**3GPP TSG-RAN WG2 Meeting #119bis-e R2-22xxxxx**

**Online, 10 – 19 October 2022**

**Agenda item: 6.24.1**

**Source: Samsung**

**Title: Report of [AT119bis-e][008][NR17] Dual PA (Samsung)**

**Document for: Discussion**

# 1 Introduction

This document is the report of the following offline discussion:

* [AT119bis-e][008][NR17] Dual PA (Samsung)

Scope: Treat R2-2209343, R2-2210134, R2-2209381, R2-2209382, R2-2210659. Determine agreeable parts, Based on agreeable parts, progress CRs

Intended outcome: Report, Agreed-in-principle CRs

Deadline: In time for CB W2 Mon (if CB is needed),

Note that the following discussion paper seems missing so it is included in this offline discussion:

[R2-2209383](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_119bis-e/Docs/R2-2209383.zip) Discussion on R4 LS on dual-PA architecture clarification OPPO, Ericsson, Samsung discussion Rel-17 NR\_RF\_FR1\_enh

Deadline (for companies' feedback): Thursday 2202-10-13 1600 UTC

# 2 Contact information

|  |  |  |
| --- | --- | --- |
| Company | Name | Email address |
| Ericsson | Mattias Bergström | [Mattias.a.bergstrom@ericsson.com](mailto:Mattias.a.bergstrom@ericsson.com) |
| Qualcomm Incorporated | Masato Kitazoe | mkitazoe@qti.qualcomm.com |
| OPPO | Qianxi Lu | qianxi.lu@oppo.com |
| Huawei, HiSilicon | Yang Zhao | zhaoyang@huawei.com |

# 3 Discussion

### 3.1 Discussion on the RAN4 reply LS

In [1], RAN4 replied to our questions as follows:

**Q1**: During RAN2#117, RAN2 had made the following agreement for the DC location report

* [032] It is left to UE implementation whether a UE supporting *dualPA-Architecture* for a BC always reports two DC locations for the BC.
* [032] A UE not supporting dualPA-Architecture for a BC always reports one DC location for the BC. Whether to change the specification can be discussed at next meeting.

Is the required change from RAN4 (i.e., the reporting of *dualPA-Architecture* also indicates the support of dual-LO) compatible with the RAN2 agreement above (i.e., the reporting of *dualPA-Architecture* does not mandate the UE to report two DC locations for the BC)?

**Q2**: In RAN2 specification, there are two *dualPA-Architecture* as follows: Where the former one is reported for the intra-band CA part of NR, while the latter one is for the intra-band BC part of (NG)EN-DC/NE-DC.

| ***dualPA-Architecture***  For band combinations with single-band with UL CA, this field indicates the support of dual PA. If absent in such band combinations, the UE supports single PA for all the ULs. For other band combinations, this field is not applicable. | BC | No | N/A | N/A |
| --- | --- | --- | --- | --- |
| ***dualPA-Architecture***  For an intra-band band combination, this field indicates the support of dual PAs. If absent in an intra-band band combination, the UE supports single PA for all the ULs in the intra-band band combination. For other band combinations, this field is not applicable.  This capability applies to:  - Intra-band (NG)EN-DC/NE-DC combination without additional inter-band NR and LTE CA component;  - Intra-band (NG)EN-DC/NE-DC combination supporting both UL and DL intra-band (NG)EN-DC/NE-DC parts with additional inter-band NR/LTE CA component;  - Inter-band (NG)EN-DC/NE-DC combination, where the frequency range of the E-UTRA band is a subset of the frequency range of the NR band (as specified in Table 5.5B.4.1-1 of TS 38.101-3 [4]).  If this capability is included in an "Intra-band (NG)EN-DC/NE-DC combination supporting both UL and DL intra-band (NG)EN-DC/NE-DC parts with additional inter-band NR/LTE CA component", this capability applies to the intra-band (NG)EN-DC/NE-DC BC part. | BC | No | N/A | N/A |

Is the required change also applicable to the latter one, or only applicable to the former one?

After discussion during RAN4#104-e, RAN4 would like to respectfully provide the following responses for RAN2 consideration.

***Response to Q1:*** Reporting DC location(s) is up to UE implementation which is independent with indicating *dualPA-Architecture* capability. The RAN4 required change on *dualPA-Architecture* capability was for the purpose of differentiating two sets of MPR requirements with different UE architectures for intra-band UL non-contiguous CA, it was not intended to use as an indicator for UE to report two DC locations as of now.

***Response to Q2*:** RAN4 required change applicable only to the former one is sufficient as of now.

The rapporteur thinks that [1] can be just noted and actual discussion can be done based on companies' contributions [2 – 6] in the following section.

**Q1: Do companies agree to note the RAN4 reply LS [1]?**

|  |  |  |
| --- | --- | --- |
| Company | Yes / No | Comments (if any) |
| Ericsson | Yes |  |
| Qualcomm Incorporated | Yes |  |
| OPPO | Yes |  |
| Huawei, HiSilicon | Yes but | We think the answer to Q1 means that indicaiting support of *dualPA-Architecture* is independent with whether to report two DC locations. We are not sure whether companies have same understanding here. |

Summary:

### 3.2 Discussion on the response to Q1 in RAN4 reply LS

Based on RAN4's response to Q1 in [1], the rapporteur understands that RAN4 confirmed RAN2's understanding made in RAN2#117-e meeting. The CR in [2] suggests to capture this understanding in the specification explicitly (see below highlighted text).

|  |
| --- |
| *UplinkTxDirectCurrentTwoCarrier* field descriptions |
| ***carrierOneInfo***  The serving cell ID and BWP ID of the first carrier of the uplink carrier aggregation for which the uplink Tx Direct Current location(s) are being reported. |
| ***carrierTwoInfo***  The serving cell ID and BWP ID of the second carrier of the uplink carrier aggregation for which the uplink Tx Direct Current location(s) are being reported. |
| ***singlePA-TxDirectCurrent***  The uplink Tx Direct Current location for the UE which support single PA for this uplink carrier aggregation. For the UEs which support dual PA for this uplink carrier aggregation, this field is for reporting the uplink Tx Direct Current location of the first PA. |
| ***secondPA-TxDirectCurrent***  The uplink Tx Direct Current location used by the UE with the second PA for the UEs which support dual PA for this uplink carrier aggregation. This field shall be absent for the *UplinkTxDirectCurrentTwoCarrier* entity where *deactivatedCarrier* of *carrierOneInfo* or *carrierTwoInfo* is set to *deactivated*. In other situations, it is up to UE implementation when the UE includes the uplink Tx Direct Current location for the second PA. |

**Q2: Do companies agree with the CR [2]?**

|  |  |  |
| --- | --- | --- |
| Company | Yes / No | Comments (if any) |
| Ericsson | Yes |  |
| Qualcomm Incorporated | No | We do not see a strong need to capture what is left to UE implementation. |
| OPPO | Yes | We are open on this though, since R2 agreement has clarified. |
| Huawei, HiSilicon | No | Without adding this sentence, nothing seems broken. |

Summary:

### 3.3 Discussion on the response to Q2 in RAN4 reply LS

According to RAN4's response to Q2 in [1], three companies provided views [3 – 6] on how to implement the required change of intra-band CA part of NR for dualPA architecture. As the concerned capability bit exists from Rel-15, [3] suggests to extend the meaning of dualPA architecture from Rel-15 if there is no NBC i.e.

1. RAN2 confirm there is no NBC issue to extend the meaning of dualPA architecture capability in TS38.306, and agree on CR since Rel-15.

**Q3: Do companies agree that there is no NBC issue to extend the meaning of dualPA arcitecture capability in TS 38.306 from Rel-15? If not, please provide your detailed views/options on the required change in TS 38.306.**

|  |  |  |
| --- | --- | --- |
| Company | Yes / No | Comments (if any) |
| Ericsson | Yes | We understand from RAN4 LS R4-2206503 that dual PA architecture indeed means dual LO and the change proposed by RAN4 in that LS indeed is backwards compatible and is merely a clarification of what dual PA means, i.e. that it means also dual LO.  RAN4 indicates in the LS that they suggest doing the change from Rel-16. But to have different meanings of a capability bit in different releases is not how we should do things. A capability bit must mean the same thing in all releases. The gNB should be able to inspect the capability bit an understand what the UE supports/not supports. The capability bits must be self-contained in that way.  To change only from Rel-16 is therefore not appropriate.  Since this is backwards compatible, RAN2 should change from Rel-15.  If RAN2 ends up concluding that it is NOT backwards compatible, we would have to implement a new capability from Rel-16 onwards which in addition to dual PA indicates whether the UE has dual LO. But again, we understand that there is a one-to-one mapping between these and hence it is backwards compatible and the change should be done from Rel-15, not Rel-16. |
| Qualcomm Incorporated | Yes |  |
| OPPO | Yes |  |
| Huawei, HiSilicon | No | We understand RAN4 LS response in Q1 indicated that dualPA-Architecture capability setting is independent with reporting of two DC locations.  In RAN4 terminology and context, dual LO means there will be dual DC locations, and therefore this change is inconsistent with RAN4’s interpretation. We think the above changes are not backward compatible, and not the same as what RAN4’s LS has indicated. |

Summary:

**Q4: If companies agree with Q3, do you have any comments on the CRs [4 - 6]?**

|  |  |
| --- | --- |
| Company | Comments (if any) |
| Qualcomm Incorporated | Is the placement of "all the ULs" for single PA case in the final text appropriate?   * the UE supports single PA and single LO frequency for all the ULs for FR1, or single LO frequency for FR2   Shouldn’t “all the ULs” be made applicable also to FR2? |
|  |  |

Summary:

### 3.4 Others

For any other issues not covered above, please feel free to indicate them into the following table.

|  |  |  |
| --- | --- | --- |
| Company | Discussion points | Comments |
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|  |  |  |

Summary:

# 4 Conclusion

TBD

# 5 Reference

[1] [R2-2209343](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\TSGR2_119bis-e\Docs\R2-2209343.zip) Reply LS on clarification of dualPA-Architecture capability (R4-2214924; contact: Samsung) RAN4 LS in Rel-17 NR\_RF\_FR1\_enh To:RAN2

[2] [R2-2210659](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\TSGR2_119bis-e\Docs\R2-2210659.zip) Correction to description of secondPA-TxDirectCurrent field Ericsson, Samsung, OPPO CR Rel-17 38.331 17.2.0 3558 - F NR\_RF\_FR1\_enh

[3] [R2-2209383](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_119bis-e/Docs/R2-2209383.zip) Discussion on R4 LS on dual-PA architecture clarification OPPO, Ericsson, Samsung discussion Rel-17 NR\_RF\_FR1\_enh

[4] [R2-2210134](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\TSGR2_119bis-e\Docs\R2-2210134.zip) Correction to definition of dualPA-Architecture capability indication Ericsson, OPPO, Samsung CR Rel-15 38.306 15.18.0 0813 - F NR\_RF\_FR1\_enh

[5] [R2-2209381](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\TSGR2_119bis-e\Docs\R2-2209381.zip) Correction to definition of dualPA-Architecture capability indication Ericsson, OPPO, Samsung CR Rel-16 38.306 16.10.0 0812 - A NR\_RF\_FR1\_enh

[6] [R2-2209382](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\TSGR2_119bis-e\Docs\R2-2209382.zip) Correction to definition of dualPA-Architecture capability indication Ericsson, OPPO, Samsung CR Rel-17 38.306 17.2.0 0811 - A NR\_RF\_FR1\_enh