

5. Summary

In this chapter, we conclude our thesis contributions and results. First, we solve the complexity problem in SCMA. Conventionally, MPA SCMA will face a complexity problem because the complexity exponentially grows with the codebook size. By implementing EPA as SCMA detector algorithm, the complexity of EPA now becomes linear to the SCMA codebook size.

We prove that appending a rotation value [4, 5] in SCMA encoder is unnecessary. Figure 4.2 proves that rotation has not affect the performance of SCMA data detection process, in uplink case. The removal of the rotation value can omit many unnecessary calculations not only in decoding but also in SCMA encoding.

We provide theoretical analysis by doing the state evolution for EPA SCMA. In order to prove that EPA SCMA can achieve near optimal performance, we provide the theoretical analysis as depicted in Figure 4.3. As a result, when the system grows large, the optimal performance of EPA SCMA can be achieved.

We proposed a novel algorithm named decentralized EPA which improves the prior art in [6]. In the chapter 3, we have discussed the advantages of massive MU-MIMO systems such as increase spectral efficiency, solve the LOS challenge, allow a direct gain in multiple access capacity. The decentralized architecture makes a possibility of implementing massive MU-MIMO systems without suffering a unaffordable complexity. By adopt the concept of EP algorithm, we improve the performance of the previous work on decentralized systems.

We successfully reduce the complexity of original EPA. Decentralized EPA can also be viewed as a low complexity version of original EPA. Generally, EPA complexity relies on the dimension of the matrix inverse. The dimension of this matrix is depend on the number of transmitter. Decentralized EPA reduce the complexity C times smaller than original EPA. However, there is a trade off between the complexity with

the convergence rate. Lastly, we proposed semi fully decentralized architecture, in order to improve the performance of FD architecture while maintaining the advantages of FD structure.