**3GPP TSG-RAN WG4 Meeting #94-e R4-2002195**

**Electronic Meeting, Feb.24th – Mar.6th 2020**

**Agenda item:** 7.12.1

**Source:** Moderator (Nokia, Nokia Shanghai Bell)

**Title:** Email discussion summary for RAN4#94e\_#72\_LTE\_feMob\_RRM

**Document for:** Information

# Introduction

*Briefly introduce background, the scope of this email discussion and provide some guidelines for email discussion if necessary.*

In RAN4#93 meeting, we have agreed most of the requirements for LTE mobility enhancement and the requirements were introduced in the specification 36.133 Rel-16 (R4-1915943 & R4-1915948). The open issues were captured in the agreed way forward (R4-1915920), and this way forward will be the input for this topic in RAN4#94-e meeting.

|  |
| --- |
| *Companies are encouraged to provided analysis on:** *Interruption in DAPS HO D1 to down select from option 1 and option 2 in slide 2.*
* *Power imbalance between the source and target cells in DAPS intra-frequency HO side condition.*
* *Restrictions related to source and target BW.*
* *TRRC\_2 in conditional handover*

*Conclusion on issues above will be made in RAN4#94.* |

According to the meeting agenda, we will have 2 topics for discussion:

* Conditional handover
* Reduction of user data interruption (DAPS)

*List of candidate target of email discussion for 1st round and 2nd round*

* 1st round: Get agreement on the conditional handover delay requirements and DAPS delay requirements, if possible, we can also get agreement on text proposals.
* 2nd round: Get agreement on the text proposals if text proposals for conditional handover delay requirement and DAPS delay requirements are not treated in 1st round.

## Email discussion guideline for Round 2

Please use R4-2002195 as baseline for the discussion. Use the ’recommendation for 2nd round’ as the baseline for the discussion in 2nd round.

In R4-2002177 a number of possible agreements have been listed (tentative agreements). Based in R4-2002177 discussion I have collected under ’Discussion on 2nd round’ aspect for input in 2nd round in this Revised\_R4-2002177. Companies should at least indicate if they cannot agree to the tentative agreement. If no objections are received the tentative agreement will be listed as agreed and captured in the WF as such. Otherwise, the tentative agreement will open for further discussion in next meeting.

Additionally, companies may add further comments to round open parts. These open aspects will be listed in the WF for further discussion.

After each Issue I have listed:

Comments: [Chronological order]

[Company A:]

Agreement:

Please fill in Company view under Company. Based on the input I will add Agreement. E.g.:

Nokia: Support the tentative agreement.

Once updated please upload to Draft folder (same location as in Round 1) adding company name at the end of the file name (same procedure as in round 1).

As for Dormancy SCell a WF will be created directly based on the round 1 discussion. Companies can comment the WF directly.

# Topic #1: Conditional Handover

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2001336 | Nokia, Nokia Shanghai Bell | 1. Remove *TCHO\_execution* from Dhandover for conditional handover.
2. Agree to one of the text proposals in section 2.3.
 |
| R4-2001411 | Ericsson | **Proposal 1**: TCHO\_execution is specified as [5]ms**Observation 1**: Conditional PSCell addition or release is not within the scope of release 16 mobility enhancements since it involves the MN**Proposal 2:** No additional requirements are needed for PSCell addition, release or change in 36.133 |
| R4-2001412 | Ericsson | Text Proposal to capture the proposal#1 in R4-2001411 |
| R4-2001839 | Qualcomm Incorporated | CR, Corrections to HO delay requirements for conditional HO1. Clarified measurement period defintion and corrected references and included inter-frequency case
2. Clarified preparetion time defintion
3. Clarified the interruption time defintion
4. Corrected reference in clause 5.1.2.7
5. TCHO\_execution is specified as [10]ms
 |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

Based on the contributions, observations and proposals following list of sub-topics for further discussion and agreement have been identified:

1. TCHO\_execution
2. Text Proposals for conditional Handover
3. Additional requirements for PSCell addition, release or change in 36.133

### Sub-topic 1-1

*Sub-topic description:* Discuss the needed of TCHO\_execution and its’ value for conditional handover delay requirement.

*Open issues and candidate options before e-meeting:*

**Issue 1-1: TCHO\_execution**

* Proposals
	+ Option 1: Removed
	+ Option 2: [5] ms
	+ Option 3: [10] ms
* Recommended WF:
	+ Firstly, discuss if TCHO\_execution should be removed from Dhandover for conditional handover.
		- Option 1: Removed
		- Option 2: Not removed
	+ Secondly, if TCHO\_execution is needed, what it should be:
		- Option 1: [5] ms
		- Option 2: [10] ms

### Sub-topic 1-2

*Sub-topic description:* Discuss the text proposal for correction of the conditional handover requirements

*Open issues and candidate options before e-meeting:*

**Issue 1-2: Reference for TDD cell is not correct in conditional handover requirements**

* Proposals
	+ Option 1: When the target cell is a TDD cell, the references should refer to TDD requirements.
* Recommended WF
	+ Potential agreements: In Conditional handover requirements, when the target cell is a TDD cell, the references should refer to TDD requirements.

### Sub-topic 1-3

*Sub-topic description:* discuss the inter-F cases in conditional handover requirements

*Open issues and candidate options before e-meeting:*

**Issue 1-3: Add inter-F cases in conditional handover requirements**

* Proposals
	+ Option 1: add inter-F cases in conditional handover requirements
* Recommended WF
	+ Need further discussion if inter-F cases are needed in conditional handover requirements

### Sub-topic 1-4

*Sub-topic description:* discuss the needed of additional requirements for PSCell addition, release or change in 36.133

*Open issues and candidate options before e-meeting:*

**Issue 1-4: Additional requirements for PSCell addition, release or change in 36.133**

* Proposals
	+ Option 1: Not needed
* Recommended WF
	+ Potential agreement: No additional requirements are needed for PSCell addition, release or change in 36.133

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | Sub topic 1-1: TCHO\_execution For the same topic in NR, we are OK with [10]ms as a compromise value (Ericsson proposal was 5ms for both LTE and NR). Then we don’t think this will be shorter in LTE CHO than NR CHO, and don’t see that this is so critical as long as it is much shorter than the shortest possible measurement period. Therefore although any of the options including removal, [5]ms or [10]ms are OK for us, we think it would be best to use the same value as is decided in this meeting for NR to make progress.Sub topic 1-2: Reference for TDD cell is not correct in conditional handover requirements Agree the reference should be updatedSub topic 1-3: Add inter-F cases in conditional handover requirements : Agree that inter-f conditional HO should be possible.Sub topic 1-4: Additional requirements for PSCell addition, release or change in 36.133 : PSCell addition or release involves MN which is outside the scope of the WI. Conditional PSCell change is possible in LTE DC or NE-DC, however there are no unconditional requirements for PSCell change in 36.133 so we also don’t propose to add conditional varaints, and support the potential agreement above,Others: |
| Qualcomm | Sub topic 1-1: we support Ericsson’s views and suggestions above.Sub topic 1-2: we support Ericsson’s views and suggestions above.Sub topic 1-3: we support Ericsson’s views and suggestions above.Sub topic 1-4: We support potential agreement proposed.  |
| Huawei, HiSilicon | Issue 1-1: we don’t agree TCHO\_execution  to be removed. The exact value of TCHO\_execution can be 10ms.Issue 1-2: agree with the recommended WF. Issue 1-3: agree with option 1, since the inter-f and intra-f handover shall be distinguished in CHO.Issue 1-4: In RAN2 there is no conclusion of CHO based PSCell addition and release. So we suggest RAN4 can focus on CHO based PSCell change in NE-DC. We have no strong view on whether to specify the requirements for PSCell change in LTE. |
| Nokia | Sub topic 1-1: TCHO\_execution: We support to remove TCHO\_execution. The current delay is already very relaxed and hence we see this delay as being redundant or at most very short. For the sake of progress, we can support 5ms.Sub topic 1-2: Reference for TDD cell is not correct in conditional handover requirements: We agree the option 1, the reference for TDD should be updated in conditional handover requirements. Sub topic 1-3: Add inter-F cases in conditional handover requirements: We are fine with option 1, we should have inter-F cases in CHO requirements.Sub topic 1-4: Additional requirements for PSCell addition, release or change in 36.133: We agree with option 1, there is no need to introduce additional requirements for PSCell. |

### CRs/TPs comments collection

*Major close-to-finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#1**  | Issue 1-1: TCHO\_execution*Tentative agreements:* TCHO\_execution in LTE conditional handover could use the same value as NR conditional handover. *Candidate options:*Basedon the compromise of companies, below options are listed:- Use the same value as is decided in this meeting for NR- [10]ms- [5]ms*Recommendations for 2nd round:* Companies are welcome to give input on TCHO\_execution, and get agreement on this issue. |
| **Sub-topic#2**  | Issue 1-2: Reference for TDD cell is not correct in conditional handover requirements*Tentative agreements:* In Conditional handover requirements, when the target cell is a TDD cell, the references should refer to TDD requirements.*Recommendations for 2nd round:* Capture the agreement in text proposal for conditional handover requirements. |
| **Sub-topic#3** | Issue 1-3: Add inter-F cases in conditional handover requirements*Tentative agreements:* Inter-F cases should be introduced in conditional handover requirements*Recommendations for 2nd round:* Capture the agreement in text proposal for conditional handover requirements. |
| **Sub-topic#4** | Issue 1-4: Additional requirements for PSCell addition, release or change in 36.133*Tentative agreements:* No additional requirements are needed for PSCell addition, release or change in 36.133*Recommendations for 2nd round:*  |

*Recommendations on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 |  |  |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provides recommendation on CRs/TPs Status update*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

### Open issues

**Issue 1-1: TCHO\_execution**

* Proposals based on the 1st round discussion:
* Option 1: Use the same value as is decided in this meeting for NR
* Option 2: [10]ms
* Option 3: [5]ms
* Recommended WF
* Potential agreements:TCHO\_execution in LTE conditional handover could use the same value as NR conditional handover.

Comments: *[Chronological order]*

*[Company A:]*

*Qualcomm: we agree with the potential agreement.*

*[Ericsson:] Potential agreement is fine. In NR discussions Ericsson position is that we can agree on [10]ms as a compromise.*

*[Nokia:] We agree with the potential agreement*

Agreement:

 TCHO\_execution in LTE conditional handover could use the same value as NR conditional handover.

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2001412 | Company A |
| Company B |
|  |
| R4-2001839 | Company A |
| Company B |
|  |

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
|  | **Status summary in 2nd round discussion** |
| **Sub-topic#1**  | Issue 1-1: TCHO\_execution*Tentative agreements:* TCHO\_execution in LTE conditional handover could use the same value as NR conditional handover. |

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation**  |
| R4-2002272 | This WF is captured the agreement and open issues for further discussion on 1st and 2nd round discussion. It can be agreeable.  |
| R4-2001412 | CRs/TPs can come back next meeting. It can be noted. |
| R4-2001839 | CRs/TPs can come back next meeting. It can be noted. |

# Topic #2: Reduction of user data interruption (DAPS)

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2001409 | Ericsson | **Proposal 1** : 1ms interruption is specified for the case that bandwidth of target cell is larger than the bandwidth of source cell for in intra-frequency DAPS handover.**Proposal 2**: power imbalance between the two cells should be within [6] dB. |
| R4-2001410 | Ericsson | TP for 5.7 E-UTRAN DAPS Handover to capture the proposals in R4-2001409 |
| R4-2001670 | Huawei, HiSilicon | CR for 5.7 E-UTRAN DAPS Handover-Tinterrupt1 is 2ms if the bandwidth of target cell is larger than the bandwidth of source cell for intra-frequency DAPS handover.-Tinterrupt2 is 1ms if the bandwidth of target cell is larger than the bandwidth of source cell for intra-frequency DAPS handover. |
| R4-2001840 | Qualcomm Incorporated | CR for 5.7 E-UTRAN DAPS Handover1. Replaced [TBD] for source cell release message to RRC command
2. Clarified Dhandover2 defintion
3. Clarified intra-frequency requirements are for sync case
4. Added a note on further possible interruptions on source cell in case simultaneous UL Tx to source/target cells are not possible (per agreement in WF of RAN4#93 meeting)
 |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

Based on the contributions, observations and proposals following list of sub-topics for further discussion and agreement have been identified:

1. Tinterruption1
2. Tinterruption2
3. The power imbalance between source cell and target cell
4. Source cell release message
5. Synchronous intra-frequency DAPS handover

### Sub-topic 2-1

*Sub-topic description:* Discuss the interruption delay Tinterruption1 for the case that bandwidth of target cell is larger than the bandwidth of source cell for in intra-frequency DAPS handover

*Open issues and candidate options before e-meeting:*

**Issue 2-1: Tinterruption1 for the case that bandwidth of target cell is larger than the bandwidth of source cell for in intra-frequency DAPS handover**

* Proposals
	+ Option 1: 2 ms
	+ Option 2: not needed
* Recommended WF
	+ Potential agreement: Tinterrupt1 is 1ms if the bandwidth of target cell is larger than the bandwidth of source cell for intra-frequency DAPS handover

### Sub-topic 2-2

*Sub-topic description:* Discuss the interruption delay Tinterruption2 for the case that bandwidth of target cell is larger than the bandwidth of source cell for in intra-frequency DAPS handover

*Open issues and candidate options before e-meeting:*

**Issue 2-2: Tinterruption2 for the case that bandwidth of target cell is larger than the bandwidth of source cell for in intra-frequency DAPS handover**

* Proposals
	+ Option 1: 1 ms
* Recommended WF
	+ Potential agreement: Tinterrupt2 is 1ms if the bandwidth of target cell is larger than the bandwidth of source cell for intra-frequency DAPS handover

### Sub-topic 2-3

*Sub-topic description:* discussthe power imbalance between source cell and target cell

*Open issues and candidate options before e-meeting:*

**Issue 2-3: The power imbalance between source cell and target cell**

* Proposals
	+ Option 1: 6 dB
* Recommended WF
	+ Potential agreement: The power imbalance between source cell and target cell should be within 6 dB

### Sub-topic 2-4

*Sub-topic description:* discuss which message UE will receive to start source cell release.

*Open issues and candidate options before e-meeting:*

**Issue 2-4: Source cell release message**

* Proposals
	+ Option 1: RRC command
* Recommended WF
	+ Potential agreement: the UE receives a RRC command implying source cell release.

### Sub-topic 2-5

*Sub-topic description:* Discuss the requirements of intra-frequency DAPS handover are applied for synchronous case

*Open issues and candidate options before e-meeting:*

**Issue 2-5: Synchronous intra-frequency DAPS handover**

* Proposals
	+ Option 1: Clarify the requirements of intra-frequency DAPS handover for synchronous case
* Recommended WF
	+ Potential agreement: The requirements of intra-frequency DAPS handover are applied for synchronous case

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | Issue 2-1: Tinterruption1 for the case that bandwidth of target cell is larger than the bandwidth of source cell for in intra-frequency DAPS handoverWe support the potential agreement of 1ms. It should be possible to perform any needed baseband and RF reconfigurations in parallel.Issue 2-2: Tinterruption2 for the case that bandwidth of target cell is larger than the bandwidth of source cell for in intra-frequency DAPS handoverWe support the potential agreement of 1ms as a compromise; in this case there is no RF reconfiguration and BB reconfiguration time would be similar as in issue 2-1.Issue 2-3: The power imbalance between source cell and target cellBased on the NR discussion, further clarification seems necessary on the meaning of power imbalance, ie is it a short term or long term imbalance, and does the requirement apply for the entire duration of the DAPS handover (target addition, dual link operation and source release)? Issue 2-4: Source cell release messageThe recommended WF is fine. RAN2 will define the RRC signaling that implies source cell releaseIssue 2-5: Synchronous intra-frequency DAPS handoverPotential agreement appears to be OK; if we define interruptions of 1ms for issue 2-1 and 2.2 then we are implicitly assuming synchronous intra-frequency DAPS anyway. Others: |
| Qualcomm | Issue 2-1: We support option 1, i.e., 2ms. When RF retuning is required, it was already agreed to use 2ms as interruption 2. So 1ms interruption is not aligned with the agreement. Issue 2-2: We can support 1ms interruption in this case since no RF retuning is required. Issue 2-3: We also propose to wait for conclusion in NR discussion.Issue 2-4: Agree to WF. We don’t believe there is an alternative.Issue 2-5: We prefer to be explicit and specify so in the spec text.  |
| Huawei, HiSilicon | Issue 2-1: disagree with the recommended WF. Tinterrupt1 Shall be 2ms as the RF retuning is performed in the case that the bandwidth of target cell is larger than the bandwidth of source cell.Issue 2-2: agree with the recommended WF.Issue 2-3: the power difference shall be smaller.Issue 2-4: waiting for RAN2’s conclusion.Issue 2-5: This may limit the application scenarios of DAPS handover. In addition, what is the definition of “sync”? within CP/2 or something else? Anyway, this restriction needs careful discussion. |
| Nokia | Issue 2-1: Tinterruption1 for the case that bandwidth of target cell is larger than the bandwidth of source cell for in intra-frequency DAPS handover: we support the potential agreement, 1ms for this case. Issue 2-2: Tinterruption2 for the case that bandwidth of target cell is larger than the bandwidth of source cell for in intra-frequency DAPS handover: we support the potential agreement, 1ms for this case.Issue 2-4: Source cell release message: We agree with the recommended WF. Do we have this RRC message defined already? Issue 2-5: Synchronous intra-frequency DAPS handover: We are fine with the potential agreement. |
|  |  |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
|  | Company A |
| Company B |
|  |
|  | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#1** | Issue 2-1: Tinterruption1 for the case that bandwidth of target cell is larger than the bandwidth of source cell for in intra-frequency DAPS handover*Tentative agreements:* No agreement*Candidate options:* Based on the companies’ comments, more discussion is needed with these options: - 1ms- 2ms*Recommendations for 2nd round:* The discussion will be continued. Companies are welcome to give input on Tinterruption1, try to get agreement on this issue. |
| **Sub-topic#2** | Issue 2-1: Tinterruption2 for the case that bandwidth of target cell is larger than the bandwidth of source cell for in intra-frequency DAPS handover*Tentative agreements:*Tinterruption2 for the case that bandwidth of target cell is larger than the bandwidth of source cell for in intra-frequency DAPS handover could be 1ms*Recommendations for 2nd round:* Capture the agreement in the text proposal for DAPS requirements |
| **Sub-topic#3** | Issue 2-3: The power imbalance between source cell and target cell*Tentative agreements:* Waiting for the conclusion in NR DAPS discussion*Candidate options:* further clarification on the meaning of power imbalance would be helpful on this discussion. Below options are listed:- waiting for the conclusion in NR DAPS discussion- less than [6]dB*Recommendations for 2nd round:* discussion will be continued, further clarification on the meaning of power imbalance are welcome.  |
| **Sub-topic#4** | Issue 2-4: Source cell release message*Tentative agreements:* Waiting for RAN2 decision*Candidate options:* Most companies are fine with the WF, the RRC signaling that implies source cell release will be defined in RAN2. Below views are captured in the discussion: - Agree with the WF, the UE receives a RRC command implying source cell release.- Waiting for RAN2 decision*Recommendations for 2nd round:* discussion will continue, companies are welcome to provide comments. |
| **Sub-topic#5** | Issue 2-5: Synchronous intra-frequency DAPS handover*Tentative agreements:* The requirements of intra-frequency DAPS handover are applied for synchronous case, this can be explicit captured in DAPS handover requirement.*Candidate options:*WF could be fine. Need to clarify what is synchronous case here. *Recommendations for 2nd round:* Continue on this discuss to clarify the definition of synchronous intra-frequency DAPS handover. Then get agreement on this issue and capture in specification. |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 |  |  |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

### Open issues

**Issue 2-1: Tinterruption1 for the case that bandwidth of target cell is larger than the bandwidth of source cell for in intra-frequency DAPS handover**

* Proposals based on the 1st round discussion:
* Option 1: 1 ms
* Option 2: 2 ms
* Recommended WF
* Need further discussion

Comments: *[Chronological order]*

*[Company A:]*

*Qualcomm: this scenario requires RF retuning so option 2 [2ms] is our choice. We note that MG tuning time cannot be re-used here as UE is not required to sustain simultaneous connectivity with 2 links during MG.*

*[Ericsson:] We prefer [1ms] but could agree with [2ms] to conclude the work as a compromise since DAPS is mostly about improving HO robustness rather than throughput in handover procedure.*

*[Nokia]: We support [1ms].*

Agreement:

Tinterruption2 for the case that bandwidth of target cell is larger than the bandwidth of source cell for in intra-frequency DAPS handover:

* + Option 1: 1ms
	+ Option 2: 2ms

**Issue 2-3: The power imbalance between source cell and target cell**

* further clarification on the meaning of power imbalance is needed
* Proposals based on the 1st round discussion:
* Option 1: Waiting for the conclusion in NR DAPS discussion
* Option 2: < 6dB
* Recommended WF
* Potential agreement: The power imbalance between source cell and target cell will be discussed after the conclusion in NR DAPS discussion.

Comments: *[Chronological order]*

*[Company A:]*

*Qualcomm: we support the potential agreement.*

*[Ericsson:] We support the potential agreement since discussing LTE and NR in parallel would lead to a lot of repetition of the same points.*

*[Nokia:] We support the potential agreement.*

Agreement:

The power imbalance between source cell and target cell will be discussed after the conclusion in NR DAPS discussion.

**Issue 2-4: Source cell release message**

* Proposals based on the 1st round discussion:
* Option 1: Agree with the WF, the UE receives an RRC command implying source cell release.
* Option 2: Waiting for RAN2 decision
* Recommended WF
* Potential agreement: RAN4 should wait for RAN2 decision of the source cell release message.

Comments: *[Chronological order]*

*[Company A:]*

*Qualcomm: potential agreement is fine with us.*

*[Ericsson:] Agree with potential agreement, there is no big urgency to settle the trigger for source cell release in RAN4 spec until RAN2 has decided it.*

*[Nokia:] We agree with the potential agreement.*

Agreement:

RAN4 should wait for RAN2 decision of the source cell release message.

**Issue 2-5: Synchronous intra-frequency DAPS handover**

* Clarification on synchronous intra-frequency DAPS handover is needed
* Proposals based on the 1st round discussion:
* Option 1: The requirements of intra-frequency DAPS handover are applied for synchronous case, this should be explicit captured in DAPS handover requirement.
* Option 2: Restriction the DAPS requirement on intra-frequency sync may limit the application scenarios of DAPS handover
* Recommended WF
* Need further discussion

Comments: *[Chronological order]*

*[Company A:]*

*This has been extensively studied and discussed in the past year (since Feb 2019 meeting) and feasibility issues particularly in simultaneous transmission with single Tx or dual Tx implementations have been raised. RAN4 did not confirm the feasibility of async intra-frequency DAPS in its response to RAN2. We support option 1.*

*From R4-1902030:*

* Regarding Intra-frequency asynchronous,
* It is feasible that UE performs simultaneous reception for intra-frequency asynchronous deployment with dual FFT, when the bandwidth between the source and target cell is the same.
	+ Some issues may need be further investigated and addressed if needed, e.g., AGC issue.
* Further studies on simultaneous transmission for intra-frequency asynchronous deployment shall be performed in RAN4.
* When the bandwidth of the source and target cell are different,
	+ If the bandwidth of the source cell is larger than that of the target cell, simultaneous reception is feasible.
	+ If the bandwidth of the source cell is smaller than that of the target cell, simultaneous reception is feasible if some interruption time is allowed for reconfiguring RF before the initial simultaneous reception takes place.
	+ Note: the conditions under the first main bullet also applies here.

*The highlighted text was neither concluded nor pursued in RAN4.*

[Ericsson:] We supported defining synchronous intra-frequency requirements in RAN4 in the first round, although we also agree that they are rather limited in applicability eg in FDD networks and even in TDD considering multipath, propagation delays etc the synchronisation would likely need to be even better than 3µS cell phase sync. To explain a bit further, the reason why we considered we could accept sync requirements is that async would seem to inevitably end up being a UE capability (dual FFT for intrafrequency downlink is needed) and it doesn’t seem like many UE would support it as a capability. So our position is to agree option 1, even though we also acknowledge it is unfortunate and limits the possibility of some very useful cases of DAPS HO from the network perspective.

Huawei: as we discussed in the reflector, first RAN1had some schemes to support intra-f async scenarios. Secondly whether sync /asyc is one of UE capability, some UEs can report the capability of supporting intra-f async. Third the restriction of intra-f sync will limit the applicability network deployment. Even with the limitation of 3us time difference between serving cell and target cell, it still can not guarantee the UE received time difference is within one CP considering multi-path and propagation delay.

[Ericsson:] Issue 2-5 We think Huawei raise a very good point on the definition of sync. Some further thinking from our side is

- In general there can be a significant additional cost and technical feasibility issue with synchronising network nodes, especially as GPS is not always available.

- For TDD we can of course guarantee the cell phase sync requirement such as 3us is met at the BS antenna connectors since that is needed for the proper interference free operation of the TDD system. Better synchronisation than this between geographically separate nodes may in some cases be technically challenging or more expensive. In CA scenarios even for non collocated cells, they both belong to the same eNB and there can be an RRH but here we are talking of something much more like dual connectivity than CA with separate eNBs with their own clocks etc. Many handovers are not going to be intra-eNB although there are (fairly common) special cases like HO between eNB sectors

- Even if we know there is good sync at the BS antenna connector, what matters is the sync at the UE antenna connector

- Sync (aka MRTD/MTTD) at the UE antenna connector is pretty much deployment dependent and for handover we have to consider that source and target are a different distance from the UE, especially if we think of something like an interfrequency HO for load balancing, but even in the intrafrequency case the propagation distance may not be the same at handover point. So it comes down to a discussion about cell sizes, and how far away neighbours can be. One obvious approach can be to reuse 10km that we have typically used before in CA

- That means from the network side, we come to something like ~33uS MRTD. It is certainly in the ballpark, and tightening it means really restricting DAPS HO use cases

- However, I also know something about the UE side, and I know UEs can’t use the same FFT if the signals (and multipaths) are not aligned to within the CP. And I think UE vendors plan to reuse typical CA architectures and reuse the same FFT in the intraband case for sure.

So my conclusion is that there can be at least two very different understandings of what sync means. If one network implementation assumes a certain thing, and the UE vendors assume something else we potentially have no interoperability, which will have severe implications for this feature. Therefore we agree that the definition of sync needs to be carefully considered, otherwise it is not even meaningful to say that requirements are only defined for the sync case. Agreement:

If the requirements of intra-frequency DAPS handover are applied for synchronous case need further study.

CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2001410 | Company A |
| Company B |
|  |
| R4-2001670 | Company A |
| Company B |
|  |
| R4-2001840 | Company A |
| Company B |
|  |

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
|  | **Status summary in 2nd round discussion** |
| **Sub-topic#1**  | Issue 2-1: Tinterruption1 for the case that bandwidth of target cell is larger than the bandwidth of source cell for in intra-frequency DAPS handover*Candidate options:* * Option 1: 1ms
* Option 2: 2ms

*Way Forward:* further discussion is needed |
| **Sub-topic#3** | Issue 2-3: The power imbalance between source cell and target cell*Tentative agreements:* The power imbalance between source cell and target cell will be discussed after the conclusion in NR DAPS discussion. |
| **Sub-topic#4** | Issue 2-4: Source cell release message*Tentative agreements:* RAN4 should wait for RAN2 decision of the source cell release message. |
| **Sub-topic#5** | Issue 2-5: Synchronous intra-frequency DAPS handover*Candidate options:** Option 1: The requirements of intra-frequency DAPS handover are applied for synchronous case, this should be explicit captured in DAPS handover requirement.
* Option 2: Restriction the DAPS requirement on intra-frequency sync may limit the application scenarios of DAPS handover

*Way Forward:* further discussion is needed |

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation**  |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |
| R4-2002272 | This WF is captured the agreement and open issues for further discussion on 1st and 2nd round discussion. It can be agreeable. Additional note is recommended to be captured in the chairman’s notes that two companies supported the view that the definition of synchronous DAPS handover shall be further studied and clearly embodied in specifications. |
| R4-2001410 | CRs/TPs can come back next meeting. It can be noted. |
| R4-2001670 | CRs/TPs can come back next meeting. It can be noted. |
| R4-2001840 | CRs/TPs can come back next meeting. It can be noted. |