

How young the accretion-powered pulsars could be?

M. V. Kostina^{1*}, N. R. Ikhsanov^{1,2,3†}

¹Saint-Petersburg State University, St. Petersburg, Russia

²Pulkovo Observatory, St. Petersburg, Russia

³Special Astrophysical Observatory, Nizhnij Arkhyz, Russia

A question about the age of accretion-powered X-ray pulsars has recently been reopened by a discovery of the X-ray pulsar SXP 1062 in the SMC. This High Mass X-ray Binary (HMXB) contains a neutron star rotating with the period of 1062 s and is associated with a supernova remnant of the age $\sim 10^4$ yr [1–3]. An attempt to explain the origin of this young long-period X-ray pulsar within the traditional scenario of three basic states (ejector, propeller and accretor) encounters difficulties. Even if this pulsar were born as a magnetar the spin-down time during the propeller stage would exceed 10^4 yr. Here we explore a more circuitous way of the pulsar spin evolution in HMXBs, in which the propeller stage in the evolutionary track is avoided. We find this way to be possible if the stellar wind of the massive companion to the neutron star is magnetized. The geometry of plasma flow captured by the neutron star in this case differs from spherically symmetrical and the screening of the dipole magnetic field of the neutron star does not occur. We show that the age of an accretion-powered pulsar in this case can be as small as $\sim 10^4$ years without the need of invoking initial magnetic field in excess of 10^{13} G.

References

- [1] F. Haberl et al., *A&A* 537, L1 (2012)
- [2] V. Hénault-Brunet et al., *MNRAS* 420, L13 (2012)
- [3] R. Sturm et al., *A&A* 556, id.A139, 8 pp. (2013)

*E-mail: maria@astro.spbu.ru

†E-mail: ikhsanov@gao.spb.ru