THE William Optics Gran Turismo 102-mm Apo Refractor

GREAT FOR VISUAL OBSERVATIONS, AS WELL AS DIGITAL IMAGING

By James R. Dire, Ph.D.

Image 1 - The William Optics GTF102 is shown mounted next to the GTF81 on which Dr. Dire previously reported.

Image 2 - As with the GTF81, the GTF102 features fully multi-coated lens elements with a special super-high transmission coating on all surfaces.

In the July-August 2013 issue of *ATT*, I had the privilege to write about the William Optics Gran Turismo 81-mm apochromatic (Apo) refractor. In this issue, I will cover its big brother, the Gran Turismo 102-mm Apo (**Image 1**).

Four-inch apochromatic refractors seem to be one of the most popular sizes used by amateur astronomers for both visual observing and imaging. High-quality Apo refractors cost substantially more than acromatic doublet refractors, and the cost seems to increase exponentially with aperture. Just scanning one website, a 3-inch Apo listed for $1200, a 4-inch for $2300, a 5-inch for $6000 and a 6-inch for more than $10,000. The 4-inch price range seems to be the choice for the majority of astronomers. Plus, 4-inch Apos have great portability and provide excellent views of binary stars, star clusters, planets, the Moon, and brighter galaxies and nebulae.

There are a lot of great 4-inch Apos on the market made by well known manufacturers. They usually come in objective sizes ranging from 98 mm to 105 mm, with focal ratios from f/6 to f/8. Most Apos have a triplet objective and make use of the best glass, usually FPL53.

As I discussed in my last article, even high-quality triplet Apos suffer from field curvature. However, using a field flattener between the focuser and the eyepiece or camera can eliminate field curvature. A few 4-inch Apos use a four-element optical design that totally eliminates field cur-

Image 3 - The nearly-full Moon imaged through both the GTF81 (right) and the GRF102 (left) with the same CCD camera, demonstrating the 47-percent increase in magnification achieved by the 102's 704-mm focal length.

vature and provide an optical system faster than f/6. These Apos are typically priced $1000 higher than the average triplet Apo. The William Optics GTF102 is a great, low-cost alternative to these higher priced Apos.

Like its little sibling, the GTF102 has an air-spaced triplet objective containing high-quality FPL-53 extra-low dispersion glass, in this case 102 mm in diameter, and a second group, located at the focuser end of the optical tube assembly, containing an air-spaced doublet with ED glass that serves as a built-in field flattener. Each lens is fully multi-coated with a special super-high transmission coating on all surfaces (**Image 2**).

Although the GTF102 has a 26 percent larger diameter objective than the GTF81, it has a focal ratio of f/6.9 compared to f/5.9. This results in a focal length of 704 mm, 47-percent greater than the GTF81. **Image 3** shows the nearly-full Moon taken through both telescopes with the same CCD camera, clearly showing the 47-percent increase in magnification. In addition, the GTF102 objective has 59-percent greater surface area than the GTF81, so it collects 59-percent more light. For 550-nm light, the GTF81 has a limiting resolution of 1.65 arcseconds, while the GTF102 has a limiting resolution of 1.13 arcseconds. Note the improved resolution of the 4-inch Apo over the smaller version in Image 3. (We routinely get 1-2 arcseconds seeing where I image in Hawaii.)

Image 4 - Dr. Dire recommends an Atlas-class mount for imaging with the GTF102.

The GTF102 comes with an extra-smooth 360-degree rotatable 2.5-inch rack-and-pinion focuser with 1:10 dual-speed knob on the right side. Like the GTF81, the slow-motion knob comes with a cover, and the left knob comes with a built-in analog metric- and English-reading thermometer. It can also be ordered with a Digital Display Gauge focuser. The telescope is 27 inches long and weighs 11 pounds. The GTF102 comes with a set of nicely machined tube rings, a Vixen-style dovetail plate, a 2-inch to 1.25-inch adapter, and a soft carrying case. It does not come with a diagonal or finder-scope bracket, eyepieces or a mount.

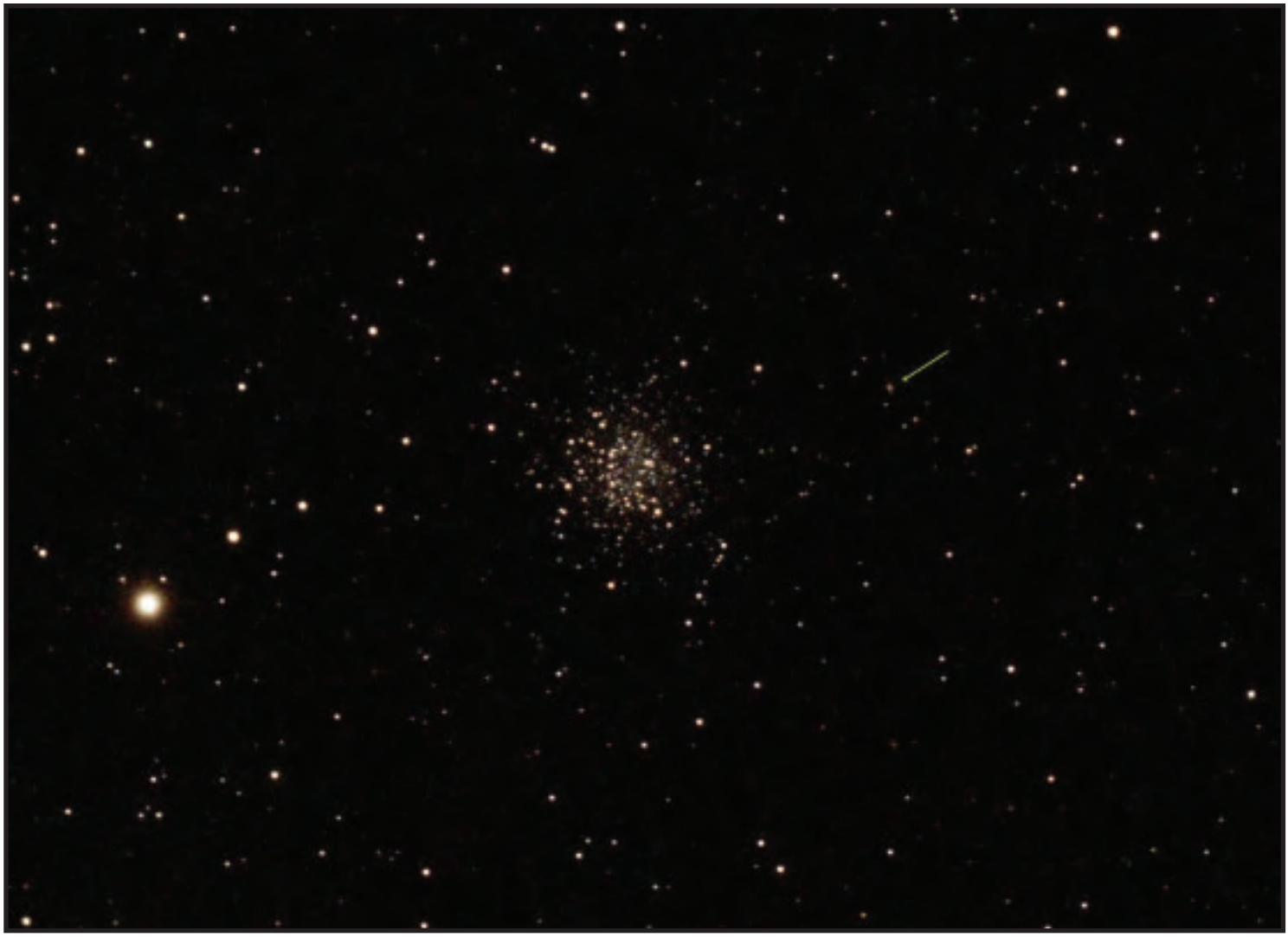

Image 5 - 10-minute exposure of 9.3-magnitude NGC5466 captured through the GTF102.

Besides being a great-sized telescope for visual observations, 4-inch Apos are ideal for digital imaging with CCD or DSLR cameras. A $10,000 mount is not required. Very superb results can be obtained with smaller German equatorial mounts. I would recommend one with at least a 30-pound payload capacity, because mounts in that payload range are of sufficient quality to produce very gratifying results. My CCD setup with an Orion Atlas mount and the GTF102 is shown in **Image 4**.

Like the GTF81, the GTF102 has superb color correction, as good as any other Apo I have used. The five-glass optical assembly produces an extremely flat field. **Image 5** shows a 10-minute exposure of the globular cluster NGC5466 in Bootes. The cluster is magnitude 9.3 and 11 arcminutes in diameter. I kept the exposure short so as not to overexpose the center of the cluster so that stars can be compared from the center to the edges of the image. As you can see, throughout the image the stars are perfectly round. Many blue and red stars are easily identifiable across the image. Despite the

short exposure, the faintest stars in the image are magnitude 17! The arrow points to a magnitude 15.5 spiral galaxy, a mere 43 x 20 arcseconds in size.

Image 6 shows a longer exposure, 20 minutes, of globular cluster M68 in Hydra. This cluster is magnitude 7.8 and, like NGC5466, 11 arcminutes in diameter. The longer exposure and brighter globular cluster result in many more cluster stars visible in the center of this image.

I like imaging deep-space objects, especially when I can capture two or more of them in the same image. The 704-mm focal length of the GTF102 is ideal for capturing such images. **Image 7** contains the galaxies M95 and M96 in Leo. M96 (left) is a magnitude 9.2 spiral galaxy measuring 8.5 x 5.6 arcminutes in size while M95 (right) is a magnitude 9.8 barred spiral galaxy 7.2 x 4.4 arcminutes in size. The exposure was 110 minutes, and all images were taken with an SBIG ST-2000XCM CCD camera.

My conclusions are the Gran Turismo 102-mm Apo is an outstanding refractor, great for visual observations as well as digital imaging. It is well-crafted and a beautiful instrument. It performs as well as any 4-inch Apo I have used. To get the same performance, you would have to buy a more expensive triplet Apo, plus an external field flattener, or an even more expensive four-element refractor. ATT

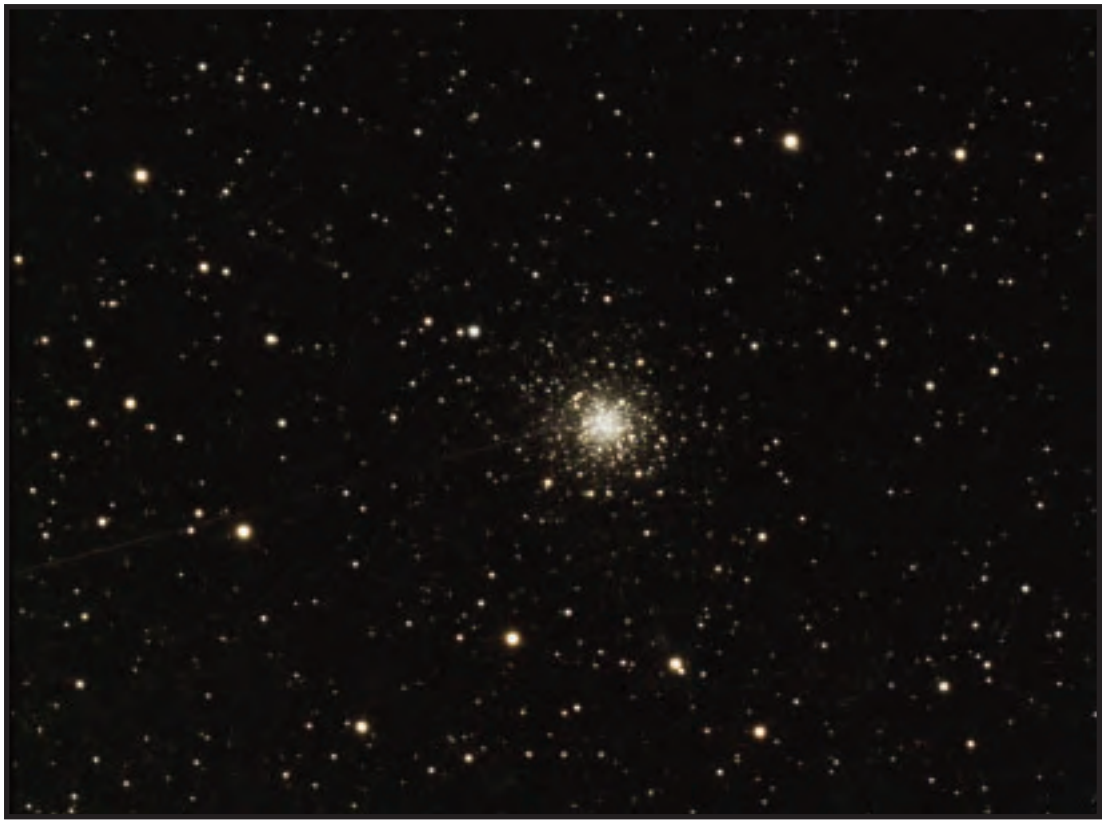

Image 6 - 20-minute exposure of 7.8-magnitude M68 using the GTF102.

Image 7 - This image of 9.8-magnitude M95 and 9.2-magnitude M96 consists of a total of 110 minutes of exposures captured through the GTF102 using an SBIG ST-2000XCM CCD camera