



3GPP TSG RAN Rel-19 workshop
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Agenda Item: 5

Views on enhanced Network-Controlled Repeaters (eNCR) for Rel-19

Apple

Overview | Enhanced Network-Controlled Repeaters (eNCR)

- Network-controlled repeaters introduced in NR Rel-18 for FR1 and FR2, but with following aspects not studied and/or not specified:
 - No unlicensed operation
 - No power control at NCR
 - No out-of-band operation between control link and backhaul/access link



Justification (1/2) | Enhanced Network-Controlled Repeaters (eNCR)

- **Unlicensed operation**

- With the availability of unlicensed bands in both FR1 (particularly in 5/6 GHz bands) and FR2 (particularly in 60GHz bands in FR2-2), it is beneficial to enhance NCR to be able to operate in FR1 and especially, FR2 unlicensed bands
- Currently, there is **no support for using legacy UE procedures/signaling for channel access for NCR**
 - Cannot address the key aspect for NCR to receive and forward simultaneously
 - From NCR perspective, this would require that channel can be accessed on two links including backhaul link and access link)simultaneously
 - Especially, for channel access in FR2-2, channel access on specific beams for receiving and forwarding need to be considered



Justification (2/2) | Enhanced Network-Controlled Repeaters (eNCR)

■ Power Control

- If power control is not applied and a fixed transmit power is considered at the NCR, then this may degrade UL performance for UEs at the cell edge
- For downlink, a fixed transmit power could reduce the NCR coverage
- From this point of view, adaptive power control could be beneficial as side control information

■ Out-of-band operation

- Current NCR deployment could be quite limited as it needs to be use same bands for both NCR-MT and NCR-Fwd
- Out-of-band could be beneficial considering FR1 for NCR-MT and FR2 for NCR-Fwd, as one possibility

Proposals (1/2) | Enhanced Network-Controlled Repeaters (eNCR)

- Unlicensed operation
 - Study and specify the **necessary enhancements needed to support channel access** in unlicensed bands for NCR
 - Unlicensed bands in both FR1 and FR2 are considered
 - For unlicensed bands **in FR2**, study and specify (if justified) at least the following enhancements:
 - **Beam-based (directional) LBT** based channel access mechanism
 - No-LBT based channel access mechanism
 - Channel occupancy related aspects such as **COT initiation and sharing**



Proposals (2/2) | Enhanced Network-Controlled Repeaters (eNCR)

- Power control
 - Out-of-band operation at NCR may include operating NCR-MT (control link) on different frequency than NCR-Fwd (backhaul link and access link)
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