INTERFERENCE PERFORMANCE ANALYSIS AND CODEBOOK ANALYSIS USING CSI-RS IN 5G NEW RADIO

A Project Report

submitted by

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in partial fulfilment of the requirements
for the award of the degree of

MASTER OF TECHNOLOGY

DEPARTMENT OF ELECTRICAL ENGINEERING
INDIAN INSTITUTE OF TECHNOLOGY MADRAS.

May 2019

THESIS CERTIFICATE

This is to certify that the thesis titled **Interference performance analysis and Codebok analysis using CSI-RS in 5G New Radio**, submitted by **Junoothula Harshitha Reddy**, to the Indian Institute of Technology, Madras, for the award of the degree of **Master of Technology**, is a bonafide record of the research work done by him under our supervision. The contents of this thesis, 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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Date: 5th May 2019

ACKNOWLEDGEMENTS

I would first like to thank my project advisor **Prof. Radha Krishna Ganti** for extending his support throughout the course of project work.

I would also like to thank my mentor **Ramya T.R.** Lead Research Engineer of Centre of Excellence in Wireless Technology (CEWiT) for her guidance and constant supervision, for providing necessary information required for completion of the project.

In addition, I thank my parents for their constant encouragement and support without whom it would have been difficult to complete this project.

ABSTRACT

KEYWORDS: NZP CSI-RS; ZP CSI-RS; Precoder; Eigen Based Beamforming; Codebook ; Channel Quality Indicator

The aim of 5G NR is to improve the data rates and efficiency of frequency resources. Cell edge users usually suffer from high levels of interference known as inter-cell interference. This phenomenon results in lower performance for the cell edge users and inefficient utilization of radio resources. For accurate measurement of inter-cell interference Zero Power CSI-RS is introduced in LTE Release-10. Channel State Information feedback to the gNB improves the user performance. In this thesis, two different interference measurement methods based on two reference signals are studied: DM-RS based interference measurement and zero power CSI reference signal. The performance is studied with various NZP CSI-RS configurations. Simulation results has shown that ZP CSI-RS based interference measurement is more efficient compared to NZP CSI-RS method in terms of Block Error Rate and Spectral Efficiency for cell edge user.

As the mmWave band in 5G NR uses very high frequency, it leads to high path losses. To compensate for the losses, directional communication is essential at such frequencies. Antenna arrays with large number of antenna elements make it possible due to smaller wavelengths. Multiple directional beams are formed using same antennas using digital beamforming technique. The directional beams also increase the coverage area. The best beam index is chosen by using NZP CSI reference signal and the best Precoder Matrix Indicator is fedback to the gNB. In this thesis, two performance of two methods for beamforming Codebook based Precoding and Non-Codebook based precoding are studied. It is observed that the Eigen Based Beamforming which uses the property of channel reciprocity has better performance than the other methods. In Codebook based precoding Type II codebook is observed to have better performance over Type I codebook.

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