3GPP TSG-RAN WG2 #112 electronic R2-20xxxxx

Electronic Meeting, Nov 2-13, 2020

Agenda Item: 6.8.4

Source: vivo

Title: [AT112-e][225][NR][DCCA] Correction on FR2 maximum power for NR-DC power control (vivo)

Document for: Discussion, Decision

# 1 Introduction

This contribution summarizes the following discussion:

* [AT112-e#225][NR][DCCA] Correction on FR2 maximum power for NR-DC power control (vivo)

Scope:

* + - Provide CRs on FR2 power limit based on RAN4 LS band Tdocs [R2-2010291](file:///C%3A%5CUsers%5Cterhentt%5CDocuments%5CTdocs%5CRAN2%5CRAN2_112-e%5CR2-2010291.zip), [R2-2010112](file:///C%3A%5CUsers%5Cterhentt%5CDocuments%5CTdocs%5CRAN2%5CRAN2_112-e%5CR2-2010112.zip), and [R2-2010340](file:///C%3A%5CUsers%5Cterhentt%5CDocuments%5CTdocs%5CRAN2%5CRAN2_112-e%5CR2-2010340.zip).

 Intended outcome:

* + - Agreeable CRs to 38.331 in R2-2010743 (revision of [R2-2010291](file:///C%3A%5CUsers%5Cterhentt%5CDocuments%5CTdocs%5CRAN2%5CRAN2_112-e%5CR2-2010291.zip))

 Deadline for providing comments, for rapporteur inputs, conclusions and CR finalization:

* + - Final CRs: 2nd week Wed, UTC 1100

The rapporteur proposes to split this email discussion in two phases:

* Companies are invited to provide feedback on the questions proposed in this document.

**Deadline: 2020-11-10**

* The rapporteur proposes a draft CR to capture the agreements based on companies’ feedback. Then companies can comment on the draft CR.

**Deadline: 2020-11-11**

**Contact from companies**

|  |  |
| --- | --- |
| **Company** | **Email** |
| OPPO | wangshukun@oppo.com |
| Nokia | Jarkko.t.koskela@nokia.com |
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# Discussion

In the RAN4 LS [R2-2008736](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2008736.zip) (R4-2011721), it is stated that:

*“For newly introduced p-UE-FR2 in the RRCReconfiguration message, RAN4 decides not to use this parameter in Rel-16. Further discussion on this topic would be postponed to Rel-17.”*

During the online discussion, the following agreement for p-UE-FR2 was made, and there are two remain issues need to be discussed.

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| * We keep the field (i.e. not dummify)
* Discuss whether inter-node message information is needed
* Discuss if the same should apply also for p-NR-FR2
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Thus, this offline will separately discuss whether p-maxUE-FR2 in the inter-node message and p-NR-FR2 in RRCReconfiguration message also need some similar clarification.

## 2.1 p-maxUE-FR2 in inter-node message

Since p-UE-FR2 and p-maxUE-FR2 has the same meaning / usage for NR-DC power control on FR2, but in the different message, i.e., the former is included in RRCRecofniguration to be sent to the UE and the latter is used to be indicated to SN by MN via CG-ConfigInfo inter-node message. Thus, as proposed in [R2-2010340](file:///C%3A%5CUsers%5Cterhentt%5CDocuments%5CTdocs%5CRAN2%5CRAN2_112-e%5CR2-2010340.zip), it is straightforward to add the similar clarification for the p-maxUE-FR2 within the CG-ConfigInfo, as follows:

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| --- |
| ***p-maxUE-FR2***Indicates the maximum total transmit power to be used by the UE across all serving cells in frequency range 2 (FR2). In this release of the specification, it shall be ignored if received. |

**Q1: Do companies agree with the change above?**

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| --- | --- | --- |
| **Company** | **Yes or No** | **Comments** |
| OPPO | Yes  |  |
| Nokia | Yes |  |
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## 2.2 p-NR-FR2 in RRCReconfiguration message

NR-DC power control on FR2 was discussed and agreed in RAN1. For P-NR-FR2, it was introduced in PhysicalCellGroupConfig for NR-DC power control on FR2 to configure the maximum transmit power allowed in MCG FR2 or SCG FR2, which is based on the below RAN1#99 meeting agreement.

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| --- | --- | --- | --- | --- | --- |
| LTE\_NR\_DC\_CA\_enh-Core | NR-DC | PhysicalCellGroupConfig | P-NR-FR2 | New | Maximum transmit power allowed in a cell group's FR2 carriers  |

And RAN1 has specified this filed P-NR-FR2 and the corresponding NR-DC power control on FR2 mechanism in TS 38.213-g30, as follows. More detail can be found in the Appendix.

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| 7.6.2 NR-DC<Omit>If a UE is configured with an MCG and a SCG using NR radio access in FR1 and/or in FR2, the UE is configured a maximum power $P\_{MCG}$ for transmissions on the MCG by *p-NR-FR1* and/or by *p-NR-FR2-r16* and a maximum power $P\_{SCG}$ for transmissions on the SCG by *p-NR-FR1* and/or by *p-NR-FR2-r16* and with an inter-CG power sharing mode by *nrdc-PCmode-FR1-r16* for FR1 and/or by *nrdc-PCmode-FR2-r16* for FR2. The UE determines a transmission power on the MCG and a transmission power on the SCG per frequency range.<Omit> |

We think this field is still valid and would be used to support NR-DC power control on FR2, and thus there seems no need to modify the description/usage of this filed.

**Q2: Do companies agree that there is no need to modify the description/usage of p-NR-FR2 in RRCReconfiguration?**

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| **Company** | **Yes or No** | **Comments** |
| OPPO | Yes  | Confirmed with our RAN4 colleague. |
| Nokia | Yes |  |
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# 3 Conclusion

- To be updated after discussion.

# 4 References

[1] [R2-2008736](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2008736.zip), Reply LS on power control for NR-DC (R4-2011721; contact: vivo), RAN4 (R4-2011721)

[2] [R2-2010112](file:///C%3A%5CUsers%5Cterhentt%5CDocuments%5CTdocs%5CRAN2%5CRAN2_112-e%5CR2-2010112.zip), Correction on p-UE-FR2 for NR-DC power control Ericsson, NTTDOCOMO CR Rel-16 38.331 16.2.0 2165 1 F LTE\_NR\_DC\_CA\_enh-Core [R2-2010027](file:///C%3A%5CUsers%5Cterhentt%5CDocuments%5CTdocs%5CRAN2%5CRAN2_112-e%5CR2-2010027.zip)

[3] [R2-2010340](file:///C%3A%5CUsers%5Cterhentt%5CDocuments%5CTdocs%5CRAN2%5CRAN2_112-e%5CR2-2010340.zip), Correction on p-UE-FR2 for NR-DC power control in FR2 Huawei, HiSilicon CR Rel-16 38.331 16.2.0 2207 - F LTE\_NR\_DC\_CA\_enh-Core

[4] [R2-2010291](file:///C%3A%5CUsers%5Cterhentt%5CDocuments%5CTdocs%5CRAN2%5CRAN2_112-e%5CR2-2010291.zip), Correction on p-UE-FR2 in NR-DC power control vivo CR Rel-16 38.331 16.2.0 2201 - F LTE\_NR\_DC\_CA\_enh-Core

# 5 Appendix

## 7 Uplink Power control (TS 38.213)

<Omit>

### 7.6 Dual connectivity

<Omit>

#### 7.6.2 NR-DC

If a UE is configured with an MCG using NR radio access in FR1 or in FR2 and with a SCG using NR radio access in FR2 or in FR1, respectively, the UE performs transmission power control independently per cell group as described in Clauses 7.1 through 7.5.

If a UE is configured with an MCG and a SCG using NR radio access in FR1 and/or in FR2, the UE is configured a maximum power $P\_{MCG}$ for transmissions on the MCG by *p-NR-FR1* and/or by *p-NR-FR2-r16* and a maximum power $P\_{SCG}$ for transmissions on the SCG by *p-NR-FR1* and/or by *p-NR-FR2-r16* and with an inter-CG power sharing mode by *nrdc-PCmode-FR1-r16* for FR1 and/or by *nrdc-PCmode-FR2-r16* for FR2. The UE determines a transmission power on the MCG and a transmission power on the SCG per frequency range.

If a UE is provided *semi-static-mode1* for *nrdc-PCmode-FR1-r16* or for *nrdc-PCmode-FR2-r16*,or *semi-static-mode2* for *nrdc-PCmode-FR1-r16* or for *nrdc-PCmode-FR2-r16*, the UE does not expect $P\_{MCG}$ and $P\_{SCG}$ to be configured such that $\hat{P}\_{MCG}+\hat{P}\_{SCG}>\hat{P}\_{Total}^{NR-DC}$, where $\hat{P}\_{MCG}$ is the linear value of $P\_{MCG}$, $\hat{P}\_{SCG}$ is the linear value of $P\_{SCG}$, and $\hat{P}\_{Total}^{NR-DC}$ is the linear value of a configured maximum transmission power for NR-DC operation in FR1 or FR2 as defined in [8-3, TS 38.101-3].

If a UE is provided *semi-static-mode1* for *nrdc-PCmode-FR1-r16* or for *nrdc-PCmode-FR2-r16*, the UE determines a transmission power for the MCG or for the SCG as described in Clauses 7.1 through 7.5 using $P\_{MCG}$ or $P\_{SCG}$ as the maximum transmission power, respectively.

If a UE is provided *semi-static-mode2* for *nrdc-PCmode-FR1* or for *nrdc-PCmode-FR2*

- if at least one symbol of slot $i\_{1}$ of the MCG or of the SCG that is indicated as uplink or flexible to a UE by *tdd-UL-DL-ConfigurationCommon* and *tdd*-*UL-DL-ConfigurationDedicated*, if provided, overlaps with a symbol for any ongoing transmission overlapping with slot $i\_{2}$ of the SCG or of the MCG, respectively, the UE determines a power for the transmission on the SCG or the MCG overlapping with slot $i\_{2}$ as described in Clauses 7.1 through 7.5 using $P\_{SCG}$ or $P\_{MCG}$, respectively, as the maximum transmission power

- otherwise, the UE determines a power for the transmission on MCG or the SCG overlapping with slot $i\_{2}$, as described in [8-3, TS 38.101-3] and in Clauses 7.1 through 7.5 without considering $P\_{MCG}$ or $P\_{SCG}$, respectively

The UE expects to be provided *semi-static-mode2* for *nrdc-PCmode-FR1-r16* or for *nrdc-PCmode-FR2-r16* only for synchronous NR-DC operation [10, TS 38.133].

If a UE

- is provided *dynamic* for *nrdc-PCmode-FR1-r16* or for *nrdc-PCmode-FR2-r16*, and

- indicates a capability to determine a total transmission power on the SCG at a first symbol of a transmission occasion on the SCG by determining transmissions on the MCG that

- are scheduled by DCI formats in PDCCH receptions with a last symbol that is earlier by more than $T\_{offset}$ from the first symbol of the transmission occasion on the SCG, or are configured by higher layers, and

- overlap with the transmission occasion on the SCG

the UE determines a maximum transmission power on the SCG at the beginning of the transmission occasion on the SCG as

- $min\left(\hat{P}\_{SCG},\hat{P}\_{Total}^{NR-DC}- \hat{P}\_{MCG}^{actual}\right)$, if the UE determines transmissions on the MCG with a $\hat{P}\_{MCG}^{actual}$ total power

- $\hat{P}\_{Total}^{NR-DC}$, if the UE does not determine any transmissions on the MCG

where

- $T\_{offset}=max⁡\{T\_{proc,MCG}^{max},T\_{proc,SCG}^{max}\}$,

- $T\_{proc,MCG}^{max}$ and $T\_{proc,SCG}^{max}$ is the maximum of $T\_{proc,2}$, $T\_{proc,CSI}$, $T\_{proc,release}^{mux}$, $T\_{proc,2}^{mux}$, and $T\_{proc,CSI}^{mux}$based on the configurations on the MCG and the SCG, respectively, when the UE indicates the value of 'long' for the capability,

- $T\_{proc,MCG}^{max}$ and $T\_{proc,SCG}^{max}$ is the maximum of $T\_{proc,2}$, $T\_{proc,release}^{mux}$, $T\_{proc,2}^{mux}$based on the configurations on the MCG and the SCG, respectively, when the UE indicates the value of 'short' for the capability, and

- $\hat{P}\_{MCG}^{actual}$ is the total power for the transmissions on the MCG that overlap with the transmission occasion on the SCG where $\hat{P}\_{MCG}^{actual}$ is determined based on transmissions configured by higher layers and on transmissions scheduled by DCI formats in PDCCH receptions with a last symbol that is at least $T\_{offset}$ before the first symbol of the transmission occasion on the SCG.

The UE does not expect to have PUSCH, PUCCH, or SRS transmissions on the MCG that

- are scheduled/triggered by DCI formats in PDCCH receptions with a last symbol that is earlier by less than or equal to $T\_{offset}$ from the first symbol of the transmission occasion on the SCG, and

- overlap with the transmission occasion on the SCG

The UE does not expect to receive a positive TPC command value in a DCI format 2\_2 or a DCI format 2\_3 in a PDCCH reception with a last symbol that is less than $T\_{offset}$ before the first symbol of the transmission occasion on the SCG, if the transmission on the MCG overlaps with the transmission occasion on the SCG.

The UE is not required to apply a TPC command the UE receives in a DCI format 2\_2 or a DCI format 2\_3 in a PDCCH reception with a last symbol that is less than $T\_{offset}$ before the first symbol of the transmission occasion on the SCG, if the transmission on the MCG overlaps with the transmission occasion on the SCG.