1.3M Devasthal Optical Telescope (DOT)

Proposal for Observations

To:
DOT-Time Allocation Committee (DOT-TAC),
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Proposal Code: Dynamic value put here
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Proposal Category :

3

Proposal Title :

arvind

Proposal Type :

1

Target of Oppurtunity?

1

Abstract :

This is the first proposal for a long term BINA project that focuses on candidate exoplanet hosts that were discovered in bulk by the Kepler space mission. For this proposal, we selected a sample of three objects classified as planetary or eclipsing binary candidates that are lacking spectroscopic and photometric follow-up observations needed to pinpoint their true nature. These observations will be gathered with Belgian and Indian telescopes. Our long-term project aims to make a large contribution on (1) the detection and

characterization of exoplanets (by determining accurate physical parameters through constraining the orbital inclination) and (2) solving the mass-radius problem of the low-mass stars (by significantly increasing the number of low-mass eclipsing binaries with accurate masses, radii and metallicities). This proposal focuses on photometry in the infrared with TIRCAM2 attached to the 3.6-m DOT. As a significant number of planet hosting stars are red dwarfs and have low-amplitude variations in the optical bands, the infrared has better prospects to capture planetary transits. Observations in the K band are particularly useful to detect and study secondary

Sheduling request :

4

Observing time request :

12

Preferred Dates :

Oct. 3, 2023

Impossible Dates :

Oct. 3, 2023

Justification for scheduling request :

We are requesting a total observing time equivalent to 3 nights (6 half nights) in the period from 2020-12-01 to 2021-01-15 because the second half of the nights can only be filled with our targets during this period. On each night, only one target star will be observed to capture one primary or secondary eclipse. The requested observations have to be considered as time critical on the preferred dates because this choice of dates allows one observation of both the primary and the secondary eclipse of each of the 3 systems under good circumstances (high altitude).

Observation mode :

1

Arvind;							

Technical justification and observing strategy :

We aim to obtain light curves with TIRCAM2 in the infrared (K-band) for our targets in an attempt to detect and characterize secondary transits/eclipses (that are best visible in this wavelength range) and to determine the capability of this instrument for future observations. Three science targets (Section 15) are chosen to test the possibilities for our project: * TIRCAM2 has a small field-of-view (86.5''x86.5''). We selected planetary and eclipsing binary candidates from Barros et al. (2016, A&A 594, A100) that have at least 2 stars of similar brightness within the field-of-view (Fig.1 of Section 19). * Barros et al. (2016) give an estimate for the period (P_orb) and the central eclipse timings (Epoch), proportional depths in flux (Depth) and total durations (Length) of the primary eclipses/transits. They are used to predict the times of primary/secondary eclipses/transits, assuming that the orbits are circular (Tables 1 and 2 of Section 19). As these events are the most important phases of the lightcurve, the requested dates should be considered as time critical. * Our targets are bright (V~13-14 mag), which makes it possible to determine the maximum precision of the K-band photometry. We request continuous observations of 10s each (cf. TIRCAM2 guidelines). As we aim for a high accuracy, we might need to defocus the telescope to avoid saturation effects and to spread the flux on more pixels. To optimize the quality of the data reduction, we request ~10 flat fields in the evening/morning twilight and ~10 dark frames of 10 seconds each night. Each night, the near-infrared standard star FS-16 will be observed too. * We request 1 night of observation time for each target. Given their brightness, the lunar phase is not important. The preferred observation dates were chosen to maximize the visibility of the targets during the second half of the night and to capture one primary and secondary eclipse/transit for each target.

Plans for data reduction :

We will use the standard procedures for the reduction of CCD photometry, including corrections with dark frames and flatfielding. The resulting infrared light curves will be analysed together with multi-band observations in the optical and radial velocity variations to allow a full characterisation of the observed systems.

Scientific Justification: