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Non-radial f-mode of strange quark stars based on the vector MIT bag model

The detection of gravitational waves (GWs) by detectors such as LIGO has opened a new path for the observation of astrophysical objects [1].
In this context, we highlight compact stars as a source of GWs via their pulsation modes, in particular the non-radial f-mode which is very sensitive to the equation of state (EoS) of the star, which is composed of ultra-dense matter [2]. This means that we can learn the properties of matter under extreme conditions that cannot be duplicated on laboratories by detecting these GWs. One intriguing hypothesis, for instance, that could be verified by this method is that strange matter (i.e., a fluid made of an equal number of deconfined up, down and strange quarks) may form in the core of very dense stars [3].
Based on this, we employ the vector MIT bag model, a modification of the MIT bag model which employs a vector field to model inter-quark interaction [3], to study the EoS of strange quark matter and solve the TOV equations for different values of the coupling constant of the model. We then developed the perturbation equations of the spacetime metric for the stellar system in order to calculate the f-mode oscillation frequency and damping time. We verified that different values of the coupling constant significantly affect the physical and oscillatory properties of the star.

References:

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