



Contribution ID: 304

Type: **Oral presentation**

Massive Graviton Geons and Dark Matter

Monday 9 July 2018 16:30 (25 minutes)

We find vacuum solutions such that massive gravitons are confined in a local spacetime region by their gravitational energy in asymptotically flat spacetimes in the context of the bigravity theory. We call such self-gravitating objects massive graviton geons. The basic equations can be reduced to the Schroedinger-Poisson equations with the tensor “wavefunction” in the Newtonian limit. We obtain a non-spherically symmetric solution as well as a spherically symmetric solution. The energy eigenvalue of the Schroedinger equation in the non-spherical solution is smaller than that in the spherical solution. The results suggest that the non-spherically symmetric solution is the ground state of the massive graviton geon. The massive graviton geons may decay in time due to emissions of gravitational waves but this timescale can be quite long when the massive gravitons are non-relativistic and then the geons can be long-lived. We also discuss the ultralight dark matter scenario by this geon.

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Session Classification: Workshop on Frontiers in Gravitation, Astrophysics, and Cosmology