

The Sun and the Aurora and how to take a picture of them

The Sun in White Light

If you are interested in using a white light filter and a regular camera to prepare for the 2024 eclipse I would highly recommend Alan Dyer's eBook on photographing the eclipse

<https://www.amazingsky.com/EclipseBook>

I make my own solar filters with Baader No. 5 paper. <https://astrosolar.com/en/information/how-to/how-to-make-your-own-objective-solar-filter-for-your-camera-or-telescope/>

This paper is safe for visual (through a telescope) and photographic work. A Baader Green Continuum filter is often useful in white light for both visual use and imaging.

The Sun in H-Alpha

Most of my solar imaging is in H-alpha. Two popular types of H-alpha solar filters are the dedicated H-alpha solar telescopes by Lunt and Coronado, and the Quark Solar filters, (Chromosphere, Prominence and Gemini models).

I use the Lunt 40mm scope and it is tilt tuned and has a 400 mm focal length. I also use the B600 blocking filter. There are smaller (B500) and larger (B1200) blocking filters for shorter and longer focal lengths respectively. The Lunt 40mm is an amazing little telescope and great for imaging. Lunt has also announced a double stack option is coming to market soon. A "double stack" is a stack of two filters or etalons and is thought to increase contrast but also increases exposure time.

Here are two videos that peaked my interest in this cute little scope.

<https://www.youtube.com/watch?v=0nLEnCvdE0Q>

<https://www.youtube.com/watch?v=bcXVj0rokHM>

I also image with a Starfield Optics 102 ED refractor and a Quark chromosphere filter. The Quark conveniently makes use of any regular refractor that you may already own (f/5-F/7 is the best) An inexpensive f/7 doublet makes the best refractor for the Quark. You should not use any of the 4-5 element refractors such as a petzval configuration as there is too much heat reflecting in the telescope.

There is a Quark chromosphere version (which can also see the prominences and not just the surface detail) and a prominence version. There is also a Gemini version (used by Simon Tang) which can alternate between the two wavelengths.

The Quark filter includes a built in 4.3x Barlow which makes it very zoomed in at long focal lengths. In my 102 mm telescope set up I actually enjoy using a 0.5x reducer. The 102mm refractor is also the largest aperture telescope you can use with the quark without a front mounted ERF (energy rejection filter).

The 102mm and smaller aperture telescopes can use a standard UV/IR cut filter at the Quark side of the scope to reject dangerous UV and IR light. I also use a tilt adapter which helps avoid Newton's rings. If you do planetary work and already own an atmospheric dispersion corrector (ADC) you can also use that as a tilt adapter.

Cameras and imaging in H alpha

I use a mono planetary cameras and lucky imaging (similar to the technique used for planets). Mono cameras are easier to focus and more sensitive and colour is added later in your favorite photo editing software. To make a mono image orange, you convert it to RGB, raise the red channel, lower the blue channel and adjust the green channel to make it glow.

For the Lunt 40 I love the 290MM camera. It is a smaller sensor so when combined with the B600 blocking filter and the 40mm LUNT I cannot capture the full disk. I can however do a 2-panel mosaic.

I use Sharpcap for imaging and use all of the techniques of Simon Tang including his use of the histogram to capture the prominences and disk in a single exposure. I capture video in SER video format, stack in Autostakkert, invert and increase contrast and sharpness in IMPPG and colourize in photoshop or Pixinsight.

The sun is very bright so you can get a short exposure to reduce the effect of seeing and stack a pretty small number of frames to get rid of the noise. Here are some videos that show the entire process from capture to processing with Simon Tang.

<https://www.youtube.com/watch?v=I5GrBVNuoE8>

<https://www.youtube.com/watch?v=5yjiC5zt-Xg>

<https://www.youtube.com/live/eIOP7Q8XEus?si=uxCkLko-girGWIHE>

<https://www.youtube.com/watch?v=xU7SBpKEnhk&t=6s>

The Aurora

Keys to seeing /imaging the Aurora. Can use DSLR/Mirrorless with a wide fast lens

- 1) Know when to expect the aurora
 - a. Download Space weather Live App
 - b. Watch for type 2 radio bursts (CME is launched)
 - c. Watch Dr. Tamitha Skow aka Space Weather Woman on Youtube to see if CME was launched towards earth
 - d. Visit NOAA to see the modeling of the CME
 - e. Wait for the solar storm (CME) to arrive – usually 2-3 days

- 2) The day of the Aurora
 - a. Watch the data in Space weather Live
 - b. Solar wind speed and density increase
 - c. BZ must be SOUTH
 - d. When BZ is south the hemispheric pressure will build
 - e. KP will rise Aurora will build
 - f. When Hemispheric pressure rises over 60GW consider getting really to head outside

3) In the field

- a. Camera should be in manual mode -focus on the stars
- b. Choose a wide fast lens 14mm – 20mm (full frame lens)
- c. ISO 3200 (dark sky) 800 (near City, big moon)
- d. Wide open aperture f/18-2.8
- e. 5-10 s exposures shorter is better