Manuscript ID Submission ID 101666v1

This paper is related to reviewing the manuscript titled **" Optimized Energy Management and Small Cell Activation in Ultra-Dense Networks through a Data-Driven Approach**"

This research examines the efficacy of a data-driven methodology in augmenting the average achievable data rates of small cells within heterogeneous ultra-dense networks. The proposed Data Driven Opportunistic Sleep Strategy (D-DOSS) leverages a stochastic geometry-based mathematical model to evaluate the influence of strategic small cell placement on network performance, particularly in terms of energy efficiency. Extensive Monte Carlo simulations are conducted to demonstrate that a carefully designed deployment strategy can substantially enhance both energy efficiency and data rates within heterogeneous ultra-dense network environments.

Firstly, Although the proposed study is successful in terms of organization, presentation, content and results, major revision given in the following items need to be performed.

1) Provide the major numerical findings and conclusions of the study in the abstract section

2) Use abbreviations after the first use in the text, in the abstract and throughout the paper

3) The introduction section is too short, this section should be increased.

4) Some of the variables and symbols in Equations 1-5 are not defined. These equations should be checked for correctness and necessary definitions should be made. Also, references should be made to equations that are not introduced for the first time by the authors.

5) Also, references should be made to figures that the authors have not introduced for the first time.

6) The authors stated that they did the simulations with Monte Carlo, but the supplementary file only contains the .m MAtlab code. The authors should clarify this issue.

7) The authors analyzed the performance in simulations according to energy consumption and coberage probability metrics in ultra-dense networks. Performance analysis according to more parameters such as network efficiency, energy-consuming nodes (such as BSs), lifetime, packet analysis of nodes in the network, and collision probability would increase the value of the article considerably.

My decision is major revision. I do not see any harm in publishing the manuscript once the above revisions are made.

Best regards.