

**3GPP TSG RAN Rel-18 workshop
Electric Meeting, June 28 – July 2, 2021**

FUJITSU

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RWS-210289

Views on Rel-18 Uplink MIMO

FUJITSU LIMITED

Enhancement on UL MIMO

- ❑ In Rel-18, UL MIMO enhancement is expected to
 - Support emerging use cases that requires UL peak data rate higher than what the Rel-17 can provide, such as XR, video surveillance/monitoring, IAB.
 - Besides, enhanced UL MIMO could enable the V2X services with high data rate requirement as well.
 - Support UEs (e.g., IAB nodes) with advanced UE features, such as being tolerable to more UL power consumption and equipped with more RF chains



XR



Real-time HD video/surveillance
in industries



IAB

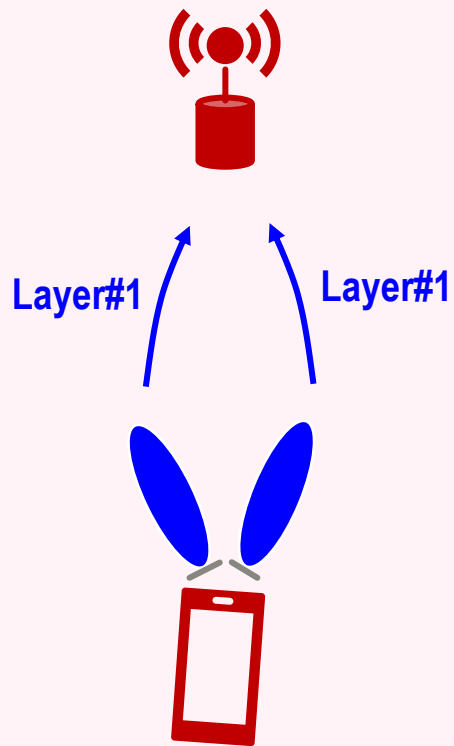


V2X

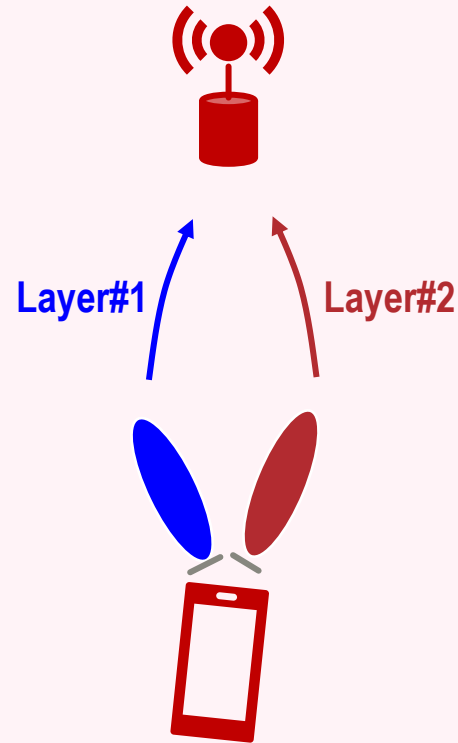
Aspects to be enhanced

- **#1: Multi-panel joint transmission for UL**
- **#2: Sub-band precoding for UL**
- **#3: UL SU-MIMO with rank > 4**

#1 Multi-panel joint transmission for UL



(a) Diversity



(b) Multiplexing

- ❑ Multi-panel joint transmission for UL is expected due to the following reasons:
 - According to current NR specification, the activation of multiple UE panels is possible, but only one of them can be used for UL transmission at a time.
 - Multi-panel joint transmission for UL is beneficial.
 - Higher peak data rate: different UL data can be transmitted simultaneously via different UE panels exploiting spatial multiplexing gain.
 - Better coverage/robustness: same UL data can be transmitted simultaneously via different UE panels exploiting spatial diversity gain.

Potential study points

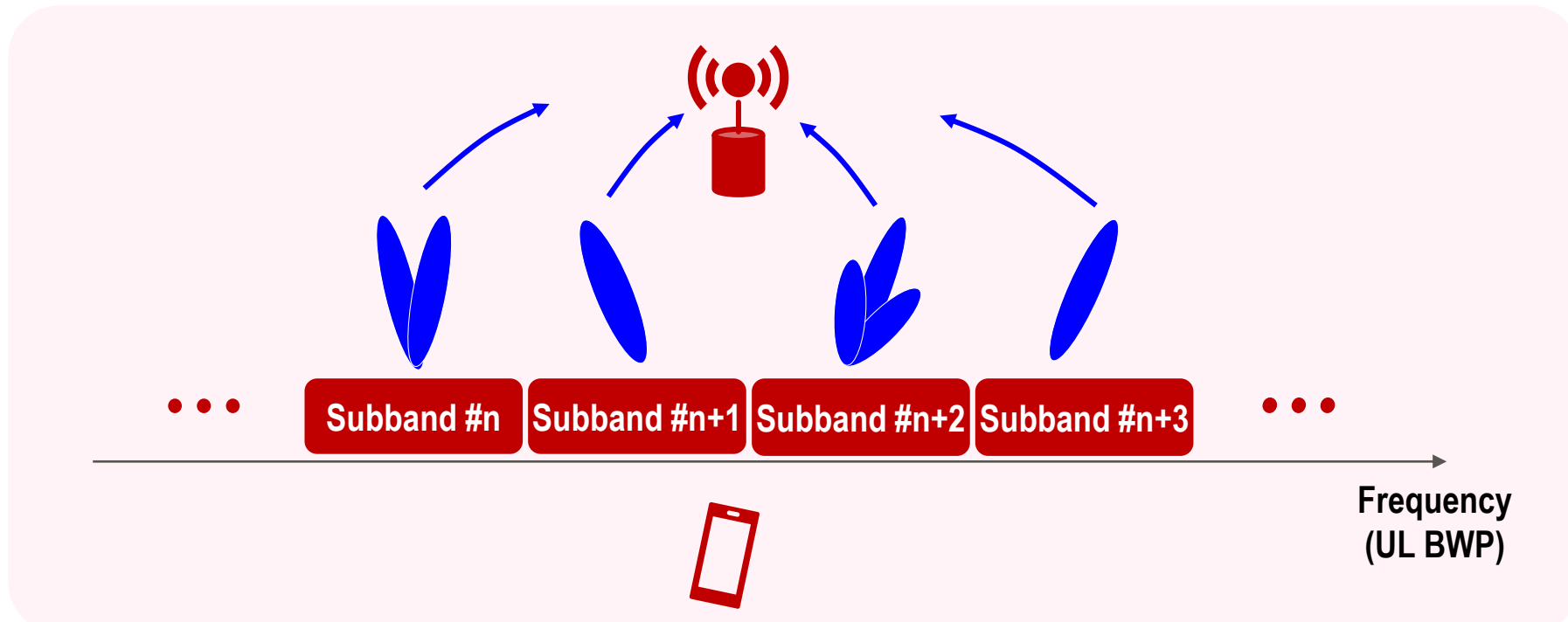
- **UL codebook design for multi-panel joint transmission**
- **SRS enhancement for multi-panel joint transmission**

#2 Sub-band precoding for UL

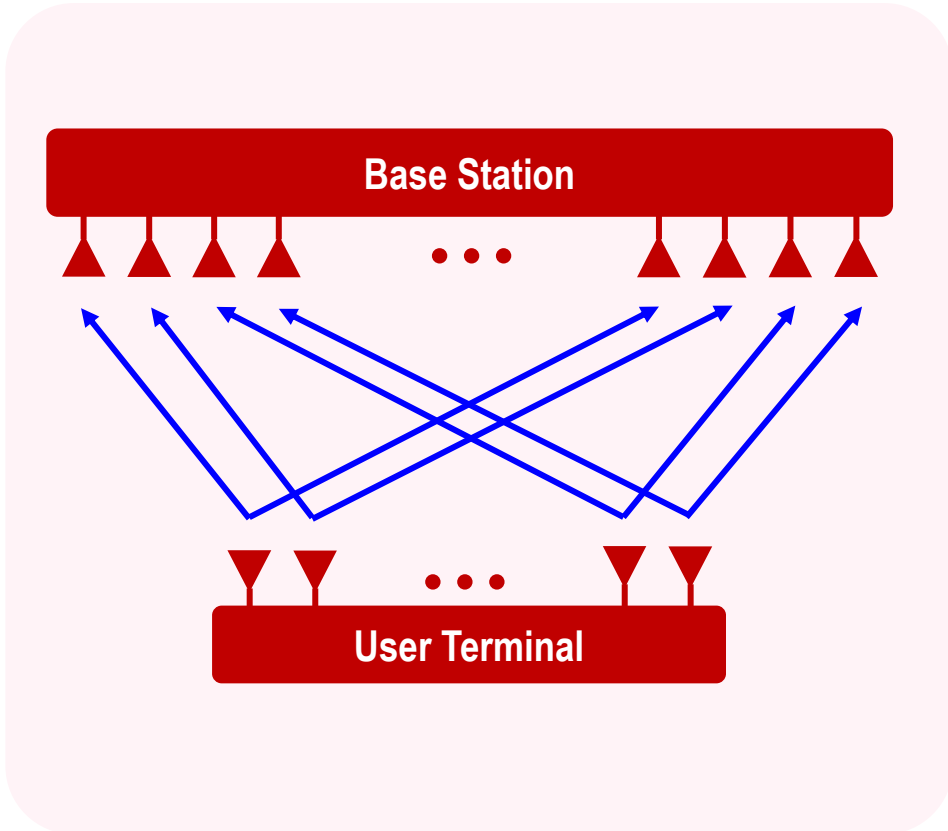
- ❑ Sub-band precoding for UL is expected due to the following reasons
 - According to current NR specification, only wideband precoding is supported for UL transmission.
 - Sub-band precoding is beneficial
 - Exploit frequency-selective feature of channel in the case of UL transmission with wide bandwidth.

Potential study points

- **SRS enhancement for sub-band precoding**
- **PUSCH/DMRS enhancement for sub-band precoding**



#3 UL SU-MIMO with rank > 4

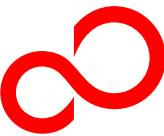


- UL SU-MIMO with rank > 4 is expected due to the following reasons:
 - This is an efficient way to achieve higher peak data rate in the case of low-speed scenario (with high SINR).
 - Easy extension according to DL design.
 - According to current NR specification, the maximum rank of UL SU-MIMO is 4, while the maximum rank of DL SU-MIMO is 8.
 - Due to the similarity between UL and DL MIMO design, it is natural to support UL SU-MIMO with highest rank of 8.

Potential study points

- **SRS enhancement to support 8 ports**
- **PUSCH enhancement to support 8 ports**
- **UL codebook design**

- **For Rel-18 MIMO enhancement, specify the following aspects:**
 - **#1: Multi-panel joint transmission for UL**
 - **#2: Sub-band precoding for UL**
 - **#3: UL SU-MIMO with rank > 4**



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