

The origin and
components of
EAA

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Electronically Assisted Astronomy



Electronically Assisted Astronomy

Positioned somewhere between visual observing and astrophotography, EAA (Electronically Assisted Astronomy) is a natural transition of using available technologies to enhance our ability to “see” the universe.

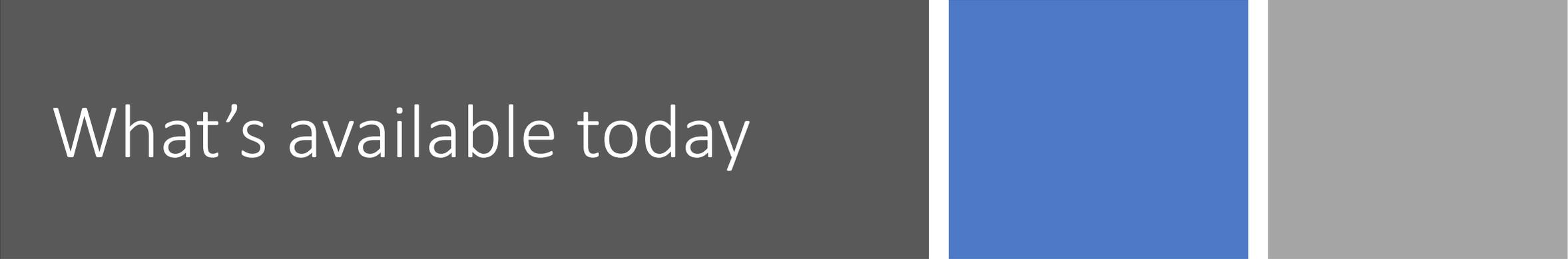
Origin

EAA comes out of digital imaging technology. In the early days of digital sensors amateurs experimented with the low light capabilities of video surveillance cameras.

They exploited their capabilities for capturing occultations of objects like asteroids to get timings that could estimate their size. Lunar occultations could be performed with the same equipment. Niche manufacturers developed video camera systems that could accumulate light in near real time.

These are the roots of EAA.

What's available today



An even more attractive solution exists today with the use of fast CMOS sensor cameras and specific image capture software. These programs are designed to capture images quickly and “stack” the results to achieve “digital sketches” of astronomical objects to enhance the views offered by a telescope.

For me that has been a welcome addition to the amateur astronomer's toolkit.

One example

EAA equipment can be immensely varied and most likely can utilize what you have.

One example is what I have configured for myself. As time goes by I have been more resistant to carry out heavy gear for tentative viewing opportunities so for me a light weight configuration works for me.

Electronically Assisted Astronomy (EAA)



Lightweight Tracking Mounts

- Increasing number of choices
- Different levels of stability and accuracy
- Some have autoguiding capability

Lightweight Tracking Mounts



Better Lightweight Optics

- Smaller lighter designs built for astronomy
- Fluorite and low dispersion lenses
- Astrograph class – flattener reducers
- Weight of the optical train is important for balance on light weight tracking mounts

Better Lightweight Optics



OSC CMOS Imagers

- Technology constantly improving CMOS technology
- APS and full frame sensors becoming more available
- Combined with small Linux based computers offers almost turnkey imaging

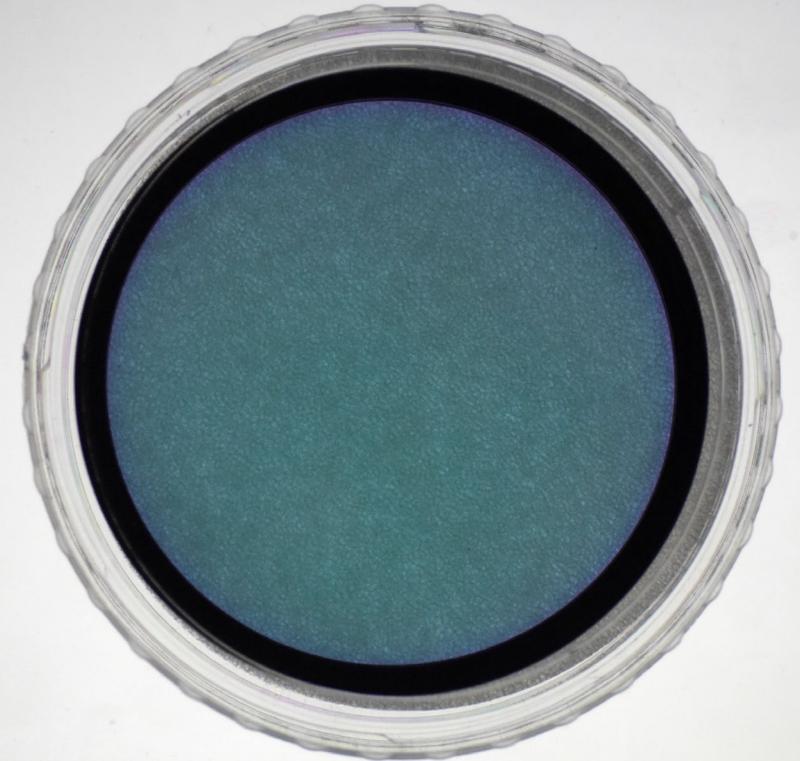
OSC CMOS Imagers



Light Pollution Filters



- The ubiquitous IDAS filters have been improved to accommodate traditional artificial lighting wavelengths and some protection from LED lighting
- With CMOS imagers there is an opportunity to do narrowband imaging
- Other manufacturers also produce similar products, prices vary.

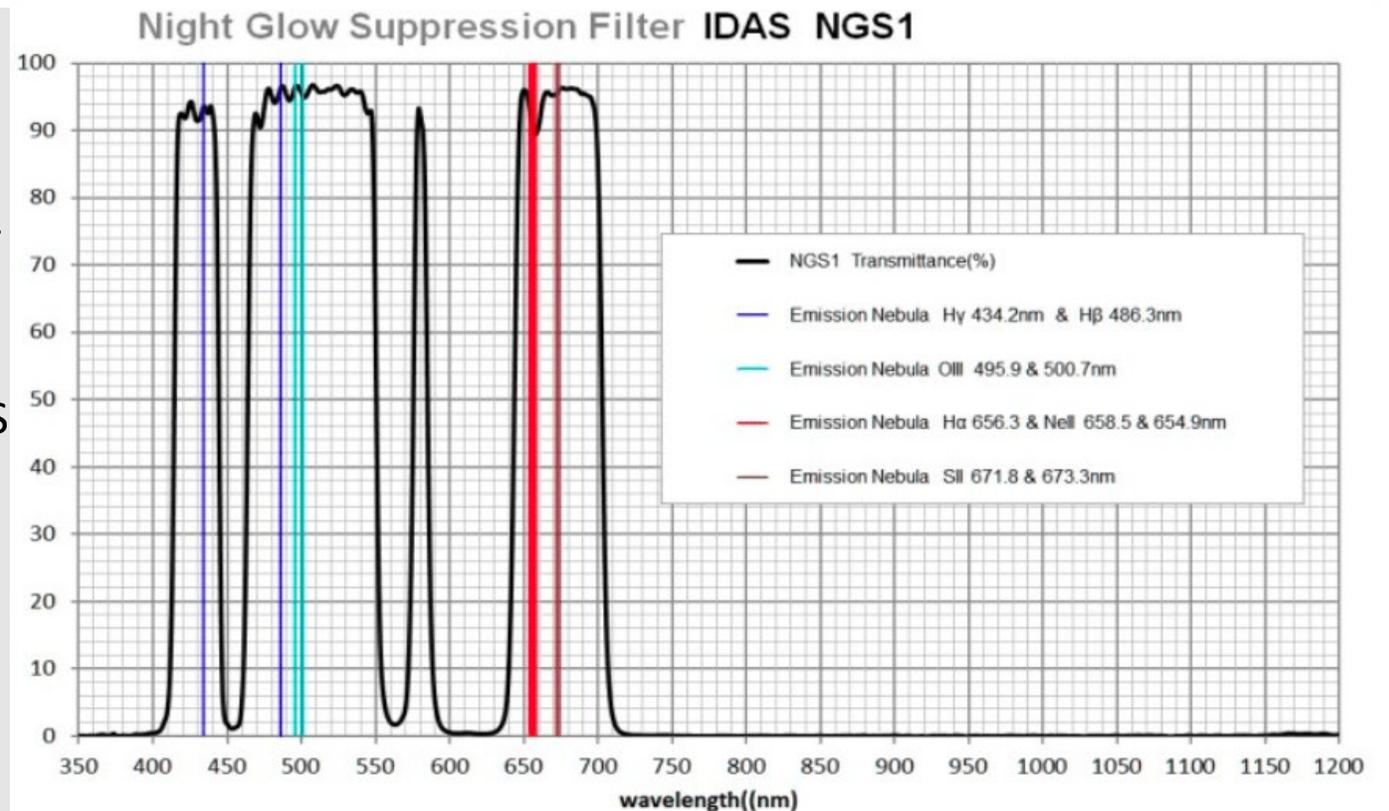


Light Pollution Filtration

Similar to the original IDAS LPS series introduced over two decades ago, there have been refinements to accommodate the introduction of LED lights.

There are two that are used commonly from IDAS the most common being the NGS1.

The other filter I'm going to experiment with is the IDAS LPS-D2.



Optics and Tracker

Weight of Components

Optical Train with CMOS Imager: 1716 gm (3.8 lbs)

Tracker with Wedge: 2536 gm (5.6 lbs)

Tripod: 4300 gm (9.5 lbs) Load Capacity 12 kg or 26.5 lbs

Total Weight: 18.9 lbs



DSLR and 200mm Lens Comparison



Weight of Components

Optical Train with DSLR and 200mm : 1601 gm (3.5 lbs)

Tracker with Wedge: 2536 gm (5.6 lbs)

Tripod: 4300 gm (9.5 lbs) Load Capacity 12 kg or 26.5 lbs

Optical trains about the same weight. New optics purpose built for astrophotography with field flattener and provision for easy filter changes.

German Equatorial Mount Comparison



Weight of Components

Optical Train with CMOS Imager: 1716 gm (3.8 lbs)

Equatorial Head: 9525 gm (21 lbs)

Tripod: 7000 gm (15.4 lbs) Load Capacity 13.6 kg or 30 lbs

Counterweight: 3175 gm (7 lbs)

Lightweight tracking support for imaging train about 25% of the weight of a German Equatorial mount.

**Total Rig Weight:
19 lbs vs 40+ lbs**

Easily moved fully assembled.



Further Refinements

More to follow on the ASIAir Pro as a replacement for a laptop in performing polar alignment, autoguiding and image capture using your phone or tablet.

Dimensions of ASIAir Pro is 9 x 6.5 x 3.5 cm. and runs directly from 12v DC.

It is specific to ASI devices but a similar software suite Stellarmate will run on a Raspberry Pi4.



Some caveats ...

My system has no GOTO, so I rely on a basic understanding of the night sky and planning ahead of time with star charts which may require a star hopping plan.

I also use a small refractor similar to the image scope to fine tune positioning. Both refractors mount in the same way so it is easy to exchange the optical trains.

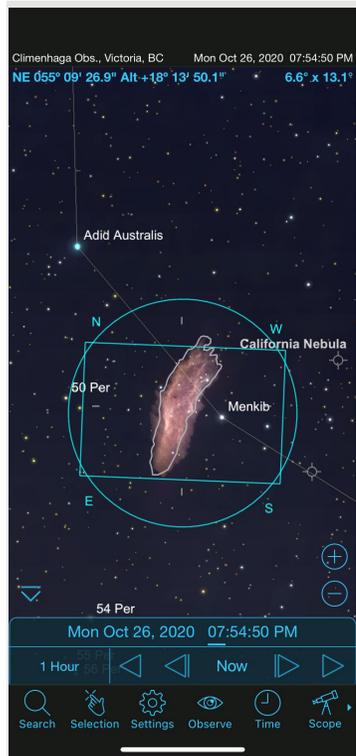
The system is used for wide-field deep sky images and for smaller objects I would use a different system.

Some typical objects for a 200mm optical train and the ASI183MC

FOV = $3.78^\circ \times 2.52^\circ$

Sony Exmor
IMX83CQJ-J

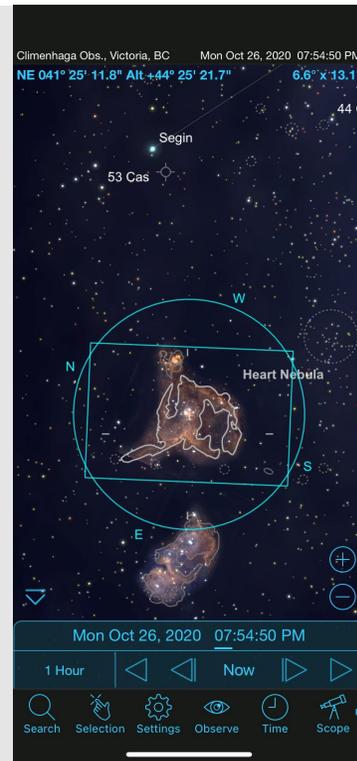
20.48 Mpx
2.4 micron pixels



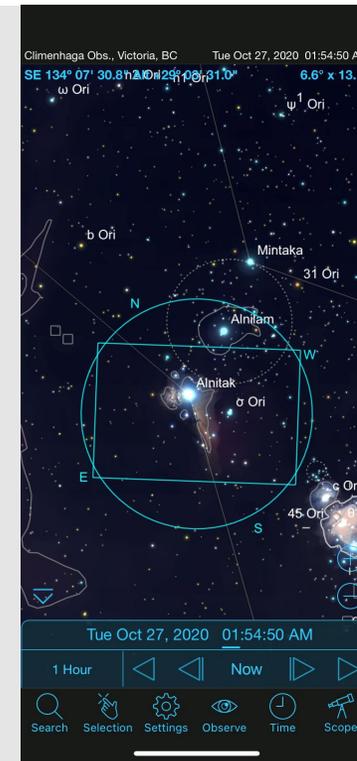
California Nebula



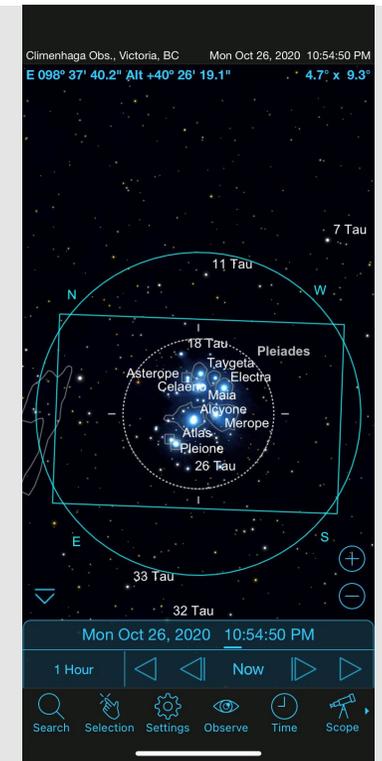
Elephant Trunk



Heart Nebula



Horsehead Nebula



Pleiades



Capture and Stacking Software

The common feature of all these programs is they take individual images and “stack” them to give you more image signal.

The image builds up over time while you wait. Fast download times, typically 2 to 10 seconds depending on your USB bandwidth can be expected. Optimally use USB 3 if your camera has the interface.

Exposures times can vary from 10 to 30 seconds or if you are willing to wait, possibly 90 seconds.

Capture and Stacking Software

However, the longer the exposure the more it becomes more like astrophotography imaging. With EAA the goal is not to do any post processing though you could if you wished. This is where the lines between the two activities gets blurry.

In practice there is no reason why a night of EAA couldn't end up as an imaging run if the conditions or the desire warrant it.

Sharpcap Pro and ASI Studio

The most popular software for EAA is Sharpcap Pro. It has features specifically designed for EAA. This is what I use mostly but I also use ASI Studio which is supplied by ZWO for their line of imagers specifically for EAA.



Where we go from here

As a group as we develop our own personal configurations we have the opportunity to share what we discover and perhaps initiate some projects of mutual benefit such as the testing of software and hardware. I think a topical area will be the use of filters to temper the light dome of the city that most of us have to view under.