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Can dark-matter Q-balls grow to the mass gap masses?

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Within the framework of general relativity, it can be shown that gravitational waves are radiated with the merger of massive compact objects. Such gravitational wave signals are observed on Earth on various detectors, in particular, on Laser Interferometer Gravitational Wave Observatory (LIGO) and Virgo. During the operation of these detectors, many events have been detected. Those events are associated with the merger of massive compact objects; however, the nature of some merging objects has not yet been reliably established. This work considers nontopological solitons of dark matter—Q-balls, as candidates for the role of massive compact objects. In this work, one of the simplest models of Q-balls, the mechanism of their birth during a phase transition in the early Universe and the mechanism of their mass gaining during the evolution of the Universe, which is based on their mutual merger, are considered. As a result, it is analyzed whether Q-balls of dark matter can grow to the mass gap masses and be candidates for the role of massive compact objects.

Collaboration you are representing

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