

We test Starlight Xpress' new camera

Light weight, low noise, and high quantum efficiency make the Trius-SX694 CCD camera a winner. **by Tony Hallas**

If you know me, you know I'm all about performance in a CCD camera. Recently, however, I discovered that good things can come in small packages. Starlight Xpress always has designed its CCD cameras around a compact architecture, and the company's latest entry, the Trius-SX694, is no exception.

The camera contains a third-generation Sony EXview Progressive Scan CCD chip with high quantum efficiency and extremely low thermal noise. The CCD chip features a matrix of 2,750 by 2,200 4.5-micron pixels in an active area measuring 12.5 by 10.0 millimeters. Some quick math and you will see that this is the ideal aspect ratio: It scales up to 8-by-10 or 16-by-20 print sizes without any waste.

Lots of details

The quantum efficiency (QE), or the percentage of photons the chip records, peaks at 77 percent in yellow light, with an excellent 65 percent from blue all the

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way to Hydrogen-alpha wavelengths. Beside the excellent QE, the broad spectral response works well with Astrodon series E filters, giving a combined ratio under dark skies close to 1:1:1.

All this means is that you can take and stack equal exposures for your final result. The anti-blooming (which restricts light to the pixels on which it falls) is superb, so you lose no active area despite the small size of the pixels.



The optional off-axis guider includes a pick-off mirror that captures light through the same optics the CCD camera uses. **TONY HALLAS**



The Starlight Xpress Trius-SX694 CCD camera measures less than 3 inches (76 millimeters) on a side and weighs only 14.1 ounces (400 grams). **COURTESY STARLIGHT XPRESS**



If I were to characterize this CCD camera, "versatile" is what comes to mind. I have used it with my 14.5-inch f/8 Ritchey-Chrétien scope at a 3,000-millimeter focal length for close-up views of celestial objects. And I've used it on my 4-inch f/3.8 astrographic refractor, which has a 380mm focal length, for wide-field views. Conventional wisdom dictates that the recorded detail is grossly oversampled (in other words, too many pixels per unit area) at 3,000mm, but I have found that this is not the case. Oversampling an image allows for better deconvolution (which lets you create sharper images), and it lets you reduce the sizes of stars because the image-processing software has finer increments to work with.

You do pay a slight price for such small pixels, and that is the deep-well capacity — how much light a pixel can hold before it saturates (fills up and is no longer effective). The deep well for each of the SX694 chip's pixels is approximately 20,000 photons, but it really doesn't matter in practice. If you have an image with a bright area, you'll want to shoot some shorter exposures and blend them with longer ones to pull out the fainter areas. This procedure is

PRODUCT INFORMATION

Starlight Xpress Trius-SX694

Type: CCD camera
Chip: ICX694AL EXview CCD
Quantum efficiency: 77 percent (yellow light); 65 percent (Hydrogen-alpha)
Power consumption: Less than 1.5 amps at 12 volts DC
Dimensions: 2.95 by 2.76 inches (75 by 70 millimeters)
Weight: 14.1 ounces (400 grams)
Price: \$2,795
Contact: Starlight Xpress
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standard when imaging the Orion Nebula (M42), for example.

I can illustrate the versatility of the Trius-SX694 by letting you compare the two images of M82 that you'll find to the upper right on this page. I took the left with my 14.5-inch scope and the right with my 4-inch refractor. The 4.5-micron pixels worked extremely well with both telescopes due to the low noise, high overall QE, and excellent spectral response.

New features

The Trius is the latest camera body design from Starlight Xpress, and it has some new features. The company filled the CCD chamber with dry argon to improve the cooling. That coupled with a high-performance, two-stage cooler can bring the chip's temperature to 72° F (40° C) below ambient. On the back, you'll find a three-port powered USB hub that can drive a Lodestar guider and the SX filter wheel. All you need is a single USB connection to the computer.

All Trius cameras use a multicoated fused-silica window at the front of the camera to seal the CCD chamber. Using this material ensures that all the near-ultraviolet and infrared light entering the camera can do so unhindered, letting you capture a greater spectral range. It also has better heat transfer characteristics than glass, so as the camera body warms, the front window also warms slightly to help prevent dew from forming.



This pair of images illustrates the versatility of the Trius-SX694. The author took the close-up image of the Cigar Galaxy (M82, left) through his 14.5-inch f/8 Ritchey-Chrétien reflector, which sports a 3,000-millimeter focal length. He captured the wide-field image of M82 and its companion, Bode's Galaxy (M81), through his 4-inch f/3.8 astrographic refractor (380mm focal length). **TONY HALLAS**

I have used many CCD cameras in my life, but none allowed me to get to the filters as easily as the SX filter wheel. You simply unscrew a few thumbscrews, remove the back, and there they are. It's so easy to clean the filters that you could do this before every image if you wanted to.

You also can attach the company's accessory off-axis guider directly to the filter wheel, which makes for a compact imaging system. The guider features an easily adjustable prism height to let you decide how much of the light beam to capture before the prism casts a shadow on the CCD. A little experimentation will give you the perfect setting. Many other interface options allow you to attach the front of the filter wheel to just about anything.

Because of its compact size and efficient design, the Trius-SX694 weighs only 14.1 ounces (400 grams). Users of heavy CCD cameras will be surprised when they pick up this camera

The optional filter wheel (shown here with filters removed) uses the same power as the Trius-SX694. Its positioning system also returns absolute filter locations, so you won't lose the filter wheel's position. **TONY HALLAS**



and its filter wheel. The light weight greatly reduces the possibility of focuser sag.

Because the SX694 lacks a mechanical shutter, you will need to cover the camera to shoot dark frames. Initially this seemed like a lot of extra work, but after I built a library of dark frames, it was inconsequential. (Indeed, the camera has such low thermal noise that you almost can get by without darks if you dither and combine your images with outlier rejection.)

I currently have two Trius-SX694 CCD cameras. One is permanently installed on my 14.5-inch scope, and I can use it either at the f/8 focal ratio (3,000mm focal length) or with a 0.75x telecompressor that reduces the focal ratio to f/6 (2,250mm focal length) for a faster, slightly wider field of view. The other is my portable camera that goes on a variety of telescopes I use either at home or at my super-dark site.

Remember one word

As I said earlier, "versatile."

No other word describes the Trius-SX694 as well. At home on almost any telescope, I have found this camera to be a workhorse with wonderful color capture, extremely low noise, high quantum efficiency, and excellent anti-blooming. Because of the SX694's high-resolution 4.5-micron pixels, small high-quality refractors can produce beautiful, highly detailed results. And, as many of my images show, large telescopes also benefit. Is it the perfect little CCD camera? It comes very close. ☺