Asymmetric Planetary Nebulae 5
(Ebrary, Cambridge, USA),
A.A Zijlstra, I. McDonald, eds.

Using SuperWASP to find binary PN central stars

David Jones

Jodrell Bank Centre for Astrophysics, Alan Turing Building, School of Physics and Astronomy, University of Manchester, Oxford Road, Manchester, M13 9PL, UK

D. Pollacco, F. Faedi, M. Lloyd

Central star binarity has long been believed to play an important role in the evolution of planetary nebulae, particularly those with aspherical morphologies. However, their true effect cannot be ascertained until a statistically significant number of binary central stars have been discovered. Survey telescopes offer an excellent opportunity to find as yet undiscovered binary central stars through long-period photometric monitoring. One such survey, the SuperWASP project, offers unrivalled coverage of the sky on long time baselines. Here, we present the preliminary findings of a photometric search for central star binarity in the SuperWASP archive, confirming the suitability of the instrumentation by determining a ~6.5-day photometric period for the previously unconstrained spectroscopic binary system at the heart of LoTr 1. Follow-up, time-series spectroscopy is planned for LoTr 1 as well as the other newly discovered SuperWASP binaries, in order to fully model the parameters of each system.

The University of Manchester
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Using SuperWASP to find binary CSPN

D. Jones[⋆], D. Pollacco[†], F. Faedi[†], M. Lloyd[⋆]
[⋆]Jodrell Bank Centre for Astrophysics
[†]Queen's University Belfast
email: david.jones-3@postgrad.manchester.ac.uk

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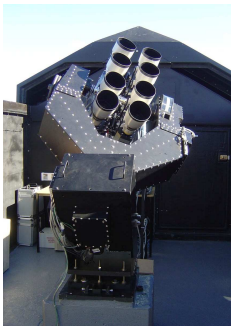
1. SuperWASP



SuperWASP consists of two robotic observatories, operating continuously, allowing for coverage of both hemispheres of the sky all year round (Pollacco et al., 2006). SuperWASP-North is situated on the Roque de los Muchachos, La Palma, and SuperWASP-South is located at the site of the South African Astronomical Observatory (SAAO) near Sutherland, South Africa. Each consists of eight wide-angle cameras simultaneously monitoring the sky for planetary transit events. However, all SuperWASP data is archived such that differential magnitude data of any astronomical source bright enough to have been detected by SuperWASP can be extracted for analysis (Faedi et al., 2007).

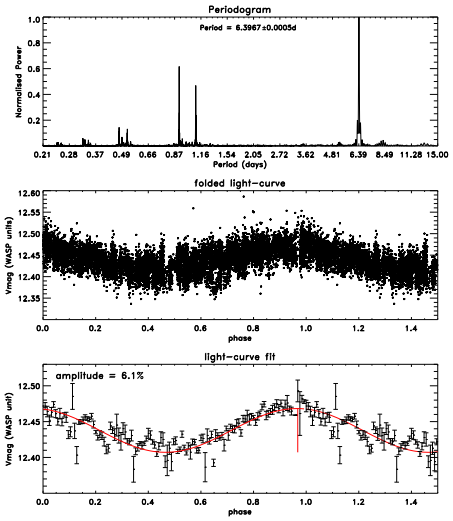
2. Sample and Analysis

Using the SIMBAD catalogue, 340 objects whose primary object type was listed as planetary nebula were found to lie within the approximate bounds of the SuperWASP field ($|\delta| < 70°$ and $|b| > 8°$). Of those objects, 88 have more than 1000 SuperWASP observations, these form our sample. The differential magnitudes of each object have been extracted and are being checked for periodicity using a Lomb-Scargle analysis, periodicities exceeding a False Alarm Probability will then be tested by folding on this period and binning to increase signal-to-noise.

Due to the unbiased nature of the sample and the sensitivity to relatively long periods; the results from our investigation will allow us to add statistical weight to the determination of the binary CSPN fraction as in the work of Miszalski et al. (2009).

Acknowledgements
This research has made use of the SIMBAD database, operated at CDS, Strasbourg, France.

3. Preliminary Results



LoTr 1 (1SWASPJ055506.69-225402.2) is known to contain a spectroscopic binary, displaying a composite spectrum of K-type star at optical wavelengths with strong continuum in the UV from an extremely hot companion (Bond et al. 1989). SuperWASP photometrically confirms the binary nature of the CSPN of LoTr 1, constraining its period to be 6.3967±0.0005 days.

4. Summary

The SuperWASP data archive is being used to search for photometric variability of CSPNe in the monitored field. The validity of the instument for this purpose has been confirmed by determing a 6.4 day photometric period for the previously unconstrained spectroscopic binary LoTr 1. The other 87 nebulae forming our sample are currently being analysed and the results are expected to be published shortly. Those CSPNe determined to be binary will be followed up spectroscopically in order to fully constrain the parameters of the binary systems.

References •Pollacco et al. 2006, PASP, 118, 1407 •Faedi et al. 2007, ASPC, 372, 157 • Miszalski et al. 2009, A&A, 496, 813 • Bond, Ciardullo & Meakes 1989, BAAS, 21, 789