

Evidence for a 304-day orbital period for Gx1+4

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We report strong evidence for a ~ 304 -day periodicity in the spin history of the accretion-powered pulsar GX 1+4 that is almost certainly associated with the orbital period of the system. We have used BATSE data to show a clear periodic modulation of the pulsar frequency from 1991 to date, in excellent agreement with the ephemeris proposed by Cutler, Dennis & Dolan (ApJ 300, 551, 1986), which were based on enhanced spin-up events that occurred during the pulsar's spin-up era in the 1970s. Our results indicate that the orbital period of GX 1+4 is 303.8 ± 1.1 days, making it the widest known low-mass X-ray binary system by more than one order of magnitude and putting this long-standing question to rest. A likely scenario for this system is an elliptical orbit in which the neutron star decreases its spin-down rate (or even exhibits a momentary spin-up behaviour) at periastron passages due to the higher torque exerted by the accretion disk onto the magnetosphere of the neutron star. These results are not inconsistent with the X-ray pulsed flux light curve measured by BATSE during the same epoch.