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Search for Continuous Gravitational Waves from Scorpius X-1 in LIGO O2 Data YUANHAO ZHANG, Max Planck Institute for Gravitational Physics, Leibniz Universitt Hannover, MARIA ALESSANDRA PAPA, Max Planck Institute for Gravitational Physics, University of Wisconsin, BADRI KRISHNAN, Max Planck Institute for Gravitational Physics, Leibniz Universitt Hannover, ANNA L. WATTS, University of Amsterdam — The low-mass X-ray binary Scorpius X-1 is one of the most promising continuous gravitational-wave sources for ground-based detectors. We use an improved method to search for signals with nearly constant frequency from Scorpius X-1 in the range of 40-180 Hz in LIGO O2 public data. Thanks to the efficiency of the search pipeline we can use a long coherence time and achieve unprecedented sensitivity, significantly improving on existing results. This is the first search that has been able to probe gravitational wave amplitudes that could balance the accretion torque at the neutron star radius. Our search excludes emission at this level between 67.5 Hz and 131.5 Hz, for an inclination angle $44^\circ \pm 6^\circ$ derived from radio observations (Fomalont et al. 2001), and assuming that the spin axis is perpendicular to the orbital plane. If the torque arm is 26 km – a conservative estimate of the Alfvén radius – our results are more constraining than the indirect limit across the band. This allows us to exclude certain mass-radius combinations and to place upper limits on the strength of the star's magnetic field with a different probe than ever used before. In this talk, I'm going to present our results and discuss the physical interpretation of the neutron star.

Yuanhao Zhang
Max Planck Institute for Gravitational Physics

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