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Quasi periodic oscillations from a transient ULX in M 101

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We have studied the unusual time variability of an ultraluminous X-ray source (ULX) in M 101 using Chandra and XMM-Newton data. Over the last two decades, the source has shown short-duration outbursts with an X-ray luminosity ~1-3x10^39 erg s-1, and longer intervals at luminosities ~0.5-1x10^38 erg s-1. The bimodal behaviour and fast outburst evolution (sometimes only a few days) are more consistent with an accretor/propeller scenario for a neutron star than with the canonical outburst cycles of stellar-mass black holes. If this scenario is correct, the luminosities in the accretor and propeller states suggest a fast spin and a low surface magnetic field, despite our identification of the ULX as a high-mass X-ray binary. The most striking property is the presence of strong 600-s quasi periodic oscillations (QPOs) found at several epochs during the ultraluminous regime. The QPO frequency range <10 mHz is an almost unexplored regime in X-ray binaries and ULXs. We compare our findings with the (few) examples of very low frequency variability found in other accreting sources, and discuss possible explanations.