



Contribution ID: 141

Type: **Talk**

Formation of twin stars in low-mass X-ray binaries and in supernova explosions

Wednesday 28 August 2024 09:00 (30 minutes)

We explore the conditions under which a first-order deconfinement phase transition in cold and warm neutron star cores would lead to the formation of a third family of compact stars and thus to cold and thermal twin stars. When this transition occurs in a low-mass X-ray binary system, possibly coupled with secondary kick mechanisms such as neutrino or electromagnetic rocket effects, it may provide a formation path for isolated and eccentric millisecond pulsars (MSPs) [1].

We find that in compact binary systems ($P_{\text{orb}} = 8$ days) the accretion-induced phase transition occurs towards the end of mass transfer, specifically during the spin equilibrium phase. In contrast, in binary systems with wider orbits ($P_{\text{orb}} \gtrsim 22$ days), this transition takes place during the subsequent spin-down phase, leading to a delayed collapse. We find that a gravitational mass loss of approximately $\Delta M \sim 0.01 M_{\odot}$ suffices to produce an eccentricity of the order of 0.1 without the need of a secondary kick mechanism. Wider systems are more prone to yielding highly eccentric orbits in comparison to those with shorter orbital periods, even with relatively small kick velocities. Alternatively, they may be disrupted, leading to the formation of an isolated MSP. In both scenarios, the phase transition leads to a more compact object, situated on the third family branch. We show that at finite temperature, like in protoneutron stars, the twin star transition is more likely to occur than in cold systems and it may contribute to the supernova explodability of massive blue supergiant stars [2].

[1] S. Chanlaridis et al., in preparation (2024)

[2] J.P. Carlomagno et al., arXiv:2406.17193

Internet talk

Maybe

Is this an abstract from experimental collaboration?

No

Name of experiment and experimental site

TBA

Is the speaker for that presentation defined?

Yes

Details

Speaker will talk in person

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Session Classification: Workshop on Astro-Cosmo-Gravity

Track Classification: Workshops & Special Sessions: Workshop on Astro-Cosmo-Gravity