Varstrometry for Dual AGN using Radio interferometry (VaDAR)

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Abstract

Binary and dual AGN are important observational tools for studying the dynamical evolution of galaxies and SMBHs. However, they are notoriously difficult to unambiguously detect. A new method for identifying possible multi-AGN makes use of the exquisite astrometric precision of *Gaia* to detect astrometrically-variable quasars, in tandem with the high radio spatial resolution of the VLA and the VLBA. Colloquially called *varstrometry,* this process is used to identify and characterize a new population of multi-AGN. We present new radio observations with the VLA 2-4 GHz and 8-12 GHz bands of 18 quasars (redshifts 0.7-2.9) exhibiting significant astrometric variability, as well as the VLBA 4cm and 13cm bands of a subset of seven quasars. All targets were selected from the SDSS DRQ16, cross-matched with the *Gaia* DR3. These observations have provided constraints on both the radio morphologies and the origin of the astrometric variability. We have investigated observed radio-optical offsets and additionally identified several gravitationally-lensed quasars within the sample. We note the importance of future high-resolution optical and radio observations, as well as comment on the potential of a pointed high-precision astrometric mission if employed with the *varstrometry* method in the search for multi-AGN (especially down to smaller pair separations).

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