

The William Optics Gran Turismo 81-mm Refractor

Test Driving William Optics' Latest Innovative Telescope

By James R. Dire, Ph.D.

I have owned many refractors over the course of my life, both acromats and apochromats (often called Apos for short). See my article in the January/February 2011 for an explanation of the differences. Apochromatic refractors are the choice among most imagers due to their excellent color correction. Unfortunately, most short-focal length Apos suffer an aberration due to field curvature. This aberration causes off-axis stars to be elongated in the radial direction; the effect increasing with distance from the center of the image.

I currently use a 102-mm $f/7.9$ (800-mm focal length) refractor for imaging. I don't notice the field curvature with my small-format SBIG ST-2000XCM CCD camera. When the stars are in focus on the imaging CCD, they are pinpoint across the field of view. However, this model also has a guiding CCD, and I notice when stars are pinpoint on the imaging CCD, they are elongated on the guiding chip. In addition, when I switch to a larger-format camera, the field curvature near the edge of the images is unacceptable.

One solution to the refractor field cur-



Image 1 - The Gran Turismo 81 refractor.

vature problem is to use a field flattener between the focuser and the camera. Many commercial field flatteners also reduce the focal length, making the optical system faster. I use a 0.8x field flattener/focal reducer with my 102-mm Apo, giving it a 640-mm effective focal length ($f/6.3$). When the stars are pinpoint on the imag-

ing CCD, they are also very round on the guiding CCD. This optical accessory allows me to use a large-format camera to obtain very flat images (pinpoint stars across the image).

I recently had the privilege to test drive William Optics' latest innovative new telescope, the GTF81 Apo. While

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Image 2 - The left focus knob has a built-in analog thermometer!

most true Apos have a three lenses in the optical train, the Gran Turismo line of telescopes have five optical elements. The objective is an 81-mm (3.2-inches) diameter optical air-spaced triplet containing high-

quality FPL-53 extra-low dispersion glass. The second group, located at the focuser end of the optical tube assembly, is an air-spaced doublet containing 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. The focal length is 478 mm creating a fast $f/5.9$ imaging system. The advantages of the built-in field flattener are it shortens the overall distance from the focuser to the camera and requires one less accessory to store in the equipment case and attach for each observing run.

Image 1 shows the Gran Turismo 81. The optical tube assembly is beautifully crafted and made of aluminum. The tube is white with a metallic-red finish on the trim, clamshell ring, Vixen-style dovetail plate, tube cover, finder bracket and the focusing knob. The telescope does not come with a finder scope, diagonal, or any eyepieces, so they must be purchased separately. However, it does come with a 1.25 inch-to-2 inch eyepiece adapter. The dovetail plate is tapped to accept a $\frac{1}{4}$ -20 tripod screw. The finder bracket should hold most 50-mm finder scopes (the finder pictured in Image 1 is a 9x50 scope). The six

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The advertisement features a smartphone displaying the 'Monitor' app interface. The screen shows 'Communications UP', 'Session status Imaging IC1085', and a 'Timeout' of 1178. Below the timeout is a 'Stop!' button and a large 'ZZZZ' icon. A circular logo for 'Lunático Astronomía' with the website 'www.lunaticastronomy.com' is overlaid on the phone. A QR code is located at the bottom left of the ad. The background is a dark blue space with white stars.



Image 3 - The nearly full moon taken with an SBIG ST-2000XCM CCD camera.

alignment screws make it easy to adjust the finder parallel to the main telescope!

The GTF81 is very compact. Its storage length is 17.3 inches (440 mm) and when the dew shield is extended it is still only 19 inches (484 mm) long. The OTA weighs just over 8 pounds (3.7 kilograms).

The telescope comes with a great two-speed 2-inch Crayford focuser with left and right focusing knobs and a 1:10 fine focusing knob on the right side. Two cool things I have never seen on a focuser before are a cover for the fine focusing knob to protect it during transport and an analog thermometer built into the left focusing knob (see **Image 2**) displaying the temperature in both Fahrenheit and Celsius! The drawtube has 3.15 inches (80 mm) of travel and is graduated to aid in

returning to a focal position. Although the model I tested did not have it, the telescope can be ordered with a Digital Display Gauge.

By loosening a locking screw on top of the assembly, the focuser assembly fully rotates 360 degrees. I found the rotation to work very smoothly, and rotation does not affect the focus. This is great for re-framing images or looking for off-axis guide stars for imaging work. There is another locking screw beneath the focuser to keep it from slipping once a sharp focus has been achieved. This is the first telescope I have done CCD imaging with that tightening the focus locking screw did not slightly shift the focus!

Visually, the telescope performed superbly. I tested the Apo's color correction

with viewing of the Moon and Venus and found it to be perfect. At low and high powers, stars were pinpoint across the field of view. I viewed Saturn with my 5-mm Nagler eyepiece (128x). The rings were in their splendor with the Cassini Divisions easily seen.

With only 3.2 inches of aperture, this is not a telescope for deep-space observing. It will perform well viewing Andromeda Galaxy and its satellites, the Orion Nebula, and brighter star clusters. But it doesn't have enough light gathering power or focal length to significantly resolve globular clusters or to view fainter nebulae or galaxies.

This telescope is designed to be a small, light-weight imaging instrument. The 640-mm focal length will capture

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Image 4 - The globular star cluster M3 in Canes Venatici. The brightest star in the image is SAO 82944, magnitude 6.2. This 15-minute exposure captures stars down to magnitude 15.5.



Image 5 - Globular star cluster Omega Centauri, NGC5139. This cluster is 57 arcminutes in diameter.

wider fields of view than larger instruments, but it is still capable of resolving many deep-space objects.

My first image with the GTF81 was of the nearly full moon (**Image 3**). Since the Moon is one-half degree in diameter,

this image provides a good measure of the field of view with my CCD camera. Notice the sharpness of the image! Also, this is a color image. With proper color correction expected from an Apo, the Moon should not display any colors, especially around the edges.

My next image taken with the GTF81 was a 15-minute exposure of the globular cluster, M3, when it was high overhead (**Image 4**). The telescope does an excellent job resolving the stars in the cluster, and all stars are pinpoint to the edge of the image. This confirmed what I saw visually. On the right side of the image, halfway down from the top is the 14th magnitude spiral galaxy NGC5263 which measures a mere 1.1 by 0.4 arc minutes in size!

A difficult object to image from the northern hemisphere is NGC5139, Omega Centauri, the largest globular cluster visible from Earth. I was able to capture Omega Centauri with the GTF81 from Hawaii when it was only 20 degrees above the horizon (**Image 5**). The seeing was 2-3 arc seconds and the exposure was 20 minutes. The Gran Turismo 81 readily resolves an uncount-



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able number of stars in the cluster. The focal length is perfect for framing the entire cluster on the CCD.

Although small in aperture, the GTF81 will perform well imaging galaxies and nebulae. **Image 6** shows a 120-minute exposure of the galaxy M101. Because of its face-on orientation and large angular diameter, M101 has low surface brightness. A 4-6 hour exposure would have provided an exceptional image with the GTF81.

With its short focal length and wide field of view, this telescope is ideal for imaging galaxy groups such as Markarian's Chain or large nebulae such as the Rosette Nebula, Heart Nebula or the Veil Nebula.

In conclusion, this telescope is superb. It is lightweight, compact and easy to take on the road. Its optics are outstanding and the telescope performs just as good as much more expensive refractors in its class. 



Image 6 - Spiral Galaxy M101 in Ursa Major.

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