Supermassive Black-Hole Binary Candidates in the Gravitational-Wave Regime from the Dark Energy Survey

A. Miguel Holgado, Yu-Ching Chen, Xin Liu, Weiting Liao, Hengxiao Guo, Yue Shen, Kaiwen Zhang, Robert Gruendl, Eric Morganson, University of Illinois at Urbana-Champaign — The cosmic supermassive black-hole (SMBH) binary population is the main contributor to the stochastic nanohertz gravitational-wave background that pulsar timing arrays (PTAs) seek to detect. In the electromagnetic window, time-domain surveys have been systematically searching for such gravitational-wave driven SMBH binaries that may reside in periodic quasars. We present new SMBH binary candidates from the Dark Energy Survey that show statistically significant periodicity in their multi-band light curves. With these candidates, we test models of circumbinary accretion variability and relativistic Doppler-boosting. We also investigate gravitational-wave implications for PTAs, like the NANOGrav PTA, and for the LISA mission.