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

**Fukuoka, Japan, May 20-24, 2024**

**Source: Qualcomm Incorporated**

**Title: Offline discussion summary: [AT126][502][R18MobE] UE cap Early TA acquisition (Qualcomm)**

**Document for: Decision**

**Agenda Item: 7.4.5**

# Introduction

This document summarises the following offline discussion.

* [AT126][502][R18MobE] UE cap Early TA acquisition (Qualcomm)

 Scope: Continue offline, i.e. based on R2-2405245 and R2-2404705 and the related discussion, determine if change is needed / desired and converge as far as reasonable, determine way forward, or alternatives / discussion points, If applicable, check impact on this discussion of R4 involvement, if any.

 Intended outcome: Report

 Deadline: CB, see schedule

Companies are invited to provide their contact information for this email discussion.

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# Discussion

* 1. Background

RAN1 and RAN4 Rel-18 feature lists [1][2] define the following features requiring “per band-pair” UE capability signalling.

RAN1 [1]

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| --- | --- | --- | --- | --- |
| **Features** | **Index** | **Feature group** | **Components** | **Type** |
| 45. NR\_Mob\_enh2 | 45-5a | RACH-based early TA acquisition with simultaneous transmission | Support of simultaneous transmission to handle the overlap between UL transmission on serving cell(s) and PRACH on candidate cell(s) | Per band pair per band combination (between the target band for RACH transmission and band under UE’s current band combo)  |

RAN4 [2]

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| --- | --- | --- | --- | --- |
| **Features** | **Index** | **Feature group** | **Components** | **Type** |
| 39.NR\_Mob\_enh2 | 39-4 | Interruption on DL slot(s) due to PDCCH- ordered RACH transmission | Capability on whether UE may cause interruption on DL slot(s) on serving cells due to PDCCH-ordered RACH transmission | Per band pair (between the target band for RACH transmission and band under UE’s current band combo) per band combination |
| 39.NR\_Mob\_enh2 | 39-4a | Interruption due to RF retuning for PDCCH- ordered RACH | Indicates the interruption length (Y ms) due to RF re-tuning for PDCCH ordered RACH of which the resources are not fully contained in any of UE’s configured UL BWP(s) of active serving cells | Per band pair (between the target band for RACH transmission and band under UE’s current band combo) per band combination |
| 39.NR\_Mob\_enh2 | 39-5 | RF/BB preparation time for PDCCH-order RACH | Indicates the RF/BB preparation time for PDCCH ordered RACH of which the resources are not fully contained in any of UE’s configured UL BWP(s) of active serving cells | Per band pair (between the target band for RACH transmission and band under UE’s current band combo) per band combination |

* 1. General principle

Offline discussion rapporteur understands companies are in agreement that the standard needs to support the UE capability signalling where the “target band” for RACH transmission is any supported band within or outside the bands of the band combination.

**Proposal 1:** The target band for RACH transmission is any supported band within or outside the bands of the band combination.

**Q1:** Agree to proposal 1?

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| **Company** | **Yes/No** | **Comment** |
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* 1. Solution

Two solutions, with some variants within a solution, have been discussed so far. Rapporteur’s attempt to describe the solutions and discussion points can be seen below.

* + 1. Solution1: Static UE capability reporting in *UECapabilityInformation*

This solution replies on the normal UE capability reporting signalling we have today. For each band of a band combination, the UE signals an index to the target band. Two variants for signalling granularity were discussed.

* Option 1: Per band per BC (in *BandCombination*) [3]
* Option 2: Per Feature Set [4]

For further discussion:

1. What should the band index above be pointing to, e.g. a band in *supportedBandListNR* (Max. size 1024)?
2. Should we aim for some signalling overhead reduction? For example, we could consider additional UE capability filter/request by the network indicating potential target bands for RACH transmission, in *UECapabilityEnquiry* message.
	* Note that the existing UE capability filter *FreqBandList* would not really help because its maximum size is 1280.
	* It was pointed out during additional offline discussion that the network-requested target bands may have to be per CA band combination. Or can it be a common target band list?
		1. Solution2: Dynamic UE capability reporting [5]

This solution can be summarized as follows.

* In *RRCReconfiguration*/*RRCResume*, the network configures, a list of NR bands that the UE is requested to report as the target bands for RACH transmission.
* In *RRCReconfigurationComplete*/*RRCResumeComplete*, the UE reports, for each requested target band, the interruption time / preparation time required for the serving cells.

For further discussion:

1. It was pointed out during additional offline discussion that the network-requested target bands may have to be per candidate LTM configuration because each candidate LTM configuration may include different CA band combination. Or can it be a common target band list?
2. Rapporteur identified one potential drawback of this solution. The network may want to configure LTM candidate cells based on the UE capability of early TA acquisition, together with other relevant UE capabilities. This solution does not allow this because the network will know about the early TA acquisition capabilities only after LTM candidate configuration.

**Q2:** Companies are invited to provide their comment for the solutions and discussion points above.

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| **Company** | **Comment** |
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# Conclusion

# Reference

[1] R1-2403703 Updated RAN1 UE features list for Rel-18 NR after RAN1#116bis

[2] R4-2406680 Rel-18 RAN4 UE feature list for NR (version 4)

[3] R2-2404527/4528 Corrections and Updates to UE capabilities for Rel-18 WIs, including TEI18 [RAN1], Intel Corporation

[4] R2-2405245 Mobility UE capabilities with Per band pair per band combination granularity Huawei, HiSilicon

[5] R2-2404705 Band-pair signalling for Early TA acquisition UE capabilities Qualcomm