3GPP TSG-RAN WG4 Meeting #102-e R4-2203810
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Agenda Item: 14.2
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Title: Rel-18 proposal on FR2 coverage/performance enhancements
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Background

- In R15/R16, MPE compliance is achieved by two means:
  - maxUplinkDutyCycle-FR2, which is reported as part of UE RF capability. Once reported, there is no further update.
  - P-MPR. Optional P-MPR reporting was added in R16 so UE can inform gNB of the required P-MPR values for MPE compliance, but the granularity can be further improved.

Table 10.1.26.1-1 Mapping of FR2 P-MPR

Reported value	Measured quantity value	Unit
P-MPR_00	3 ≤ PMP-R < 6	dB
P-MPR_01	6 ≤ PMP-R < 9	dB
P-MPR_02	9 ≤ PMP-R < 12	dB
P-MPR_03	PMP-R ≥ 12	dB

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  - And the use of P-MPR and maxUplinkDutyCycle-FR2 are kind of made separate to accommodate different UE implementations, even though there is clear correlation.
- In R17, FR2 UL gap is being discussed to facilitate proximity sensing to avoid unnecessary P-MPR
  - When human body is not proximate, unnecessary power backoff (P-MPR) can be avoided
  - When human body is proximate, P-MPR is the only degree of freedom to meeting MPE requirements.
  - During the discussion, it has become clear that UL duty cycle plays a role in determining the amount of power backoff, especially in power-limited scenarios.

Background

- While dynamic max. UL duty cycle reporting was discussed in R15/R16, there was no consideration of the possible use of body proximity sensor (BPS) to detect if a human tissue is close-by and then decide if P-MPR is needed. With BPS, the use of dynamic maxUplinkDutyCycle-FR2 reporting is more targeted and useful. For instance, instead of incurring a large P-MPR, a UE at the cell edge can rely on a smaller duty cycle to transmit with a high power and still meet MPE requirements.

- Possible enhancements to R17 beam-specific P-MPR reporting, as discussed in R4-2200301:
  - Based on RAN1 agreements, it is not guaranteed that the L1-RSRP of the associated SSBRI/CRI is always reported. In this case, the value of per-beam PMRP reporting is questionable.
  - In RAN1 discussion, body proximity sensing capability is assumed when per-beam PMPR reporting is introduced. From UL performance perspective, for the same SSBRI/CRI, UE can have different strategy to report P-MPR depending on human body approximation. If there is no human target around, UE should select the beam with the best EIRP in UL or L1-RSRP in DL and the corresponding P-MPR is reported. When there is human body approximate, the beam with maximum (L1-RSRP-P-MPR) should be selected and reported. Obviously, reporting a single P-MPR per SSBRI/CRI are not sufficient for MPE and UL performance enhancement.

FR2 Coverage/Performance Enhancements

- In order to continue to enable better FR2 coverage and/or performance, it is proposed to investigate, and if justified, specify in R18:
  - Better granularity of P-MPR reporting from UE
  - maxUplinkDutyCycle-FR2 reporting, dynamic or semi-static, which would provide the network timely update to assist scheduling
  - Possible enhancements to R17 beam-specific P-MPR reporting
- The above objectives can be included in R18 WI on FR2 enhancement, along with other FR2 related proposals