International Journal of e-Collaboration
Volume 15 • Issue 2 • April-June 2019

MIMO Modes in LTE

Saurabh Dixit, Central Institute of Plastics Engineering and Technology, Lucknow, India
https://orcid.org/0000-0003-1918-9758

Himanshu Katiyar, Rajkiya Engineering College, Sonbhadra, India

Arun Kumar Singh, REC Kannauj, Kannauj, India

ABSTRACT

The multiple input multiple output (MIMO) technology is a key technology for fourth generation (4G) and beyond wireless communications. The MIMO exploits the space diversity to improve performance as well as augment its capacity. Long term evolution (LTE), the dominant 4G standard, operates in diverse MIMO modes, including spatial multiplexing, spatial diversity, and beamforming techniques to combine the advantages of spatial diversity and spatial multiplexing. This article discusses the various modes in LTE and analyses the performance of the single input single output (SISO) and the single input multiple output (SIMO) modes with selection combining (SC) and maximal ratio combining (MRC) at the receiver end. multiplexing (OFDM) is the multiple. The analysis was done on different values of power decay factor and the different number of channel taps. The performance of MIMO configurations for varying power delay profiles and resolvable paths has been analyzed. It is inferred that the higher number of resolvable paths and a low scattering propagating environment augments the performance.

KEYWORDS

BER, Diversity, Frequency Selective Fading, MRC, OFDM, Power Delay Profile, SC, Spatial Multiplexing

DOI: 10.4018/IJeC.2019040101

INTRODUCTION

Multiple input multiple output (MIMO) technology is a key technology for fourth generation (4G), and beyond, wireless communications. MIMO exploits the space diversity to improve performance as well as augment its capacity. Long Term Evolution (LTE), the dominant 4G standard, operates in diverse MIMO modes (Zarrinkoub, 2014). Figure 1 illustrates the key MIMO modes in LTE. The single input single output (SISO) mode has a single link and offers no diversity; hence, the link reliability is compromised in SISO mode. In the single input multiple output (SIMO) mode, a single antenna is present at the transmit end, while multiple antennas are placed at the receiving end. In this mode, receiver diversity is exploited. The key techniques employed at the receiver are selection combining (SC) and maximal ratio combining (MRC). The multiple input single output (MISO) mode exploits transmit diversity and has multiple antennas at the transmit end, while a single antenna is placed at the receiving end. It provides the same diversity order as the MRC and does not require any bandwidth expansion or any feedback from the receiver to the transmitter (Alamouti, 1998). Thus, the prime advantage of this technique is that it does not require channel state information (CSI).

In MIMO mode, multiple antennas are employed at both the transmit end, as well as the receiving end. The degree of freedom is dictated by the product of transmit and receive antennas, provided they are not correlated. Figure 2 illustrates the key benefits of MIMO technology in spatial multiplexing, spatial diversity, and beam-forming techniques (Mietzner et al., 2009). A sublime trade-off exists between performance and the capacity advantage regarding multiplexing and diversity gain. To improve link reliability, diversity gain is enhanced, which may undermine the multiplexing gain. The beam-forming technique is oriented to combine the advantages of spatial diversity and spatial multiplexing by focusing the transmit energy towards the desired

Figure 1. Key MIMO modes in LTE