Paper ID: 87068
oral

31st IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Constellations and Distributed Systems (7)

# ADVANCING SATELLITE-TO-CELL CONNECTIVITY: A NOVEL APPROACH USING FRACTIONATED CUBESAT SYSTEMS

**Abstract**

In this study, we introduce an innovative mission concept aimed at revolutionizing satellite-to-cell connectivity through the use of a fractionated CubeSat payload architecture, tailored to fulfill the BlueWalker-3 mission's objectives. The system is designed around 41 CubeSats, each employing a 16U configuration, to provide targeted coverage across designated sub-regions. This early design phase leverages readily available, flight-proven commercial components to ensure reliability and cost-effectiveness. Through comprehensive analysis, we evaluate the deployment methodologies, design intricacies, and potential operational scenarios. A pivotal part of our research is the comparative assessment of our fractionated approach against the traditional BlueWalker-3 model, utilizing Monte-Carlo simulations to evaluate system performance and reliability. Our results reveal that a fractionated design significantly enhances mission flexibility, robustness, and efficiency, achieving comparable operational standards to BlueWalker-3 but with considerable advantages in terms of mass and cost savings. Moreover, we address the environmental impact of such fractionated systems on terrestrial astronomical observations, demonstrating their potential for minimized optical interference and lower brightness levels, which is a crucial consideration amidst the growing concern over satellite constellations' effects on the night sky. This study not only reaffirms the feasibility and benefits of fractionated spacecraft for satellite communication but also underscores their compatibility with sustainable space and ground-based observational practices.