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Application Number:

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Area of interest: Astrophysics

Title:

Exploring the Interaction Between Dark Matter, Black Holes, and Cosmic Evolution in the Early Universe

Aim of this proposal:

This research explores how black holes and dark matter have influenced the development of the early universe. Black holes, especially supermassive ones, are believed to have formed during the universe's early stages, but how they grew so quickly and interacted with surrounding matter is still unclear. Dark matter, which makes up about 27% of the universe, plays an important role in forming and maintaining cosmic structures, but we still don't fully understand it. This project will study how dark matter affects black holes, particularly their formation, growth, and interaction with cosmic structures. The research will use theoretical models, simulations, and data from instruments like the Event Horizon Telescope and gravitational wave detectors to improve our understanding of both dark matter and black holes.

Black holes and dark matter are critical to understanding the universe's structure. While supermassive black holes formed early in the universe, how they grew so fast is still a mystery. Dark matter, which can only be detected through its gravitational effects, shapes the universe's large structures but is still hard to identify directly. Studying how black holes and dark matter interact can help explain their role in the universe's evolution, especially during the formation of galaxies and larger cosmic structures.

This research will develop models to simulate how black holes might have formed in dense dark matter regions. It will also examine the impact of dark matter on black hole growth and behavior using simulations and observational data. Additionally, the study will analyze data from black hole images and gravitational waves to find any signs of dark matter interaction. The research aims to provide new insights into how supermassive black holes formed and how dark matter influences cosmic structures.

Conclusion:

By using advanced simulations and data analysis, the study is expected to clarify how dark matter helps black holes grow and its role in shaping the universe. This work will contribute to understanding the complex relationship between dark matter, black holes, and cosmic evolution.