

## **ABSTRACT**

*The wireless communication network has experienced rapid growth, particularly with the proliferation of smartphones, yet network resources are becoming increasingly constrained, especially in indoor environments. Femtocell represents a small-scale cellular network solution that is more spectrum-efficient. However, Femtocell with distributed users poses challenges in distributed power control (DPC), significantly impacting power consumption and creating interference in the main network. This study discusses the Distributed Power Control (DPC) Method to optimize user power consumption in Co-tier Femtocell networks, encompassing variations such as Distributed Constrained Power Control (DCPC), Half Distributed Constrained Power Control (HDCPC), and Generalized Distributed Constrained Power Control (GDCPC). The research analyzes a semi-feasible system where some user powers have converged but exceed the maximum power limit by 50 mW, considering parameters such as the number of users, distance, channels used, maximum power value, non-negative power vector, Signal-to-Interference-Noise Ratio (SINR), and link gain matrix value. The results of this study indicate that distance and channel usage affect feasibility conditions: feasible, semi-feasible, and infeasible. DPC variations are applied to semi-feasible conditions; HDCPC proves more effective than DCPC due to its more efficient power usage with nearly the same SINR, and it is easier to implement than GDCPC as it does not require user deactivation when power exceeds the maximum limit. DPC variations can transform power and SINR conditions from non-convergence to convergence below or equal to the maximum power.*

**Keywords:** *Distributed Power Control, Femtocell, indoor, smartphone, spectrum.*