

Title

Looking for the first transitional pulsar in an early-type binary system

Abstract

A0538-66 is a transient high mass X-ray binary (HMXB) located in the Large Magellanic Cloud and containing a neutron star spinning at $P=69$ ms, one of the fastest known X-ray pulsar in early type binary systems. Its X-ray emission is powered by accretion from a Be-type companion. Optical studies over more than 3 decades show that the mass loss rate from the donor star is highly variable and this can cause the occurrence of different regimes of interaction with the neutron star. In particular, it is expected that, when the dense equatorial disc ejected by the Be star is absent, A0538-66 can switch-on as a radio pulsar. Radio observations are then proposed, triggered by the appropriate optical conditions, in order to test this scenario and to investigate the still poorly understood physical processes underlying the transitions between accretion-powered X-ray emission and rotation-powered radio emission.

In particular, once the pulsar will be detected, this system offers the opportunity to investigate the interplay between accretion mechanisms and radio pulsar activity in young binary systems where the pulsar is embedded in the dense and supersonic stellar wind of the early-type companion star. A deeper understanding of the interaction between stellar and pulsar wind is fundamental to test the current models and to investigate some of the most poorly known aspects linked to transitions from different regimes.