

Electronic Meeting, June 28 - July 2, 2021

Agenda Item: 4.1

Source: Spreadtrum Communications

Title: MIMO enhancements for R18

Document for: Discussion and decision

1 Introduction

MIMO technique is a key feature to increase channel capacity, and its enhancement has conventionally shown in each release. In this contribution, we discuss some potential MIMO enhancements for Rel-18.

2 Potential enhancements

2.1 Enhancements on UL MIMO

By the end of Rel-17, MIMO enhancement mainly focused on DL. However, only a few objectives are related to UL such as SRS enhancement, which results in unbalanced performance experience between UL and DL. In recent years, numerous application scenarios rely on high UL capability, e.g., AR/VR, V2X, and UAV. From our view, it is urgent to improve UL performance in the upcoming release.

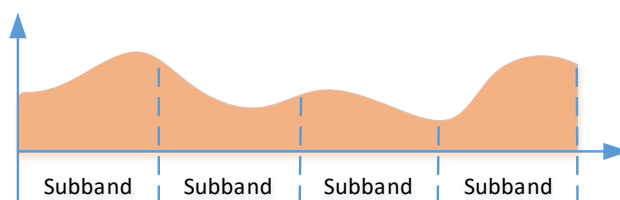


Figure 2.1-1 UL frequency selective channel

Current release has already adopted frequency hopping for PUCCH/PUSCH so as to obtain frequency-selective gain. Nevertheless, compared with PRG based DL transmission, only one TPMI is supported for the scheduled bandwidth of PUSCH, which limits the UL performance under frequency-selective channel. Therefore, we propose to introduce frequency-selective precoding for uplink transmission to further acquire more frequency-selective gain. Specifically, PRG-like scheme can be considered where the scheduled PUSCH frequency resources can be partitioned into several subbands. Each subband can have independent transmission scheme, e.g., TPMI. In Rel-18, our primary focus could be evaluating the benefit of introducing frequency-selective precoder, together with the definition/determination of subband and the related enhancement on signaling.

2.2 Enhancements on multi-beam operation

In Rel-15, beam management was introduced to support independent analog beam selection especially in high frequency range. In Rel-16/17, TCI framework used for beam indication has been further enhanced to achieve low overhead and low latency. However, the overhead and latency of beam training (i.e. beam measurement and reporting) was barely discussed. When the number of beams is large and/or the UE moves with high speed, the overhead and latency of beam training will become a critical issue.

In Rel-17, latency reduction of beam management has been discussed with low priority. Based on the discussion in the latest RAN1 meetings, multiple candidate solutions were listed to be further studied, and at most one solution will be specified due to the limited available workload. In our views, the candidate

solutions, if not specified in Rel-17, can be treated as starting point for multi-beam enhancement in Rel-18.

In addition, UE event-based beam measurement and reporting can also be considered as a candidate solution to reduce latency.

2.3 Enhancements for stationary UE

In order to support diverse deployment scenarios for UE moving with different speeds, NR supports flexible configuration including reference signals and physical channels. Recently, UE with zero speed, i.e. stationary UE, has drawn lots of attention. Many use cases can be found in the real world where the stationary UEs are wirelessly connected with the network, such as video surveillance, small cell backhauling, etc.

For stationary UEs, the channel property can be further exploited, and some novel approaches can be considered to achieve high channel capacity, low signaling overhead and also low latency. For example, beam management can be simplified to perform with a large periodicity, or even only once after initial access. For CSI feedback, UE is not required to report the whole CSI at each reporting instance, and reporting only part of the updated CSI is sufficient. Additionally, UE can also report partial PMI. Besides, similar to coverage enhancement, we can also consider cross-slot channel estimation to reduce the overhead of DMRS. If the stationary UE is equipped with battery, power saving is also a complementary requirement.

Therefore, we propose to consider stationary UE as one of the potential enhancement scenarios in R18 MIMO WI.

3 Conclusion

In this contribution, we gave our views on the potential MIMO enhancements in Rel-18. Based on the analysis above, we propose the following enhancement aspects:

Proposal 1: Consider the following MIMO enhancements in Rel-18

- ***Identify and specify features to facilitate UL MIMO enhancements to achieve high capacity, e.g. UL frequency-selective precoding***
- ***Identify and specify features to facilitate beam measurement and reporting with low latency and overhead***
- ***Identify and specify features to facilitate enhancements for stationary UE, considering the trade-off among performance, overhead, latency, and/or power consumption***