What is AEON?

Updated August 03, 2020

The Astronomical Event Observatory Network (AEON) is a facility ecosystem for accessible and efficient follow up of astronomical transients and Time Domain science. At the heart of the network, Las Cumbres Observatory [2] has joined forces with NOIRLab [3] and its SOAR 4.1m [4], Gemini 8m [5] (and soon the 4m Blanco [6]) telescopes to build such a network for the LSST [7] era. SOAR is the pathfinder facility for incorporating the 4m and 8m class telescopes into AEON.

A recent article on Science magazine [8] features AEON and the windows into Time Domain, Multi-Messenger Astronomy, and general astronomical programs that this project will open up for the astronomical community in the near future.

AEON is now seeking to expand to additional telescopes. This page [9] at the Las Cumbres website
describes the initiative, and we link here[10] to our written note. Participation in AEON may be an interesting option for international groups taking part in the Legacy Survey of Space and Time (LSST). As announced by Vera C. Rubin Observatory, one of several possible in-kind contributions to the LSST is, “Observing time, dedicated to proposals led by US PIs, at key non-US facilities”[11]. In accordance with the NOIRLab Open-sky policy, any qualified scientist may compete in peer reviewed competition for facility access, and this policy extends to AEON. Potential participants with special requirements are invited to initiate a conversation.

After successful testing during 2018-and early 2019, SOAR and NOIRLab started offering AEON-SOAR observations in shared-risk mode for 2019B. For the 2020A semester we rolled out this new operational mode as a new regular, generally available capability on SOAR.

**AEON brings a new observing mode for SOAR: a highly automated observing queue run with minimal human intervention.** At present, guide star acquisition, and on-slit acquisition of the science target (for spectroscopic observations), are the only tasks done manually. As has always been the case, Telescope Operators also assess the observing conditions and have the authority and means to start/stop the AEON-queue based on weather or because of technical reasons. Other than these, the AEON-queue on SOAR is created entirely in an unsupervised, automatic way by a scheduler software at Las Cumbres Observatory, which takes all requests submitted by the various program PIs, and sorts them according to a number of parameters, which include (but not limited to) position on the sky, distance to the Moon and airmass constraints, SOAR minimum and maximum elevation limits, time window specified in the observing request.

**Features for 2020B:**

_Due to the spread of the Covid-19 coronavirus, the SOAR Telescope suspended all science operations after the night of Monday, March 16. Science operations were suspended for all other NOIRLab and tenant telescopes on Cerro Pachón and Cerro Tololo. At this point no end date for the shutdown can be specified. This news item will be updated as circumstances warrant._

**Supported Configurations SOAR AEON Configurations:**  **Goodman High Throughput Spectrograph (GHTS) + red camera**

- Three low-resolution spectroscopic modes (R~900 - 1400):
  - 400M1: 400 l/mm grating, 300-700 nm, 1” slit, 2x2 binning
  - 400M2: 400 l/mm grating, 500-900 nm, 1” slit, 2x2 binning, GG455 order-blocking filter
  - 600MID: 600 l/mm grating, 435-702 nm, 1” slit, 2x2 binning, GG385 order blocking filter
- Imaging Mode: 2x2 binning, SDSS-g, r, i filters and the VR wide filter
- Readout: 344ATTN3 (Readout noise = 3.89e-, Gain=1.48 e-/ADU)
- Atmospheric Dispersion Corrector (ADC) always IN
- Guide Star and on-slit target acquisition: manual
- Calibrations: BIAS, FLATS; scripted, ran every afternoon by SOAR staff. Every night (weather permitting) we will also obtain a observation of a spectrophotometric standard in each of the three spectroscopic configurations indicated above. All calibration data will be publicly available at the LCOGT Observation Portal.
- Standard star observation: a spectrophotometric standard star will be observed at the beginning of every scheduled AEON night, with all three grating setups, together with the corresponding arc lamp spectra. These data will be publicly available to all users, as part of the calibration files. The
standard star observation will take place during twilight at the beginning of the night, or whenever
the telescope can start observing, if weather conditions did not allow opening at sunset.

Real-time browser-based Data Reduction Pipeline

We are deploying a newly developed web interface for the Goodman instrument automated pipeline
reduction. Users will be able to see in near-real time the raw and reduced files of their project targets as
they are written to disk at SOAR. The spectroscopic pipeline produces 1-D, wavelength-calibrated
spectra, with an interactive tool that allows the user to zoom-in into the spectrum, save it to an image
file, etc.

Calendar of SOAR AEON nights for 2020B (*see note below)
*NOTE:* This calendar is published for completeness. However, because of the ongoing COVID-19 situation, SOAR remains closed as of Aug 13, 2020 and it is clear we will not re-open during the remainder of August. Although a provisional schedule for the 2020B semester has been developed, NOIRLab has decided that it would be best if the final NOIRLab time allocation is carried out once a definite re-start date is known. More information is regularly posted on the SOAR home page. [4]

Click here for the table of SOAR-AEON nights for 2020A [12]  
Click here for the table of SOAR-AEON nights for 2019B [13]

**Observing with AEON on SOAR**

Astronomers can request observations either through the [Las Cumbres Observation Portal][14], or via standardized, *programmable* inte
Users can manage all aspects of their observing programs, including observation requests, by creating an account [17] with the Observation Portal [14].

Once time is awarded, users will find that their active proposals are listed under the 'Manage Proposals' tab and they will be able to request observations. The time needed to execute an observation is debited automatically from the relevant proposal, but only once each observation is completed. If a request cannot be scheduled, no time is debited.

Observations can be requested by filling out the observation request form [18], or programmatically by submitting a request to our API. We strongly encourage users to read the Las Cumbres Observatory Getting Started Guide, available from their Help [19] page; it describes the procedure step-by-step. Detailed information on using the APIs can be found at at this link [20].
Monitoring Your Observing Program

The homepage of a user's Observation Portal [21] will show a list of all of the observations they have requested. Clicking on any observation will display more information on each component of the request, including a wealth of information on its scheduling status, the target visibility, and any data obtained - all updated in real-time. The "Getting Started on the LCO Global Telescope Network" [22] guide in the help page describes the available information in more detail. You can also find information on the status of telescopes in the network [24].

Accessing and Reducing Your Data

When observations are completed, the raw Goodman data products are transferred automatically and made available through both the Las Cumbres Observatory Archive [25] and the NOIRLab Science Archive [26]. Both archives provide the means for users to download the data products.

The SOAR Team has developed a data reduction pipeline for Goodman data. Full details are provided on the pipeline website [27].

Where to get help

For assistance with composing observation requests, or for information on AEON-SOAR operations, users can contact Las Cumbres Observatory's Science Support team by emailing science-support@lco.global [28]. For questions about the SOAR telescope, the Goodman spectrograph and the Goodman data reduction pipeline, please contact Cesár Briceño (cbriceno@ctio.noao.edu [29])

Contact details

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Links to AEON partner pages: LCOGT [33], NSF's Optical and Infrared Astronomy Research Laboratory [34]

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Source URL: http://www.ctio.noao.edu/soar/content/soar-aeon-home-page