The origin of the flat rotation curves in spiral galaxies: The hidden roles of glitching SMDEOs and emission of gravitational waves

Hujeirat, A.[1,*] Berczik, P.[1,2]
[1]IWR, University of Heidelberg, Germany,
[2]Main Astronomical Observatory Kyiv, Ukraine

August 1, 2024

Abstract

Supermassive DEOs (- SMDEOs) are cosmologically evolved objects made of irreducible incompressible supranuclear dense superfluids: The state we consider to govern the matter inside the cores of massive neutron stars. These cores are practically trapped in false vacua, rendering their detection by outside observers impossible.

Based on massive parallel computations and theoretical investigations, we show that SMDEOs at the centres of spiral galaxies that are surrounded by massive rotating torii of normal matter may serve as powerful sources for gravitational waves carrying away roughly 10^{42} erg/s. Due to the extensive cooling by GWs, the SMDEO-Torus systems undergo glitching, through which both rotational and gravitational energies are abruptly ejected into the ambient media, during which the topologies of the embedding spacetimes change from curved into flatter ones, thereby triggering a burst gravitational energy of order 10^{59} erg. Also, the effects of glitches found to alter the force balance of objects in the Lagrangian-$L1$ region between the central SMDEO-Torus system and the bulge, enforcing the enclosed objects to develop violent motions, that may explain the origin of the rotational curve irregularities observed in the innermost part of spiral galaxies.

Our study shows that the generated GWs at the centres of galaxies, which traverse billions of objects during their outward propagations throughout the entire galaxy, lose energy due to repeatedly squeezing and stretching the objects. Here, we find that these interactions may serve as damping processes that give rise to the formation of collective forces $f \propto m(r)/r$, that point outward, endowing the objects with the observed flat rotation curves. Our approach predicts a correlation between the baryonic mass and the rotation velocities in galaxies, in line with the Tully-Fisher relation.

[*]E-mail:AHujeirat@iwr.uni-heidelberg.de

The here-presented self-consistent approach explains nicely the observed rotation curves without invoking dark matter or modifying Newtonian gravitation in the low-field approximation.

Keywords: General Relativity: black holes, neutron stars, Quantum fields: QCD, condensed matter, incompressibility, superfluidity, Cosmology: galaxy formation, spiral galaxies, dark matter, rotation curves