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Gravitational Waves from a newly born accreting magnetar

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We study the spin-evolution and gravitational-wave luminosity of a newly-born magnetar with an initial spin period of 1 ms and having an inclination α between the magnetic moment axis and the rotation axis. Given any random initial choice for the inclination, we always find α ⟶ 90 ◦ in a few milliseconds. As the star rotates under the influence of magnetic dipole radiation and the escaping neutrinos, the corotation radius exceeds the magnetospheric Alfvén radius and two columns of accreting matter are formed at the poles which eventually reach hydrostatic equilibrium with the outflow and settling matter on the stellar surface. Initially, the spin period is mostly affected by the neutrino luminosity but at later times, accretion makes the star spin-up rapidly. This object, located at 1 Mpc, emit gravitational waves with a strain h_c ~ 10ˆ{-24} at kHz frequencies. Given the estimated sensitivities for the third generation gravitational-wave detectors, we find that such an object would be a potential target.

Author: SUR, Ankan (Nicolaus Copernicus Astronomical Center, PAS)

Presenter: SUR, Ankan (Nicolaus Copernicus Astronomical Center, PAS)

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