3GPP TSG-RAN WG4 Meeting #112 R4-2414311

Maastricht, Netherlands, August 19 – 23, 2024

**Title:** WF on fragmented DL carriers study

**Agenda Item: 8.6.4**

**Source:** MediaTek Inc.

**Document for:** Approval

# Way forward

Topic #2: Methods for reducing the number of UE Rx chains

#### **Issue 2-1-1: Applicability and clarification on the scope**

Online agreements:

Agreement:

* The goal of the DL fragmented carrier study is to study the method to enable support of DL non-contiguous 2CC by using a single Rx RF chain
  + - The two non-contiguous CCs is still under the current DL non-contiguous CA framework
      * Each fragment is treated as an individual CC
    - The study should be future-proof for the higher order inter/intra-band combinations or additional CC(s) within the same band with fragments within 100MHz.
    - [The scope should be those bands, where the fragments are fully confined within 100MHz, which includes all FDD/SDL bands and TDD bands
      * Consider n2/n25, n3, n7, n66, n41, n39 as the example bands.
        + Provide the details related to gap between fragmented DL blocks]

Topic #3: Impacts on UE RF requirements and DL performance

#### **Issue 3-1-4: Means for a UE to inform the network of appropriate CA configuration it can support with adjusted RF requirements**

Recommended WF

* Proposal 1: put off the signalling related discussions until the UE performance aspects are clear.

# Appendix: Open issues

Topic #2: Methods for reducing the number of UE Rx chains

#### **Issue 2-1-2: Reference architecture**

Recommended WF:

* The existing requirements for DL NCCA was specified based on partially-shared Rx architectureaccording to TR36.823.
* FFS on following options for reducing number of Rx chains for DL non-contiguous CCs:
  + Option 1: Only the “fully shared Rx chain architecture” needs to be studied
  + Option 2: RAN4 also studies the possibility of supporting only 2Rx in the mandatory 4Rx band below 2700MHz
  + Other options are not precluded
* Companies are encouraged to provide baseband assumptions i.e., shared/separated BB filter that may relate to rejection ability toward unwanted signal for the study
* FFS on whether a single FFT are expected to cover the fragmented carriers or separate FFT are expected for each fragmented carrier.

#### **Issue 2-1-4: Study on power spectral density difference between carriers of co-located adjacent channel operators**

Recommended WF

* FFS on following options in next meeting
  + Option 1: Prioritize the “co-location” deployment (meaning only location is shared, but not infrastructure)
    - * For evaluation purpose and for simplicity, assume the two gNBs of two co-location operators are both transmitting at maximal allowed power level
      * equal PSD between two co-location operators could be assumed from gNB transmisstion point of view for evaluation purpose, as the starting point
      * The PSD difference from UE reception point of view could vary as per the different antenna type, antenna pointing direction, etc between operators
  + Option 2: For inter-operator deployment scenario, both shared RRU case and separate RRU case are considered
  + Other options are not precluded

#### **Issue 2-1-5: Prerequisite conditions**

This is discussed in issue 3-1-2

#### **Issue 2-1-6: Others**

FFS following proposals in next meeting:

* Proposal 1
* ***The impact of UE switching between common RF chain and separate RF chains, including potential interruption, should be studied. If there is RRM impact, RAN4 should consider it.***
* Proposal 2
* ***The new CA configuration supported only by adjusted RF requirements could be reported to the NW together with other default supported CA configuration.***
* Proposal 3
* ***gNB trigger UE to measure gap could be considered.***

Topic #3: Impacts on UE RF requirements and DL performance

#### **Issue 3-1-1: Assumptions on test configurations for evaluation**

Recommended WF:

See if RAN4 can agree on the following test configurations:

* + The configuration defined in Table 7.3A.2.2-1 and Table 7.3A.2.2-2 of TS 38.101-1 could be re-used for performance evaluation, for ΔRIBNC, both out-of-gap and in-gap ACS, IBB and NBB requirements for selected example combos
    - UE self-band uplink Tx re-use same assumptions for NR PC3 PA i.e., ACPR=30dB, with MPR=1dB, Full RB allocation. Tx LO leakage and image rejection ratio are 28dB
    - Reuse the Rel-15 assumption of Rx chain image rejection, which 25dB
    - At this stage RAN4 does not take DL MIMO into account
    - Evaluation may consider impairment factors such as ACLR, phase noise or IMDx of aggressor ability, duplexer isolation…etc.
  + Other configurations are not precluded if identified as having performance impact

#### **Issue 3-1-2: Prerequisite conditions**

FFS on following proposals in next meeting:

* + Proposal 1: Maintain the current ACS and IBB requirements to ensure UE selectivity
  + Proposal 2: The fourth sub-bullet in the SID should be simplified to “Determine a reasonable upper level of the power spectral density difference of the in-gap signal compared to the two non-contiguous CCs”
  + Proposal 3: RAN4 to confirm it is feasible to receive two non-contiguous CCs in a shared RF chains with the assumption that power spectral density imbalance between any of the CC and also the signal in the gap are within 6dB
    - FFS on assuming higher PSD for the signal in the gap of 2CC

#### **Issue 3-1-3: Requirements for evaluation**

Recommended WF:

Companies’ views are diverged but not controversial. Further discuss following bullets see if they can be agreeable as a package

* Both TDD and FDD intra-band DL contiguous CA should be included
* ΔRIBNC, ACS, IBB, NBB requirements [on both PCC and SCC] as well as the minimum guard band sizes for single Rx RF chain, all need to be evaluated
  + Out-of-band blocking and spurious response do not need requirement adjustment
* Adjusted requirements for fragmented carriers shall be separated from the existing FDD/TDD intra-band carrier non-contiguous aggregation ΔRIBNC, ACS, IBB, NBB
* Discussion on if a rejection level of the image caused by the in-gap interferer is needed
* Discussion on new requirement(s) if identified is not precluded

#### **Issue 3-1-5: Others**

FFS following proposal in next meeting:

Proposal

* RAN4 shall discuss expected UE fallback behaviour when an in-gap interferer precludes the UE to operate in fragmented carrier mode