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## Commissioning the new Sutherland High-speed Optical Cameras (SHOC)

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### Abstract content <br> &nbsp; (Max 300 words)

Based on two existing instruments POETS (Souza et al., 2006, PASP, 118, 1550) and MORIS (Gulbis et al. 2011, PASP, 123, 461), two new instruments, SHOC (the Sutherland High-speed Optical Cameras), have been developed for use on the SAAO 1.9m, 1.0m and 0.75m telescopes at Sutherland. The aim of the instruments are twofold: first to replace older generation instruments currently in use and second to provide users with new capabilities that are not currently available. Each SHOC system consists of a camera, GPS, control computer and peripherals. The primary components are two, off-the-shelf Andor iXon X3 888 UVB cameras, each of which utilizes a 1024x1024, frame transfer, thermoelectrically-cooled, back-illuminated CCD. Some of SHOC's features include a moderate field of view (ranging from 1.3 arcsec on the 1.9m to 3.7 arcsec on the 0.75m), high frame rates (between one and a hundred frames per second, dependent on binning and subframing), frame-by-frame GPS triggering, high quantum efficiency (> 90% from roughly 480 nm to 700 nm), low read noise, and negligible dark current. Users also have the freedom to choose from a range of custom settings in order to optimise observations. These settings include different readout amplifiers: 1 MHz (16 bit) and 3 MHz (14 bit) in conventional mode or 1 MHz, 3 MHz, 5 MHz, and 10 MHz (all 14 bit) in electron multiplying (EM) mode, with each amplifier having multiple gain conversion settings. More options include custom subframing and binning. A unique capability is the choice of operation in either conventional or EM mode. While operating in EM mode, photoelectrons undergo impact ionization before read out, resulting in the the observed signal being strengthened without increasing read noise. This effectively reduces read noise to sub-electron levels, allowing a significant increase in data quality for low-light applications. Here, we will present the instrument, characteristics, work that has been completed during the commissioning phase, development plans, and SHOC's applications to different fields of astronomy.

### Apply to be<br> consider for a student <br> &nbsp; award (Yes / No)?

Yes

### Level for award<br>&nbsp;(Hons, MSc, <br> &nbsp; PhD)?

MSc

### Main supervisor (name and email)<br>and his / her institution

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**Would you like to <br> submit a short paper <br> for the Conference <br> Proceedings (Yes / No)?**

No

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