XV Serbian Conference on Spectral Line Shapes in Astrophysics, June 9 - 13, 2025, Niš, Serbia
Book of Abstracts, Eds. P. Marziani, M. S. Dimitrijević, L. Č. Popović and Đ. Savić
Astronomical Observatory Belgrade, Special Issues No. 2
https://doi.org/10.69646/15scslsa22

Mg II LINE PROFILE VARIABILITY IN SDSS J2320+0024: CLUES TO A BINARY SUPERMASSIVE BLACK HOLE

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Supermassive binary black holes (SMBBH) are expected to form during galaxy mergers, but direct confirmations remain challenging, especially at

sub-parsec separations. Indirect signatures, such as periodic variability in quasar light curves and evolving spectral line profiles, offer promising alternatives for identifying such candidates.

We carried out a search for long-period (100–600 days) variability in quasars using high-precision (1–2%) gri photometry from the SDSS Stripe 82 survey, spanning six years. Periodic candidates were identified through Lomb-Scargle analysis and cross-matched with ZTF and Pan-STARRS data, extending the light curve baseline to over 20 years. All five final candidates were confirmed quasars, with the most promising one (P = 278 days) also flagged as variable in the Chandra X-ray catalog.

To investigate the nature of the top candidate, we analyzed three epochs of Mg II spectra, combining new observations with archival SDSS data. The line profile reveals a time-evolving double-peaked structure, suggesting dynamic changes in the broad-line region. To interpret this behavior, we compared synthetic magnitudes with photometric data and applied the PoSKI model. The results are consistent with the presence of a compact supermassive binary black hole system — a scenario of particular interest for understanding black hole coalescence and future gravitational wave emission.