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Ankan Sur - Magnetic field instabilities in Neutron stars

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Neutron stars are incredibly dense compact objects having the strongest magnetic field in the universe known to date. The exact configuration of the field is not known and the simplest model that is often considered is that of a dipole. Such a dipolar poloidal field is however known to be unstable and the equilibrium configuration is an open problem of great astrophysical relevance. We perform magnetohydrodynamic simulations using the publicly available code PLUTO. The field evolution undergoes a 'kink instability' and a cataclysmic rearrangement in few Alfven timescales. This develops a toroidal component with a field strength of the same order of magnitude as that of the poloidal component. In this process, the star gets deformed which causes it to produce a non-zero ellipticity. Such objects emit continuous gravitational waves which can be target sources for the advanced LIGO-Virgo detectors.

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