

# Astronomy tests Daystar's Quark

Ease of use, extreme portability, and a great price make this Hydrogen-alpha solar filter one to consider. **by Michael E. Bakich**

**H**ere's a prediction that I know will come true: In the next two years, interest in solar observing will rise dramatically. You probably can guess why. With the great solar eclipse of August 21, 2017, in our future, lots of people will want to prepare by purchasing a filter to view the Sun through.

Most will buy visual solar filters, also known as "white-light" filters. Such an accessory blocks harmful infrared and ultraviolet radiation and reduces the Sun's visible light to a comfortable level. Such filters let you see sunspots.

But if you want to see more than just sunspots, you'll need to move into the realm of Hydrogen-alpha (H $\alpha$ ) observing. Daystar Filters, a company that has been making such products for decades, has introduced a new player — the Quark — into that arena. It combines an all-in-one unit and the ultimate in portability with a price point below all but the smallest H $\alpha$  filters.

## Is that an eyepiece?

At first glance, you might mistake the Quark for a sleek 2" eyepiece. Daystar gave

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Daystar's Quark is a Hydrogen-alpha filter that fits into your telescope's focuser. The unit weighs only 13.9 ounces (394 grams).

ALL PRODUCT IMAGES: ASTRONOMY: JAMES FORBES

this product a cool look by anodizing the aluminum body black and red. The company also maximized its use (and sales) by making it fit both 2" and 1 1/4" focusers. The filter outputs to a 1 1/4" eyepiece (or camera adapter) using a brass compression ring to avoid marring the barrel, and the company does sell a 2" eyepiece holder for \$45. To use it, you just unscrew the 1 1/4" one and screw in the larger piece.

Daystar designed the Quark to work on refractors with focal ratios from f/4 to f/8, which immediately puts it in play with "grab-and-go" scopes. The filter has an internal heater that requires power to operate, and you can get that power in two ways: either from a USB 3.0 port (5 volts, 1.5 amps) or via the 90–240VAC wall adapter (that even comes with international plug adapters).

If you plan to do a lot of observing away from home, I suggest you also purchase the 30-amp battery pack (QBP30) that Daystar offers for \$89. This unit has both 2-amp and 1-amp USB outputs (the Quark filter uses the 2-amp one) and a solar panel that recharges it on site. Because the Quark requires 1.5 amps, a fully charged battery

pack will run it all day, even without the solar-panel recharging.

## The big choice

Because no single filter is perfect for all applications, Daystar produces two versions of the Quark: Chromosphere and Prominence. As the names indicate, each has its specialty, although there's enough overlap that you will see prominences through the Chromosphere filter and surface details through the Prominence unit.

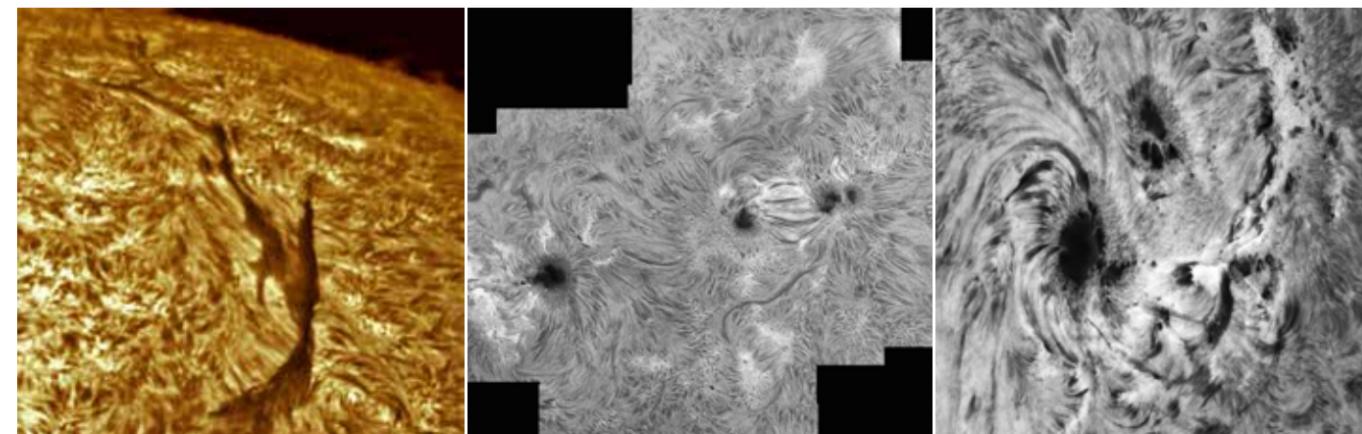
Technically, Daystar separates the two varieties by stating that the bandpass of the Prominence filter is from 0.8 to 0.6 angstroms while the Chromosphere filter is from 0.5 to 0.3 Å. "Bandpass" is the range of wavelengths the filter lets through. Each filter centers on the wavelength of the H $\alpha$  line, 656.28 nanometers (or 6562.8 Å, which conforms to the units the company gives the bandpass in).

## A bit of tech

The Quark is a 4.2x telecentric Barlow lens that incorporates a 21-millimeter H $\alpha$  filter and a 12mm blocking filter. All optical elements receive anti-reflective coatings at the factory. To further reduce scattered light (which decreases image contrast), the company has built the unit with a series of internal baffles.

H $\alpha$  filters that attach to the eyepiece end of a refractor often require an extra energy-rejection (ER) filter in front of the objective lens (that is, between it and the Sun). That pre-filter gets rid of much of the harmful radiation before it enters the main filter. If you mount the Quark on a 6-inch (150mm) or larger scope, use an ER filter at the front of the telescope.

The other time you'll need to use an ER filter is if your telescope has optics at other



In addition to using the Quark to observe visually, purchasers of the unit also are imaging the Sun through it. These three examples show some of what's possible. (The photographer gave the leftmost image a yellow tint during processing.) LEFT TO RIGHT: GARY PALMER; JOE SULLIVAN; RANDY SHIVAK

points within the tube. One example of this is the Petzval design. Without an ER filter, the two lens elements inside the tube would become too hot.

If your objective is less than 6 inches in diameter, you can use an optional UV/IR blocking filter Daystar sells (DSIUUV2, \$120). Just screw the filter onto the front of your star diagonal, and drop the Quark into the other end.

Daystar states that you can use the Quark without any ER filter for occasional views of the Sun on telescopes with apertures less than 3.15 inches (80mm) and non-tracking mounts. In both cases, excessive heat wouldn't build up within the scope. And, indeed, I had no problems viewing through my 3-inch alt-azimuth-mounted refractor without a filter off and on for several hours.

The only knob on the Quark controls the heater, which really determines what the central wavelength is. Each detent on the knob shifts it by 0.1 Å, and the filter allows a 0.5-Å adjustment either way. This puts different details — as well as some that are rotating toward or away from you — "on band." Just be sure to give the filter

a few minutes to attain the new temperature once you rotate the knob. One nice feature the company included is an LED that changes from yellow to green when the filter is on band.

Daystar claims that from a cold start the Quark takes approximately 15 minutes to reach operating temperature (the LED turns green). I can confirm that length of time as an average, although on one sunny 20° F (–7° C) day in Wisconsin when I used the optional power supply, the heating element required an additional five minutes to warm up (and I never did get warm).

And here's a tip I thought of only after my first two observing sessions with the Quark: Plug the filter into the power supply first, even before you set up your telescope. You can even do this on the way to your observing site. Then, once you've set up your scope, carefully attach the Quark without unplugging the power cord from the battery pack. It will be at temperature and ready to rock.

## The views

The Quark helped me remember why I love observing the Sun. Once the LED turned green, I saw prominences, faculae, flares, and, yes, even sunspots. I didn't concentrate on the spots themselves because there was such a vast amount of detail near them.

One of the cool things about solar viewing is that some of the Sun's features, mainly prominences and flares, show noticeable changes in real time — in just minutes. I saw tree-shaped prominences reform into arcs and then to spouts within 15 minutes. And in twice that time, I observed flares, which appear as bright (even overexposed) regions, sending out tendrils from which new flares formed.



Two optional accessories you'll want to consider are the UV/IR blocking filter (above) and the 2" eyepiece holder.

I did some experimenting with the Quark's heater knob, although I really didn't need to. The on-band views never disappointed me. After trying numerous settings (and waiting for the green "Go" LED), I found only twice when the view of part of the solar scene (once a set of prominences and the other time a sunspot group) improved. Still, the  $\pm 0.5$ -Å control is a nice option to have.

## The verdict

For me, three things made the Quark great fun to use. First, it's not a complicated setup: plug in power; insert into focuser; and observe. Second, the device is ultra-portable. It and its power supply (bubble wrapped) fit into my fabric telescope case. And third, when coupled with my 3-inch refractor, views through the Quark surpassed my expectations.

I love observing the Sun and turning people on to how utterly cool it is. Daystar has given me something new to suggest to them that won't break the bank. ☺

## PRODUCT INFORMATION

### Daystar Quark Hydrogen-alpha filter

**Optical design:** 4.2x Telecentric Barlow lens

**Models:** Chromosphere and Prominence

**Power requirement:** USB 5 volts, 1.5 amp

**Weight:** 13.9 ounces (394 grams)

**Price:** \$995

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