

The rise and fall of a binary AGN candidate: the story of PSO J334.2028+1.4075

P. Benke, S. Frey, K. Gabányi, L. Gurvits, Z. Paragi, T. An, E. Kun, P. Mohan, D. Cseh

Apparently periodic optical variations of the luminous high-redshift ($z=2.06$) quasar PSO J334.2028+1.4075 (FBQS J2216+0124) led Liu et al. (2015) to interpret the variability as the orbital period of a binary supermassive black hole (SMBH) residing in a single circumbinary accretion disk. The proposed orbital separation was around 0.006 pc, and the possible inspiral time about 7 years in the rest frame of the quasar. Such objects would be of high interest as the difficult-to-find end products of binary SMBH evolution, and potential sources of low-frequency gravitational waves. However, extending the time baseline of the variability study, Liu et al. (2016) later found that the periodicity of PSO J334.2028+1.4075 does not remain persistent. Foord et al. (2017) did not find evidence for the binary active galactic nucleus scenario based on Chandra X-ray observations. The object has also been studied in detail in the radio (Mooley et al. 2018) with the Karl G. Jansky Very Large Array (VLA) and the Very Long Baseline Array (VLBA), revealing a lobe-dominated quasar at kpc scales, and possibly a precessing jet, which may retain PSO J334.2028+1.4075 as a binary SMBH candidate. Here we report on our 1.7-GHz observation with the European VLBI Network (EVN) which complements the high-resolution VLBA data taken at higher frequencies, and discuss the current knowledge about the nature of this interesting object.