

3GPP TSG RAN#104

June 17 – 20, 2024

Shanghai, China

RP-241361

Agenda Item 9.1.4

Recommended WF on Fragmented Carriers

MediaTek Inc.

Background

- A WF [RP-240768](#) was agreed in RP#103 meeting to consider a new SI on fragmented carriers. The agreed scope is captured as below

Scope (Agreed WF)

Objectives:

- Identify methods for reducing number of UE Rx chains (e.g. 1 or 2) needed for single DL band of ≤ 100 MHz (frequency span) containing two non-contiguous CCs within a CA combination for the inter-operator co-located scenario, considering:
 - Which RF requirements could be adjusted for the inter-operator co-located scenario, e.g. Existing UE RF requirements such as ACS
 - The ability to semi-statically switch hardware resources (i.e., Rx chains) between bands
 - 6 dB power imbalance between the two non-contiguous CCs
 - Impacts on DL performance
 - Means for a UE to inform the network of new CA configuration it can support with adjusted RF requirements

RAN4 led item with minimal RAN2 impact and no RAN1 impact is foreseen

Timescale:

- Start Q3 2024
- Target completion Q2 2025

- This contribution provides considerations on
 - Band combination handling
 - Different UE architectures

Discussion

Band Combination handling

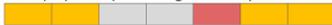
[1/3]

- [1], [2] provide examples of current operator spectrum holding

PCS (n25) example of fragmented spectrum in Toronto*



BRS (n7) example of fragmented spectrum in Toronto*



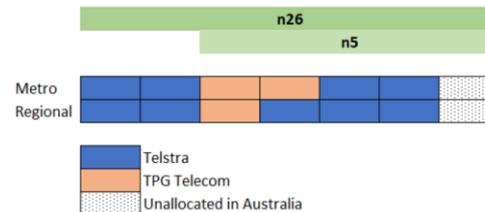
AWS1/3/4 (n66) example of fragmented spectrum in Toronto*



*Same colour indicates spectrum access for the same operator; each block is 5 MHz wide

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[1] [RP-233374](#), "Fragmented carriers in the DL", TELUS, Bell Mobility, Telstra, Nokia, Nokia Shanghai Bell, AT&T, US Cellular



[2] [R4-2402309](#): "Study on effective utilization of fragmented FR1 carriers in the DL", TELUS, Bell Mobility, Telstra, Nokia, Nokia Shanghai Bell, AT&T, US Cellular

- Following discussions with a #operators, additional potential Band Combos are listed below

BC with baseline requirements in Rel-18	New target BC
<ul style="list-style-type: none">CA_n1A-n3A-n7B-n26(2A)-n78(2A)CA_n25(2A)-n41(2A)-n66A-n71ACA_n25A-n41(2A)-n66A-n77(2A)CA_n7(2A)-n25(2A)-n66(2A)-n78(2A)	<ul style="list-style-type: none">CA_n7(2A)-n25(2A)-n66(2A)-n77(3A)CA_n25(2A), n71(2A), n66(2A) and n41(2A)CA_n2(2A)-n66(3A)CA_n7A/B-n26(2A)-n78(2A)

Discussion

Band Combination handling

[2/3]

- These higher order configurations could be complicated in terms of
 - UE implementation; and
 - RAN4 discussions.
- Sound planning on how to start the discussions is very important for timely delivery of this SI
 - Start with fundamentals: single-band DL non-contiguous carrier aggregation (NCCA)
- **Proposal 1:** Start from single-band DL non-contiguous carrier aggregation
- Different duplex modes need to be considered separately.
E.g. certain considerations were already covered in current spec for collocated inter-MNO scenario
 - FDD: Allow degradation (ΔR_{IBNC}) and study further relaxation due to sharing receiving path that UE can support the new feature
 - TDD: Study on DL carrier degradation ($\Delta R_{\text{IBNC,TDD}}$) due to sharing receiving path that UE can support the new feature with higher-order configurations
- **Proposal 2:** Different duplex modes can be studied separately

Discussion

Band Combination handling

[3/3]

- For FDD DL NCCA, ΔR_{IBNC} were specified on SCC due to the impact of self-band UL carrier.
 - This may still need to be considered in this study.
- **Proposal 3:** Although the SI focuses on DL, the UL configuration may have impact on SCC DL performance that would need to be considered
- After completing single-band DL NCCA discussions, the next step is inter-band CA cases
 - Continue with fundamentals: e.g. inter-band CA w/ non-overlapping DL freq range or NR SA
- **Proposal 4:** Focus on inter-band CA with non-overlapping DL frequency range under NR stand-alone

Discussion

Different UE Architectures

[1/3]

- There could be different UE architectures to handle the fragmented spectrum.
 - Each architecture has different sharing level and as a result different performance.
 - Companies should share their views on different arch. and the related pros and cons.
 - The detailed categorization can be left to RAN4.
In the SI, there is no need to put limitation (which can still be considered in the follow-up WI).
- **Proposal 5:** In the SI, there is no need to put limitation on different UE architectures
- In the next pages, several receiver architectures are provided, for information.

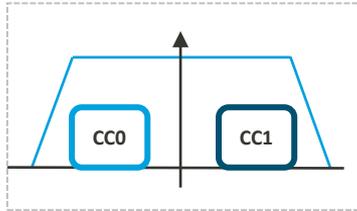
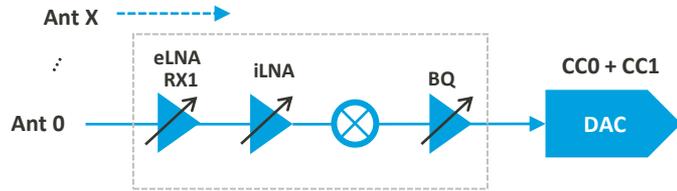
Discussion

Different UE Architectures

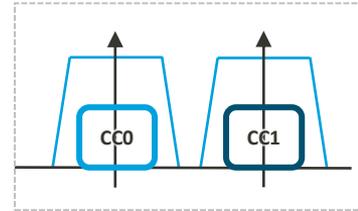
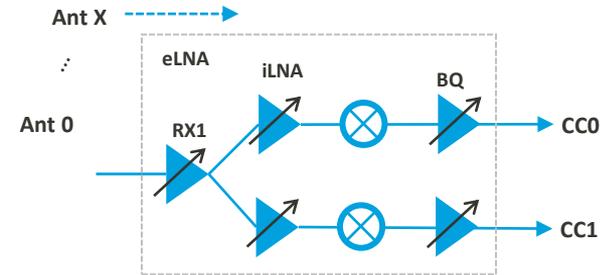
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[2/3]

Type 1: Fully shared receiver



Type 2: Partially shared receiver



Note: Carriers are handled separately in Digital baseband

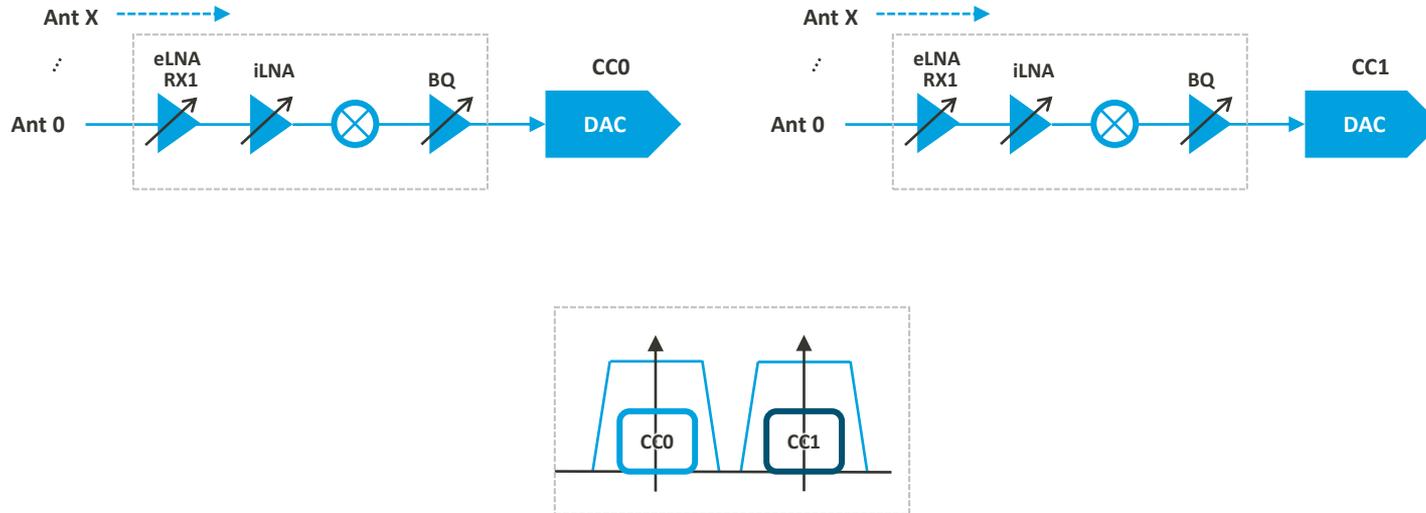
Discussion

Different UE Architectures

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Type 3: Fully separated receiver



Summary

- **Proposal 1:** Start from single-band DL non-contiguous carrier aggregation
- **Proposal 2:** Different duplex modes can be studied separately
- **Proposal 3:** Although the SI focuses on DL, the UL configuration may have impact on SCC DL performance that would need to be considered
- **Proposal 4:** Focus on inter-band CA with non-overlapping DL frequency range under NR stand-alone
- **Proposal 5:** In the SI, there is no need to put limitation on different UE architectures

Thank you!