## **Pomenis: A Small Portable Astrograph for SSA** Eric C. Pearce, Louis Avner, Adam Block, Harrison Krantz, and Kris Rockowitz *Steward Observatory, University of Arizona*



Pomenis Astrograph Enclosure (The "Dog House") being moved up to the Mt. Lemmon Sky Center near Tucson AZ. Pomenis at the Kitt Peak National Observatory (KPNO) with the Mayall 4meter Telescope in the background.

Pomenis ready for operation at sunset on Mt. Lemmon.

## **ABSTRACT**

The Steward Observatory SSA team developed the Pomenis Astrograph System as an alternative to more traditional narrow field of view small SSA systems. The astrograph is innovative with its fast optical design versus a traditional longer focal length found on commercial Cassegrain telescopes that most "Raven class" systems are based on. Compared with other systems used for SSA, the Pomenis astrograph has an exceptionally wide 4.2°×4.2° field of view and a fast readout CCD camera. These features enable synoptic survey of the deep space satellite population several times per night. The aperture and focal length were carefully selected to achieve sensitivity relevant to synoptic GEO SSA with an integration time short enough to allow high precision astrometric reference using the streaked background stars. With its 7-color filter wheel, Pomenis also performs multi-color photometric screening of deep space satellites looking for anomalous behavior and can identify objects for higher fidelity measurements and study. Pomenis is housed in a unique trailer mounted enclosure, which enables the system to be deployed with minimal infrastructure, operated remotely and autonomously, and quickly relocated as required. In addition to the SSA measurements described above, the astrograph is taking fullhemisphere night sky brightness (NSB) measurements in multiple color bands. These measurements will be compared to those conducted by other researchers previously on Mt. Hopkins and Kitt Peak to study the increase in light pollution in southern Arizona. Pomenis will allow these measurements to be made on a more routine basis, and over a tighter spatial grid. This will facilitate our monitoring of the light pollution environment at the University's observatory sites and assess the impact of future development on the quality of the night sky. Additionally, Pomenis will be used for serendipitous astronomical surveys and to develop new techniques for precise photometric reduction over a wide field of view and high air mass.

## **SPECIFICATIONS**

- Takahashi E-180 Epsilon f/2.8 180mm ED Astrograph
  - 500 mm focal length
  - 44 mm image circle
  - 0.64 arcsec spot size
  - 570 mm OTA length
- < 11 kg mass</li>



-20.875

## See the Pomenis at Work Video



📋 Scan me

- Apogee Alta F9000 CCD Camera
  - Kodak KAF-09000 imager
  - **3056x3056** pixels, **12** μm pixel size
  - 51.9 mm diagonal format
  - 7 position filter wheel using Sloan W, g', r', z', l', lc, and Johnson-Cousins V
  - QE 64% at 550 nm, 37% at 400 nm
- MYT Paramount (GEM) with Tripod
- German equatorial
- 23 kg payload capacity
- **Custom Trailer Mounted Enclosure**
- Aqawan design
- Airtow RUS12-55 with hydraulic lowering bed
- Astrometric Instruments DomePro2-c Controller
- CCTV, Boltwood Cloud Sensor II, and twin SQM Sky Brightness monitors

Images were taken with a Canon 5D Mark II with a 15mm (f/2.8) wide angle lens at an ISO of 10,000. An intervalometer was used to acquire the frames.

Frames were lightly processed to increase the contrast and reduce some noise.











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Sample images with Pomenis (left to right): Track of Sirius-I satellite, Andromeda Galaxy, and sidereal track of deep space satellite.



Full hemisphere night sky brightness measurements from Mt. Lemmon with the Pomenis Astrograph, August 6, 2018 and PanSTARRS 'w' Filter (400-850 nm). See our presentation in the Optical Systems & Instrumentation Session, Thursday, September 13, 1:00 pm **Dr. Eric C Pearce** Professor, Astronomy College of Science Professor, Astronomy College of Science Professor, Astronomy College of Science Steward Observatory Room N514 933 N Cherry Ave Tucson AZ 85719 Pepearce@email.arizona.edu Office: 520-612-2309

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