

The Sky-Watcher Quattro 12-inch Imaging Newt

A Quest for Glorious Diffraction Spikes

By Richard W. Wright, Jr.

When I first started working at Software Bisque, I never admitted to anyone that I made any efforts at astrophotography. My earliest attempts were black-and-white film on the Moon, and some stabs at the planets with a homemade web cam-based video imager. Eventually, I acquired a DSLR and started shooting deep-sky objects. As I progressed, I went through a whole graveyard of poor-quality telescopes on my journey to imaging nirvana. One of my worst nightmares was my first “Imaging Newtonian.”

It was an 8-inch $f/4$ scope I picked up at NEAF one year and shipped home to myself after the show was over. I got it for a song, and as they say, you get what you pay for. I ended up paying more for the Tele View Paracorr than I did for the scope to correct for the coma (not the fault of the

scope, this is inherent in all Newtonians), and I somewhat painfully began what is now a full-blown obsession with deep-sky imaging.

My problems with that scope in particular started with a very loose mirror cell that moved, and would not hold collimation. The same could be said for the spider vane holding the secondary. It had a lot of what at Software Bisque we like to refer to as hysteresis, a bit of unpredictable flop in a mechanical system. Collimation was like trying to wrestle a big slippery wet fish to the ground.

The focuser was clearly never intended for anything other than an eyepiece, and every time I'd slew to a new target, I'd have to refocus due to the shift or flop (there's that hysteresis again). Typically, “most” of the frame would be in good focus. Still, I managed



Image 1 - Quattro 12-inch ready for action.

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Image 2 - Yes, it's as big as my couch.



Image 3 - Mirror cell out of the box.

some images with my unmodified Canon T1i, and the imaging fire was fueled, so in a sense, it served its purpose. I finally

gave it away at my astronomy club's star party to someone more mechanically inclined than I, and he fixed it up and was

eventually quite happy with it.

Over time, I grew better at what I was doing, and of course acquired better

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Image 4 - Don't over tighten!



Image 5 - Mirror cell from the back.

equipment, primarily fueled initially by my growing involvement in the imaging side of things where I worked. I have some nice instruments today, some world-class refractors, exotic catadioptric designs, etc. I gave away my laser collimators and smugly declared I'd never go

back to slumming it with an imaging Newtonian. I was of course, quite wrong.

There is simply no denying that a well-made, well-corrected Newtonian astrograph is one of the best values (bang for the buck) on the market today. They are inexpensive to make, and simple. You

just need to avoid one that is too cheaply made.

A friend of mine makes custom Newtonian astrographs, and the quality of his work, and the resulting images, began to sway my conception of these as "low class" instruments. Here is a way to get



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Image 6 - Protruding bolts prevented sliding into the versa-plate.



Image 7 - A retrofit to the dovetail as needed for my mount's Losmandy D-style connection.

really large apertures, without a second mortgage. So it was again one year ago at NEAF that I came by the Sky-Watcher booth to chat it up with my friend Kevin LeGore. They had a new imaging Newtonian on display there, and I recounted my story of woe when I first got started imaging.

Somehow, we got to talking about how I missed diffraction spikes, because they really punch up objects like open clusters, and what a great value a Newtonian really was. I wished him luck with the new product. He called me a few months later and asked if I'd like to try out one of the 12-inch models, because I was one of the few people he knew with a mount that could handle it. I immediately thought how nice the Pleiades would look with great big diffraction spikes, and so of course I said yes. A few weeks later, a box the size of a hot water heater showed up on my front porch.

Some Assembly Required

The Quattro 12-inch actually came in two boxes. One contained the main body of the tube and all the accessories, and another well-packed box contained the 12-inch mirror. I thought this was much smarter than trying to ship a large rectangular box that was especially heavy on one end; that would be a recipe for trouble during shipment.

The mirror cell is simple to put together, and the collimation push/pull system is tight and slop free. Speaking of tight, one thing to be careful of is your own sense that everything must be tight down here. The mirror itself is already in the cell, held in place by three rubber-retaining clamps. These felt loose to me, so I immediately tightened them down without thinking. A subsequent call to Kevin at Sky-Watcher informed me that this stresses the mirror and will deform it ever so slightly, causing image distortion.

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Unless the mirror is literally sliding around, don't over do it here!

I've always felt an attraction towards small, compact scopes, and this 12-inch is now the largest instrument I have use of. I have to say, though, 12 inches of mirror is a glorious sight to behold.

What you're really assembling is the mirror cell with the bracket that goes on the back of the scope. Once assembled, you just set the scope on the ground bottom up, turn the mirror cell over and drop it right on. A set of Philips-head screws around the periphery will hold it in place.

This is a big piece of Borosilicate glass, and the rear cell comes predrilled for attaching a fan if needed. The open design of a Newtonian also helps a lot with cooling, but the black paint does make for a hot scope in the Florida sun. I keep the scope covered with a reflective



Image 8 - Ready to go with a DSLR.

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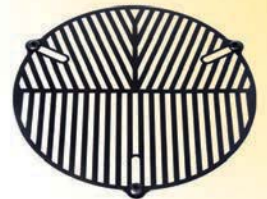
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Image 9 - Don't expect this to work well on a scope this size

cover during the day and only uncover it after the sun has set. I've found so far that by astronomical twilight, the scope is ready to go, but the very best images with ambient cooling are still a good hour

away without a fan to help the mirror cool off. I also live in a climate where the temperature does not drop that much at night. As they say these days, your mileage may vary. Sky-Watcher USA

does not offer a specific fan kit for this scope, but adapting a fan to the rear cell should not require a feat of mechanical engineering.

My first and only mechanical challenge with this scope was the included Losmandy-D dovetail. I have three Paramounts and at pounds assembled, this will need to go on my MX+ or ME II.

The issue is that the dovetail was attached in such a way as to easily facilitate mounts where the scope "rocks" in from the side, and then clamps down on the dovetail. On the Paramount's versa plate, we do this for the really big scopes with an additional bracket adapter, but in Paramount Land, a 12-inch scope is not really very big. The versa plate is designed so that smaller scopes slide in from the top or bottom, and the large bolts on either side of the dovetail prevented this. The dovetail is also shorter than the versa plate, so the option to unbolt one side

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Image 10 - Glorious diffraction spikes!

during mounting would not work either.

At first, I found a spare dovetail in my shed, but it required mounting the scope off balance to one side. I tried this in the backyard, and it seemed stable, but I opted instead to get a new universal dovetail directly from Losmandy. This has a nice recessed hole in the center that allowed the scope to slide easily in place on the Paramount's versa-plate.

So let me think ... what did I do with that HoTech laser collimator I bought a few years back? Oh yes, I traded it at a swap meet for a set of rings! One of the lessons learned in my earlier Newtonian years was that cheap laser collimators were good for one thing; teasing your neighbor's cat. A quick visit to the OPT website, and I was back in the Newtonian

collimation business a few days later with a brand new HoTech laser. This time I'll hang on to it!

Unlike my earlier experiences, this was a breeze. A tweak to one screw on the secondary brought the laser to the center of the primary mirror, and a few adjustments to the main mirror cell centered the reflected laser back on the collimators target. Piece of cake. No Newtonian is going to arrive after shipment collimated, much less if you have to put the mirror cell on yourself. I was actually starting to feel the excitement of getting this beast out under the stars.

First Light

I took the Quattro down to my observatory under darker skies than where

I live in Central Florida. Also included for evaluation was the optional \$285 coma corrector. The back focus for this was 55 mm, and the same Canon DSLR adapter I use on my two Sky-Watcher Esprits fit it perfectly and placed the chip the correct distance from the back threads. For my first attempt, I decided to go full frame and put on my Canon 5D Mark III, which is unmodified, and used a Lodestar-powered guide scope I placed in the finder-scope bracket.

My resulting configuration was 1220 mm of focal length (the coma corrector does not modify the focal length, by the way), at $f/4$ on a full-frame DSLR chip. This would be a good test of how wide the corrected field was, and a DSLR should do very well at $f/4$. One of the ad-

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Image 11 - Corner performance was reasonable.

vantages of a large chip, too, is that even at 1220 mm of focal length, I could fit the entire Pleiades star cluster in the field of view! Being that the camera was unmodified, a reflection nebula would suit it just fine, and I was hoping for some glorious diffraction spikes as a reward for my return to the Newtonian camp. I was not disappointed.

First though, I have to point out that guiding in this configuration did not work out that well. A secondary guide scope such as this works well for me on the Esprit 150, but the Esprit is operating at a slightly shorter focal length (1050

mm), and is more rigid. This large scope with a metal body flexes considerably, and the old guiding nemesis – differential flexure – reared its ugly head after only about three minutes of exposure time.

Differential flexure is when the optical axis of the main imager and the guide camera start to drift apart over time due to the ways the two different mechanical systems are flexing over time. A thousandth of an inch difference can work out to many arc seconds of error in your guider images. On subsequent nights, I would successfully go with an off axis

guider on a CCD, or use the Paramount's ProTrack features to defeat this. The smaller Quattros, likely as well, would be less sensitive to this.

The focuser does its job and while certainly not a premium model, it holds a DSLR or small CCD camera well, doesn't slip, and doesn't rock back and forth. A 10-to-1 ratio Crawford-style reduction knob makes focusing by hand possible. The one issue with not having automated focusing is, of course, this is a BIG scope, and access to the focuser knobs while pointed to a high object may be awkward or not even possible. This

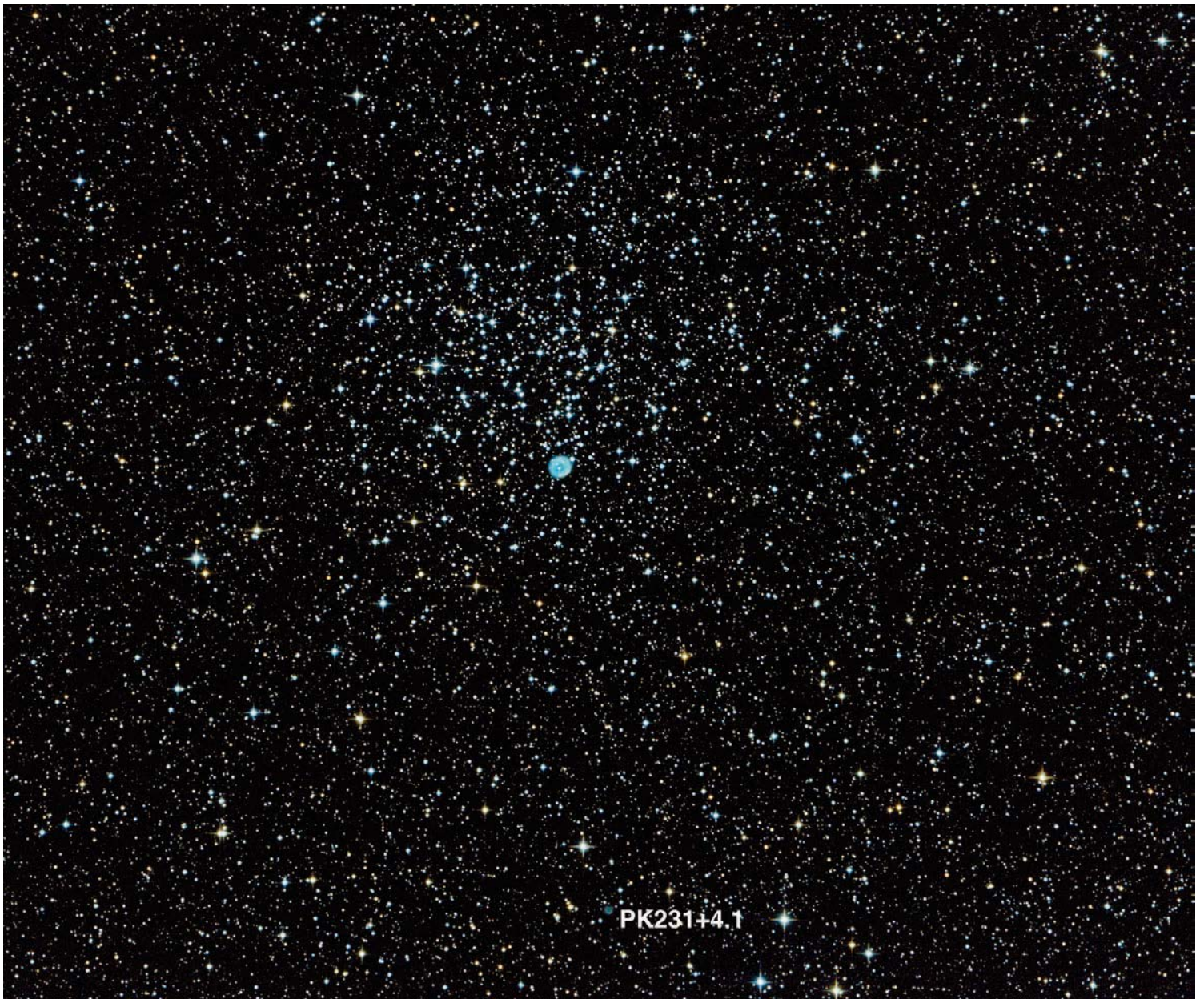


Image 12 - Messier 46 and two companion planetary nebula.

was compounded by my habit of placing the focuser UP instead of off to the side in order to maintain better balance and less flexing on the imaging train. Fortunately, I was able to focus on a lower star in the sky, and the focuser would hold focus when I slewed to a higher target. Focus will of course shift over the night as the metal tube retracts while it cools off. I did not find this to be a problem, however, as you have to give the instrument

an hour or so anyway for the mirror to cool and get best results.

Back to Evening #1

I ended up with a pile of short exposures on the Pleiades at ISO 800. While not as deep as I've gone on this subject before, I must say the diffraction spikes on the stars are glorious, and make up for the lack of depth. This object was my youngest son's favorite, and he preferred the less deep

treatments of some of my earlier images of M45. He had passed away recently, and this was my first attempt back under the stars since then, and so I shot these partially in his honor as well. I think he would have been very pleased.

It's also worth noting perhaps that, this particular evening, my wife had come along for the first time ever to get away from the house (and I didn't want to leave her alone ... or be alone myself at that



Image 13 - A sparkling Globular Cluster.

time). I was simply not in the mood for fighting with imaging equipment, and I had already resigned myself that this might be “just a camping trip,” and I didn’t care if I got any images or not.

I mention this mostly to highlight what a hassle free experience this was for me that night. Short of a refractor, an imaging Newtonian, however, is a very simple imaging system, and my first night out with the Quattro, everything “just worked,” and other than the short exposures was stress free. This was wonderful and timely at a time when my imaging acumen was not really up to its normal

standards.

Corner performance was not up to the standards of the Sky-Watcher Esprit 150 on this large a chip, but it was still pretty good. Zoomed in, the stars are clearly showing some distortion, but a slightly re-sampled (shrunk) image is still very good to the eye on a computer screen. On anything other than a full-frame chip, I expected the field to be nearly perfect in the corners, and I did find this to be the case.

Practice Makes Perfect

For subsequent adventures with the Quattro, I again choose to shoot with my

unmodified Canon 5D, as it provided a nice large field of view at the longer focal length of the Quattro 12-inch, and I would shoot some clusters where a modified DSLR was not needed. I found that I could go a bit longer unguided than guided because of the flexure, and four or five minutes was all I needed to shoot some open clusters with a DSLR at $f/4$.

Now, my very considered personal opinion is that open clusters are beautiful in an eyepiece, but just plain boring on camera. Without the dynamic range of a true visual view, the camera just cannot do them justice. But ... imaged through a



Image 14 - M81 fills the frame.

Newtonian, you get very nice diffraction spikes on the stars, and it does just make them seem to sparkle! I shot both M37 and M46, and just the hint of diffraction spikes really adds to the image.

Messier 46 in particular is a real gem in the eyepiece, and it turned out rather well, I think, on camera too with the Quattro. A cropped down version shows that not only did the planetary nebula NGC 2438 show up prominently, but I also captured the smaller lesser-known companion planetary nebula PK231+4.1.

I also made some shots with the Starlight Xpress Trius 694, using an off-axis guider. At $f/4$, I only needed five-minute exposures to go deep enough on anything I wanted. The Sony 694 is a much smaller chip than the full-frame Canon, and the stars were well corrected over the entire field. With smaller pixels and the long focal length, I went after a different set of targets (and needed to be able to guide without having to do an extensive mount model).

First, I shot the globular cluster M53. Globular clusters are my favorite object in

the eyepiece, and sometimes come close photographically. I was very happy with M53, with the smaller central stars showing a powdery quality, and the brighter surrounding stars having that “sparkle” that only a Newtonian can deliver (and don't get me started on adding diffraction spikes with Photoshop!).

I also shot Messier 81, as the galaxy filled the field of view splendidly on the Sony chip. Again, that sparkle around the galaxy just really adds to the image.

Finally, I had to try out the scope on



Image 15 - Jewel of the Winter Sky fills a CCD frame.

the ever-popular M42. I experimented to see how long I could go and still pull the trapezium out before over exposing; two minutes. Again, I find the subtle “sparkle” of the surrounding stars adds just a bit of character to the image that my other images of this object lack.

Conclusion

I have no hesitation in recommending the Quattro as a great starter imaging scope capable of delivering images any experi-

enced imager will also be happy with. I’d probably recommend for the beginner one of the smaller models, as a shorter focal length is easier to deal with when getting started. Also, you’ll need a very well made mount to put the 12-inch model on. As for me, I’m not done with this scope. I used to have a nearly post-traumatic stress response to the idea of collimating a Newtonian scope, and I can say I’m cured now that I have an instrument that didn’t cut too many corners to keep it “cheap.”

There are a lot of nice perks to a 12-inch mirror, and for sure I’m going to remove the coma corrector and try it soon on the Moon and planets with a Barlow and a high-speed CMOS imager. F/4 is also a nice photographic speed for shooting emission objects, and the focal length means I can get in tight on some interesting targets, perhaps even shooting some narrowband. All I need now are some clear skies and good weather! ☿