the failure indication, the failure target cell ID, the specific failure configuration..

2.11 [12] ask RAN2 to define a list of reconfigurations that require and do not require coordination with the target cell. A corresponding signalling is expected to be designed by RAN3

2.13 Issue 1: continue the measurement reporting after receiving cho-config [25]

2.13 Issue 2: Modification of the measurement configuration in cho-config [25]

2.13 Issue 3: Leaving condition based CHO reporting to allow the network to de-configure the CHO candidate(s) [25]

2.13 Issue 4: handling when multiple cells meet the execution condition [26]

UE should ignore the difference of the measurement results derived from different rsType when more than one candidate cells meet each execution condition

The UE should evaluate candidate cells based on the RSRP, when more than one candidate cells meet each CHO execution condition, independent of the trigger quantity configured for them

The UE should ignore the number difference between different rsType when evaluates the number of the beam above the threshold if multiple cells meet each CHO execution condition

2.3 Issue, whether the restriction on cho-RRCReconfig should be captured in the procedure or as field description

2.14 Issue 1: the UE should only derive/update the security keys when conditional handover is being executed;

2.15 issue 1: whether CHO is supported for NR-U, and if yes whether introduce a new event based on the channel occupancy;

### 2.5 Issues to be covered by other email discusions and should be treated based on email discussion report (Placeholder)

**Proposal 2-1: CHO+legacy HO command should be discussed based on email discussion 108#66;**

**Proposal 4-1: Handling of measID/reportConfig when the CHO configurations are autonomously released by the UE should be discussed based on email discussion 108#66;**

**Proposal 5-1: CHO+CPC should be discussed based on email discussion 108#67;**

**Proposal 8-1: The maximum candidate cells should be discussed based on email discussion 108#66;**

**Proposal 10-1: The support of CHO+DAPS should be discussed based on email discussion 108#66;**

**Proposal 12-1: The support of CHO+T312 should be discussed based on email discussion 108#66;**

There are clear majority in [38] for above issues. Rapporteur assume these issues can be solved based on email discussion.

**Question 18: Do companies have different view on above proposals? If yes, pls indicate your reason.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Remark**  |
| MediaTek | No | We agree to the above proposals. |
| ZTE | No | Agree to the above proposals. |
| OPPO | No |  |
| Futurewei | Yes | We have different view on Proposal 12-1. For CHO, T310 is good enough for source link failure recovery. T312 may lead to un-necessary RLF declaration and causing more service interruption. |
| Huawei, HiSilicon | No |  |
| Intel | Yes | **Proposal 12-1: The support of CHO+T312 should be discussed based on email discussion 108#66;** It is not treated in the meeting. Further discussion is needed.  |
| Sharp | Yes  |  |
| Samsung  | No  | **Same view** |
| vivo | No |  |
| Ericsson | No |  |
| ETRI | No |  |
| Nokia | Yes | Proposal 12-1 shall be discussed further. In 108#66 there were numerous companies (ZTE, Futurewei, DCM, Nokia, QC) supporting T312 is stopped when CHO is received. We believe this shall not be ignored. |
| Apple | No |  |

**Copied from 108#66**

*Proposal 8 in 108#66. T312 is not stopped upon the reception of RRC Reconfiguration with cho-Config;*

|  |
| --- |
| **[37] Should the reception of RRC Reconfiguration with cho-Config stop T312, if running?*****Yes: 6******No: 13***Summary: No change;Based on companies’s inputs, majority view is that T312 is not stopped upon reception of CHO command.* Do not need additional change when merging T312 changes;
 |

**Question 19: Do companies have different view on below proposal? If yes, pls indicate your reason.**

*Proposal 8 in 108#66. T312 is not stopped upon the reception of RRC Reconfiguration with cho-Config;*

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Remark**  |
| Intel | No |  |
| Sharp | No |  |
| Lenovo&MM | No |  |
| Samsung | No |  |
| vivo | No |  |
| ETRI | No |  |
| LG | No |  |
| Nokia | Yes | As we have pointed our in [R2-2001003](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs/R2-2001003.zip):T312 is not necessary for monitoring the radio link in the serving cell after the reception of cho-Config. T310 is still available for such purpose.T312 is used to declare fast RLF. There is no need for such immediate action when UE is prepared with CHO configurations.After T312 expiry, in the presence of CHO configurations, the UE is not likely to recover via single CHO attempt, as multiple conditions have to be met: - The UE supports recovery via single CHO attempt- The NW configured the UE with such mechanism- The selected cell in re-establishment procedure is the CHO candidate |
| Apple | No |  |

Based on companies’ inputs (10):

*T312 is not stopped upon the reception of RRC Reconfiguration with cho-Config*

* **Agree: 9**
* **Disagree: 1**

Rapporteur suggest:

**Proposal 18:** T312 is not stopped upon the reception of RRC Reconfiguration with cho-Config; Do not need additional change.

*Proposal 9 in 108#66. T312 is stopped upon the execution of CHO;*

|  |
| --- |
| **[37] Should T312 be stopped upon CHO execution?*****Yes: 17******No: 2***Summary: No change;Based on companies’s inputs, majority view is that T312 is stopped upon execution of CHO that has been covered by T312 TP.* Do not need additional change when merging T312 changes;
 |

**Question 20: Do companies have different view on below proposal? If yes, pls indicate your reason.**

*Proposal 9 in 108#66. T312 is stopped upon the execution of CHO;*

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Remark**  |
| Intel | No |  |
| Sharp | No |  |
| Lenovo&MM | No |  |
| Samsung | No |  |
| vivo | No |  |
| ETRI | No |  |
| LG | No |  |
| Nokia | No | T312 is stopped earlier. But at CHO execution as well, if not stopped earlier. |
| Apple | No |  |

Based on companies’ inputs (10):

*T312 is stopped upon the execution of CHO;*

* **Agree: 9**
* **Condition agree (if not stopped earlier): 1**

Rapporteur suggest:

**Proposal 19:** T312 is stopped upon the execution of CHO; Do not need to change specification.

*Proposal 10 in 108#66. CHO based RLF failure handling is also applied for RLF caused by the expiry of T312;*

|  |
| --- |
| **[37] What should UE do when T312 expires if the UE has CHO configuration? i.e. should the CHO based RLF handling apply to T312 expiry?*****Yes: 16*****This will not happen if T312 is stopped when CHO configuration is received: 3**Summary: No change;Based on companies’s inputs, majority view is that T312 expires is part of RLF, and then same ehaviour can be applied, i.e. CHO based RLF failure handling. * Do not need additional change when merging T312 changes;
 |

**Question 21: Do companies have different view on below proposal? If yes, pls indicate your reason.**

*Proposal 10 in 108#66. CHO based RLF failure handling is also applied for RLF caused by the expiry of T312;*

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Remark**  |
| Intel | No |  |
| Sharp | No |  |
| Lenovo&MM | No |  |
| Samsung | No |  |
| vivo | No |  |
| ETRI | No |  |
| LG | No |  |
| Nokia | No |  |
| Apple | No |  |

Based on companies’ inputs (10):

*CHO based RLF failure handling is also applied for RLF caused by the expiry of T312;*

* **Agree: 10**

Rapporteur suggest:

**Proposal 20:** CHO based RLF failure handling is also applied for RLF caused by the expiry of T312; Do not need to change specification.

# Conclusion

The followings are proposed:

UE shall autonomously remove measObject: 13

UE shall not autonomously remove measObject : 3

Change to measObject(s) only associated to CHO shall be removed when CHO configuration is autonomously removed: 2

**Proposal 1:**The UE shall autonomously remove measObject(s) only associated to CHO when CHO configuration is autonomously removed;

Option A: event 1 still satisfy entry condition after its TTT expires when event 2 TTT expires.

Option B: consider event satisfies entry condition during TTT as fulfilled and consider event not satisfies entry condition during TTT as not fulfilled. Only both events fulfilled starts CHO.

Option C: Similar to Option B, but “not fulfilled” is determined based on leaving condition instead of entry condition; [1] [7];

Option D: based on single TTT. “Not fulfilled” similar to C. The second event satisfy entry condition to start single TTT [5]

Option E [20]: CHO is executed when both events fulfil its entry condition for corresponding TTTs preceding the time of triggering CHO execution.

Option A: 5

Option B: 0

Option C: 9

Option D: 1

Option E: 3

**Proposal 2:** consider event satisfies entry condition during TTT as fulfilled and consider event satisfies leaving condition during TTT as not fulfilled. Only both events fulfilled starts CHO. Agree the text proposal shown as below:

The UE shall:

1>  for each *CHO-ConfigId* within the *VarCHO-Config*:

2> consider the cell which has a physical cell identity matching the value indicated in the *ServingCellConfigCommon* in the received *cho-RRCReconfig* to be applicable cell;

2> for each *measId* included in the *measIdList* within *VarMeasConfig* indicated in the *triggerCondition* associated to *CHO-ConfigId:*

3>  if the entry condition(s) applicable for this event associated with the *CHO-ConfigId*, i.e. the event corresponding with the *cho-eventId(s)* of the corresponding *cho-TriggerConfig* within *VarCHO-Config*, is fulfilled for the applicable cells for all measurements after layer 3 filtering taken during the corresponding *timeToTrigger* defined for this event within the *VarCHO-Config*:

4> consider the event associated to that *measId* to be fulfilled;

3>  if the leaving condition(s) applicable for this event associated with the *CHO-ConfigId*, i.e. the event corresponding with the *cho-eventId(s)* of the corresponding *cho-TriggerConfig* within *VarCHO-Config*, is fulfilled for the applicable cells for all measurements after layer 3 filtering taken during the corresponding *timeToTrigger* defined for this event within the *VarCHO-Config*:

4> consider the event associated to that *measId* to be not fulfilled;

2> if execution/trigger conditions for all associated *measId*(s) within *cho-TriggerConfig* are fulfilled for all associated *measId*(s) in *cho-TriggerConfig*:):

4> consider the target cell candidate within the stored *cho-RRCReconfig*, associated to that *CHO-ConfigId*, as a triggered cell;

4> initiate the conditional handover execution, as specified in 5.3.5.x.5;

Note: Samsung (Option E), FutureWei (Option D) expressed concern on proposal 2 in the reflector.

**Different measurement object is supported in A3+A5 combination**

* Yes: 1
* No: 18

**Proposal 3:** Only same measurement object is allowed for a candidate cell when 2 trigger events are configured for the execution condition for the candidate cell.:

**Option 1:The UE stop the evaluating the execution condition during legacy HO/CHO;**

**Option 2: The UE does not apply CHO configuration when a new execution condition is met during HO/CHO.**

**Option 1: 5**

**Option 2: 12**

**Proposal 4:** The UE shall not apply CHO configuration when a new execution condition is met during HO/CHO and agree below text proposal.

##### 5.3.5.x.4 Conditional handover monitoring

The UE shall:

xxx

2> if entry conditions for all associated *measId*(s) within *cho-TriggerConfig* are fulfilled and if T304 is not running:

4> consider the target candidate cell within the stored *cho-RRCReconfig*, associated to that *CHO-ConfigId*, as a triggered cell;

4> initiate the conditional handover execution, as specified in 5.3.5.x.5;

**cho-ExecutionCond is OPTIONAL, Need S:**

* **Yes:15**
* **No: 3**

**Proposal 5:** The field cho-ExecutionCond is OPTIONAL, Need S.

**Allow CHO configuration without cho-ExecutionCond**

* **Yes:1**
* **No: 18**

**Proposal 6:** The UE needs to have valid cho-ExecutionCond when CHO configuration is configured.

**CHO (MCG) work together with MR-DC, i.e. receive CHO when MR-DC is configured, and receive SCG addition WHEN CHO condition is configured**

* **Yes:15**
* **No: 2**

**Proposal 7:** CHO (MCG) can work together with MR-DC, i.e. receive CHO when MR-DC is configured, and receive SCG addition when CHO condition is configured.

**CHO (MCG) configuration contain SCG configuration:**

* **Yes: 11**
	+ Clarify only Pcell can be candidate cell: 9
* **No: 6**

**Proposal 8:** CHO (MCG) configuration contains SCG configuration and clarify in the specification only PCell can be candidate cell.

**A target cell indication (e.g. candidate cell index) is included in the conventional HO command to trigger the normal handover of the indicated candidate cell:**

* **Yes: 3**
* **No: 16**

**Proposal 9:** Do not introduce CHO candidate cell index for conventional handover;

**CHO execution condition is defined based on the existing measID+additional a3-Offset or a5-Threshold in CHO-ExecutionCond:**

* **Yes: 7**
* **No: 11**

**Proposal 10:** Do not change the running CR unless there is clear majority on the new signalling structure ( CHO execution condition shall be defined based on the existing measID+additional a3-Offset or a5-Threshold in CHO-ExecutionCond);

**Multiple CHO execution conditions (using “or”) of a single candidate cell:**

* **Yes: 5**
* **No: 12**

**Proposal 11:** Do not introduce multiple CHO execution conditions (using “or”) of a single candidate cell;

**Contain the measurement results (including beam level results) in HO complete message:**

* **Yes: 1**
* **No: 17**

**Proposal 12:** Do not introduce measurement results (including beam level results) in HO complete message;

**RRCReject message in resonse to an RRCReconfigurationComplete message for CHO:**

* **Yes: 4**
* **No: 14**

**Proposal 13:** RRCReject message in resonse to an RRCReconfigurationComplete message for CHO is not allowed;

**Add serving radio link status information in measurement report:**

* **Yes: 3**
* **No: 12**
* **Out of Scope:2**

**Proposal 14:** Do not introduce serving radio link status information in measurement report;

**Support of return CHO:**

* **Yes: 1**
* **No: 16**

**Proposal 15:** Do not introduce return CHO;

**CHO configuration in resume message:**

* **Yes: 1**
* **No: 17**

**Proposal 16:** Do not introduce CHO configuration in resume message;

**Proposal 17:** below issues should not be treated since they have been solved or not aligned with agreements.

2.1 Issue 2: [1] raised for A3/A5 combination, whether original agreements “same RS type” for multiple trigger events is still valid or not

2.4 Issue 3 [21]: to reverse the agreements, the UE shall not autonomously remove CHO configuration upon successful HO;

2.7 [4] raised issue on UE context discard upon successful reestablishment or CHO

2.9 [10] UE reports the CHO reconfiguration failure related information to the network side, e.g. the failure indication, the failure target cell ID, the specific failure configuration..

2.11 [12] ask RAN2 to define a list of reconfigurations that require and do not require coordination with the target cell. A corresponding signalling is expected to be designed by RAN3

2.13 Issue 1: continue the measurement reporting after receiving cho-config [25]

2.13 Issue 2: Modification of the measurement configuration in cho-config [25]

2.13 Issue 3: Leaving condition based CHO reporting to allow the network to de-configure the CHO candidate(s) [25]

2.13 Issue 4: handling when multiple cells meet the execution condition [26]

UE should ignore the difference of the measurement results derived from different rsType when more than one candidate cells meet each execution condition

The UE should evaluate candidate cells based on the RSRP, when more than one candidate cells meet each CHO execution condition, independent of the trigger quantity configured for them

The UE should ignore the number difference between different rsType when evaluates the number of the beam above the threshold if multiple cells meet each CHO execution condition

2.3 Issue, whether the restriction on cho-RRCReconfig should be captured in the procedure or as field description

2.14 Issue 1: the UE should only derive/update the security keys when conditional handover is being executed;

2.15 issue 1: whether CHO is supported for NR-U, and if yes whether introduce a new event based on the channel occupancy;

*T312 is not stopped upon the reception of RRC Reconfiguration with cho-Config*

* **Agree: 9**
* **Disagree: 1**

**Proposal 18:** T312 is not stopped upon the reception of RRC Reconfiguration with cho-Config; Do not need additional change.

*T312 is stopped upon the execution of CHO;*

* **Agree: 9**
* **Condition agree (if not stopped earlier): 1**

**Proposal 19:** T312 is stopped upon the execution of CHO; Do not need to change specification.

*CHO based RLF failure handling is also applied for RLF caused by the expiry of T312;*

* **Agree: 10**

**Proposal 20:** CHO based RLF failure handling is also applied for RLF caused by the expiry of T312; Do not need to change specification.

# References

[1] R2-2000329 Major CHO issues discussed in [108#66][NR Mob] phase-2 Ericsson

[2] R2-2000330 Major CHO issues not discussed in [108#66][NR Mob] Ericsson

[3] R2-2000374 RRC remaining issues for conditional handover configuration vivo

[4]R2-2000375 Discussion on CHO release vivo

[5]R2-2000444 On CHO execution triggering with two joint events Futurewei

[6]R2-2000445 Resource limitation on number of CHO candidates Futurewei

[7]R2-2000468 "And" events for CHO Intel Corporation

[8]R2-2000592 Consecutive CHO Apple

[9]R2-2000653 On the need of including CHO configuration in HO command OPPO

[10]R2-2000922 Further consideration on CHO compliance check failure CMCC

[11]R2-2000923 Combination of CHO and DAPS HO CMCC

[12]R2-2001002 On reconfigurations when CHO is prepared Nokia, Nokia Shanghai Bell

[13]R2-2001257 Conventional HO overriding a CHO command ZTE Corporation, Sanechips

[14]R2-2001258 CHO triggering configuration ZTE Corporation, Sanechips

[15]R2-2001259 Applicable CHO configuration ZTE Corporation, Sanechips

[16]R2-2001384 Discussion on configuration aspect for CHO Huawei, HiSilicon, China Telecom

[17]R2-2001385 Discussion on remaining issues for CHO Huawei, HiSilicon

[18]R2-2001534 Consideration of HO Command including CHO LG Electronics Inc

[19]R2-2001584 Further details of CHO configuration and execution China Telecom

[20]R2-2001637 Remaining issues for CHO execution Samsung R&D Institute UK discussion

[21]R2-2001651 Autonomous release of conditional configuration Google Inc. discussion

[22]R2-2001654 On the target to configure conditional handover Google Inc. discussion

[23]R2-2000332 Other aspects of CHO Ericsson

[24]R2-2000377 Discussion on simultaneous connectivity in CHO vivo

[25]R2-2000855 Measurement reporting while CHO is configured PANASONIC R&D Center Germany

[26]R2-2000899 Further Discussion on Cell Evaluation for CHO Cell Selection CATT

[27]R2-2000918 Discussion on CHO for DC scenarios CMCC

[28]R2-2001004 On serving cell’s radio link status reporting for CHO preparation Nokia, Nokia Shanghai Bell

[29]R2-2001305 Timing of Key Derivation in Conditional Handover Futurewei

[30]R2-2001306 Draft LS on the Timing of AS Key Derivation in Conditional Handover Futurewei

[31]R2-2001386 Discussion on combination of simultaneous connectivity and CHO Huawei, HiSilicon

[32]R2-2001535 T304 Running Issue When CHO Execution LG Electronics Inc.

[33]R2-2001537 Measurement ID Handling for CHO and CPC LG Electronics Inc.

[34]R2-2001545 CHO in NR-U LG Electronics Inc.

[35]R2-2001553 Discussion on CHO for DC scenarios CMCC, **Rap, same as [27]**

[36] R2-2000459 UE feature list for LTE and NR mobility Intel Corporation

[37] R2-2000461 Report of [108#66][LTE NR Mob] Open issues for LTE and NR mobility Intel Corporation

[38] R2-2002040 Summary of CHO in AI 6.9.3.1 and 6.9.3.3 Intel Corporation