

Self-gravitating black hole scalar wigs and the $M_{BH} - \sigma$ relation

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New solutions of the spherically symmetric Einstein-Klein-Gordon system are derived which represent self-gravitating scalar wigs surrounding Schwarzschild black holes [1]. These configurations interpolate between boson star configurations and extremely long-lived scalar field configurations in the test-field approximation (named *quasi-bound states* [2, 3]). We speculate about the possibility that these configurations could describe the innermost regions of dark matter halos made of ultra-light bosonic dark matter and we explore the region of masses of the scalar field and the resulting mass of the self-gravitating black hole scalar wig that might fit rotational curves of galaxies or dispersion velocities of spiral galaxies. With the latter we will show if it is possible to obtain the $M_{BH} - \sigma$ relation of Super Massive Black Holes from the Scalar Field Dark Matter.

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