

proposed method of Max RUE with fairness can improve the cell-edge users' rate without a sharp decrease of the system throughput.

Since the interference topology depends on the SIR threshold η_{th} , we show the impact of the threshold on these resource allocation methods in Fig. 5. We can observe that as the increase of the threshold, the cell-edge users' rate is improved slightly but the average sum rate is reduced obviously. Therefore, by choosing a proper threshold, a good trade-off between cell-edge users' rate and average rate can be achieved. For example, when $\eta_{th} = 4$ dB, the Max RUE with fairness method can enhance cell-edge users' rate by 56.7% with only 4.3% loss in the average sum rate. In the following simulation, we show the result when the threshold is 4 dB.

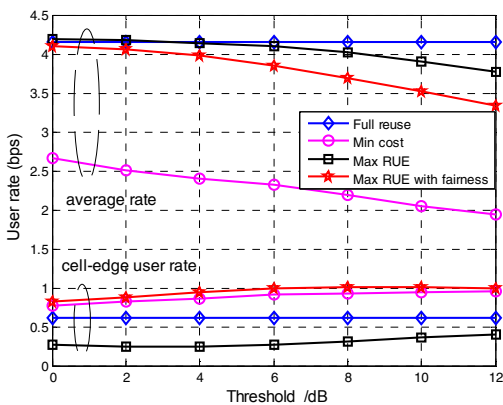


Fig 5. Data rate per-user versus interference threshold, $K=40$

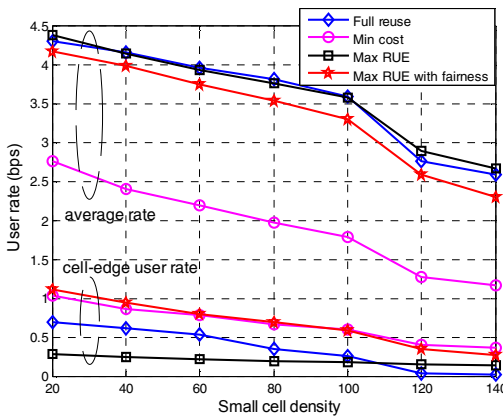


Fig 6. Data rate per-user versus small cell densities, $\eta_{th}=4$ dB

To show the impact of cell density, we show the average rate per-user and the cell-edge users' rate versus the number of cells in the considered area in Fig. 6. For an arbitrary cell density, the Max RUE with fairness method can improve cell-edge users' rate with a minor loss of average rate. Especially, when the number of cells is 100, compared with the method without ICI coordination, the Max RUE with fairness method can improve cell-edge user rate by 126.9% at the expense of a decrease of average user rate by 8%.

5. CONCLUSION

In this paper, we have presented graph-based topology control methods for ultra-dense networks. Different from traditional graph-based method, we aim to improve the resource usage efficiency under interference-free constraint. Simulation results show that the proposed topology control method based on the maximal independent set can achieve high average throughput by sacrificing the cell-edge users' rate. The proposed method which further considering user fairness can improve the performance of cell-edge users with minor loss in network throughput.

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