Performance of Downlink Type-1 CSI Reporting Schemes in 5G NR for the Indigenous 5G Testbed

PROJECT REPORT

Submitted by

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BONAFIDE CERTIFICATE

This is to certify that this thesis (or project report) titled ***"Performance of Downlink Type-1 CSI Reporting Schemes in 5G NR for the Indigenous 5G Testbed"*** submitted by **Karanam Vinod** to the Indian Institute of Technology Madras, for the award of the degree of **Master of Technology** is a bona fide record of the research work done by him under my supervision. The contents of this thesis (or project report), in full or in parts, have not been submitted to any other Institute or University for the award of any degree or diploma..

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Abstract

5G NR is continuously evolving day by day with newer 3gpp releases so that users experience relatively fast data speeds, extremely low latency, significant increases in next-generation nodeB (gNodeB) efficiency, and significant changes in the quality of service (QoS) compared to existing 4G LTE networks. One way to support the above 5G use cases is the use of multiple transmit and receive antennas. This is known as Multi-Input Multi-Output (MIMO).

The aim of this work is to measure the Channel State Information (CSI) from the MIMO channel and find the optimized precoder for the Physical Downlink Shared Channel (PDSCH). This is done by transmitting the channel state information reference signals from the gNodeB to the User Equipment (UE) and then estimating the channel at the UE.

From the estimated channel, we find the different channel state information (CSI) parameters, such as the rank indicator, precoder matrix indicator, and channel quality indicator. These parameters are reported back to the gNodeB. The gNodeB configures the physical layer parameters according to the reported CSI and then transmits the user data in such a way that the performance is improved.

This report includes extensive simulations that compare the performance of various MIMO downlink transmission schemes. The theoretical framework and design parameters associated with the simulation of downlink channel estimation and transmission adhering to 5G NR specifications are presented in this paper. Results clearly indicate improvements in bit error rates and throughput with MIMO over single antenna schemes.

Regarding thesis details

This work performed at the Indigenous 5G Testbed at IIT Madras is confidential. The original document with complete details is with Prof. Radhakrishna Ganti and can be made available on request.