Baader Planetarium Anti-Fringing Filters

The Fringe Killer, Semi-APO and Contrast-Booster Compared

By Gary Parkerson

I've tested three quality achromatic refractors extensively in recent years: (1) Hands On Optics' Astro Telescopes AT102F11, the same 102-mm f/11 "Super Planetary" refractor covered in the March-April 2011 issue of *ATT*; (2) an Astro Telescopes AT1523, Hands On Optics' 152-mm f/5.9 rich-field refractor covered in the September-October 2012 issue; and (3) a classic 6-inch f/15 long-focus refractor with Jaegers objective that I helped my local astronomy club refurbished several years ago. All are excellent refractors, each exhibiting less chromatic aberration than I judge acceptable in achromats of their respective apertures and focal ratios – even the fast AT1523.

Nevertheless, each produced enough color fringing at high magnification on brightest objects to warrant anti-fringing filters. While working with the AT102F11, I took the opportunity to test each of Baader Planetarium's current trio of anti-fringing filters: the Fringe Killer, the Semi-APO and the Contrast-Booster. I also had the Baader Neodymium Moon & Skyglow filter on hand to stack with the Fringe Killer, a strategy I'd learned as a loyal reader of *Sky & Telescope*.

Thomas Dobbins Introduces Me to Stacking

For the past 10 years, I've used the Baader Moon & Skyglow filter more than any other in my nightly casual viewing. It tames the mild light pollution of my favorite observing site with-

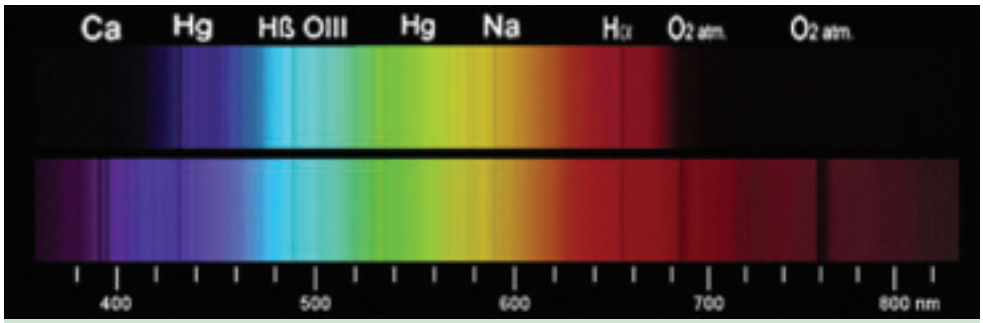

Image 1 - Spectrum of the Fringe Killer above the full solar spectrum.

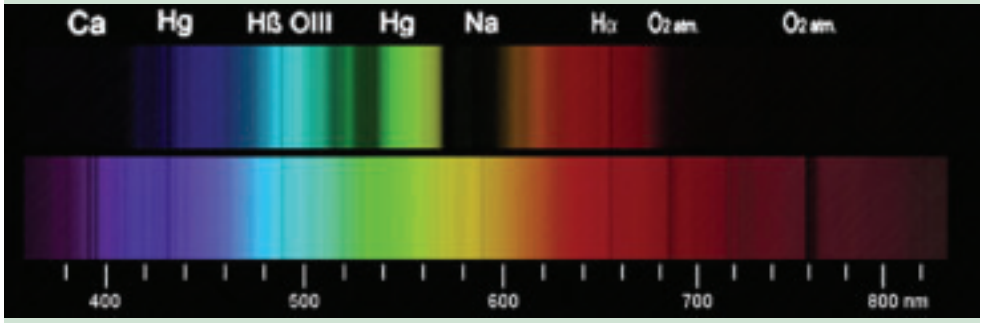

Image 2 - Baader Semi-APO spectrum above the complete solar spectrum.

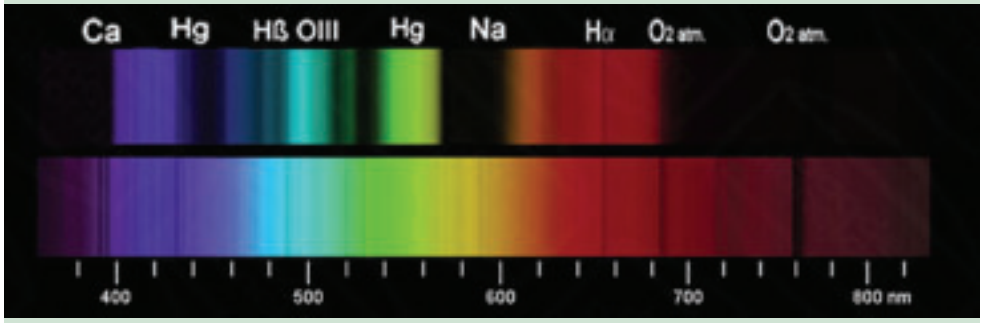

Image 3 - Spectrum of the Baader Neodymium Moon & Skyglow filter above the solar spectrum.

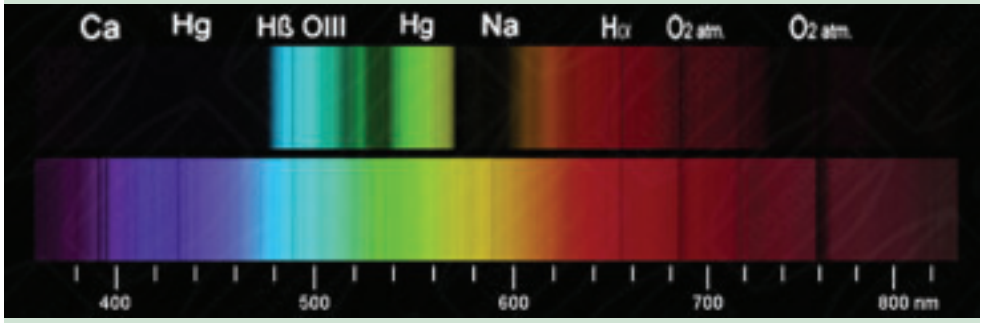

Image 4 - Contrast-Booster spectrum above the solar spectrum.

out adding an objectionably-unnatural hue, darkening the background sky perceptively without unduly dimming targets. Bottom line: It's my favorite all-purpose filter.

I was introduced to the Moon & Skyglow filter by Thomas A. Dobbins' article, *Curing the Refractor Blues*, in the April 2004 issue of *Sky & Telescope*. Dobbins tested a number of minus-violet filters with a 6-inch f/8 achromat, including the stacked combination of the Fringe Killer and Contrast-Booster filters, and it was that pairing that most impressed me. His image of sunlight glinting off of an electrical insulator – the classic daytime bright-star, point-source analog – shot through those stacked Baader filters was closest in overall hue to his sans-filter image, but without the violet fringe. I was so impressed with Dobbins' report of the Fringe Killer/Neodymium combination, that I bought both.

In contrast (pun intended), Dobbins' image of the insulator shot through the 6-inch f/8 and Baader's Contrast-Booster showed excellent cancellation of the violet fringing, but at the cost of an overall yellowish hue that I judged from Dobbins' report to be more objectionable than the fringing it cancelled. Hands-on testing of the Contrast-Booster would subsequently change my mind, but more on that later.

For the next five or six years, I used the Baader Neodymium filter almost nightly. It's not only the most benign light-pollution filter I've used, but also allows me to perceive greater detail and in the bright planets, as well as the Moon. Of course, I also combined it with the Baader Fringe Killer whenever viewing brightest objects through a quality achromat.

Then Baader introduced its Semi-APO filter, described as combining a stronger version of the Fringe Killer coatings with its Neodymium substrate. The stacked Fringe Killer and

Neodymium filters worked well, but stacking them is just one more thing I'd rather not have to do, so the Semi-APO sounded like a real winner. I called Bob Luffel of Alpine Astronomical, Baader's U.S. distributor, and requested one, along with fresh samples of the Fringe Killer and Moon & Skyglow. Although I'd long ago rejected the Contrast-Booster based upon Thomas Dobbins' 2004 report, I figured I might as well compare it to the others while at it, if only to confirm their superiority.

Baader Fringe Killer

The Fringe Killer is the least aggressive of Baader's anti-fringing options, formulated to attenuate the most distracting defocused wavelengths while retaining maximum image brightness and overall color fidelity. My observations confirmed these essential characteristics. Although not as color-neutral as the Semi-Apo, it was noticeably more so than the Contrast Booster. It reduced violet fringing significantly on bright objects, but not entirely. **Image 1** shows the spectrum transmitted by the Fringe Killer as revealed by an MPI-DADOS spectrograph compared to the solar spectrum below.

Baader Semi-APO

The Semi-APO filter overlays a slightly more aggressive version of the Fringe Killer coatings onto the Neodymium substrate of the Moon & Skyglow filter, combining the benefits of the stacked Fringe Killer-Moon & Skyglow filters without the hassles of threading two filters together. Its transmission spectrum is shown in **Image 2**, again compared to the solar spectrum. **Image 3** is shows the transmission spectrum of the Moon & Skyglow above the Sun's.

Baader Contrast-Booster

Alpine Astro describes the Contrast-Booster as "… an aggressive filter, designed to deliver the maximum sharpness and contrast possible from an achromat. The result is complete removal of the violet haze, with a somewhat dimmer and yellower image. The Contrast-Booster also incorporates additional RGB filtration for further enhancing color contrasts." That it completely removes violet fringing is a bold claim, and one I read with initial skepticism – even as I appreciated Alpine's confirmation that the filter produced the "dimmer and yellower" image revealed by Thomas Dobbins' photos. The Contrast-Booster's transmission spectrum is shown above the full solar spectrum in **Image 4**.

Two Eyes Are Better Than One

I set up the Astro Telescopes 102-mm f/11 refractor on a night in late November, 2011, next to *ATT* Associate Editor Austin Grant's imaging rig, and asked that he share his impressions using the Fringe Killer, Contrast-Booster and Semi-APO filters. I'd already tested the Semi-APO extensively and concluded it was my favorite of the three. Its performance reminded me of the stacked Fringe Killer/Neodymium combination that had satisfied me since 2004, so that was no surprise.

Austin is an astrophotographer and is so focused on that activity that he rarely looks through a telescope. I reasoned that his mind's eye would, unlike mine, not be prejudiced by expectations generated by years of through-the-eyepiece viewing. But I still expected him to agree that the Baader Semi-APO produced the most pleasing views. He studied Sirius sans filter and through each of the three Baader anti-fringing filters – back and forth, from one to another – and judged all successful in canceling the violet fringe to a satisfying degree, but kept coming back to the Contrast-Booster, which he finally declared the winner. He repeated the lengthy evaluation on Jupiter and still felt that the Contrast-Booster provided the sharpest, most violet-free and pleasing views.

To my eye, the Contrast-Booster did indeed yield the least violet fringing, but still at the cost of a decidedly yellowish overall hue. The cooler hues produced by the Semi-APO filter better fit my preconceived notions of ideal views. Austin had no such preconceptions, so reacted solely to the net reduction of fringing. Or so I thought.

Image 5 - DSLR image of sunlight glinting from a headlight shot through the AT102F11 without filter.

Image 6 - Sunlit headlight through the AT102F11 and Baader's Fringe Killer anti-fringing filter.

Image 7 - The same headlight through the AT102F11 and the Baader Semi-APO filter.

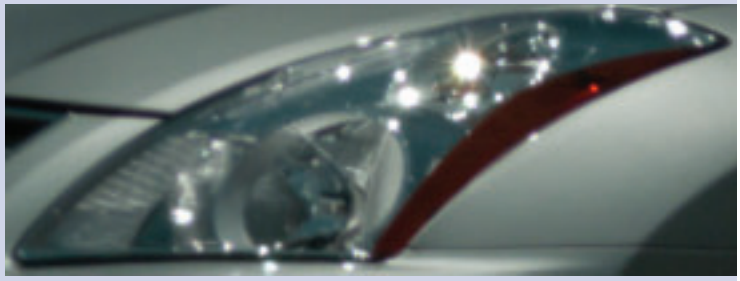

Image 8 - Image captured after adding Baader's Contrast-Booster. This aggressive filter removed all visible violet fringing.

When Eyes Don't Agree, Resort to Photography

We shot multiple photos of Sirius through the 102-mm f/11 achro using an unmodified Canon T2i DLSR, but the resulting images were too inconclusive to settle the debate, so I won't share them here. We met the next day to take daylight images through the Baader filters using the same scope and camera.

We set up in a shaded spot at the edge of a large parking lot at our local university, planning to photograph the sun glinting off a street lamp, but the school's dark-sky-friendly lighting shielded the reflective glass surfaces from direct sunlight – not so the exposed headlamps of the cars parked there. We targeted a particularly clean sample on the far side of the lot and hoped its owner wouldn't drive away before we'd completed the project.

My guess is that the newsprint interior pages of this magazine will not do the accompanying images justice, so I encourage you to view them instead in *ATT's* online digital version.

Image 5 is typical of the sharpest focus we could achieve in a single, unprocessed image across the sun-heated asphalt of the parking lot, but tells the tale of the chromatic aberration exhibited by the 102-mm achromat on a very bright object without benefit of an anti-fringing filter. The violet fringing is minimal considering the brightness of the reflected sunlight, testament to the quality of the little refractor, but it is

there.

Image 6 was taken after adding the Baader Fringe Killer and produced significant improvement in fringing without introducing a distracting degree of unnatural hue to the overall image. I now better understand why so many observers stick with this option.

Image 7, taken after adding the Baader Semi-APO filter, demonstrates significant improvement in mitigation of violet fringing – at least to my eyes – and does indeed effectively maintain the natural color balance of the overall scene, justifying my preference for that filter … until I saw **Image 8**, taken after swapping the Baader Contrast-Booster for the Semi-APO filter. Wow! Do you see any false color in that image? I don't. Yes, the overall hue of the image is a bit warmer than that captured sans filters or through the Semi-APO, but … wow! The photograph confirms Alpine Astro's claim of "complete removal of the violet haze."

Further Reflections on Baader Anti-Fringing Filters

Aside from the hues the filters add, ranging from negligible to noticeable, I noticed internal reflections that were not present when viewing through the eyepiece alone. These were faint, fleeting and infrequent, and only appeared when viewing the brightest objects, but they did occur from time to time. They were far dimmer than the filter-induced reflections I've experienced with other products, and I attribute this to the seven-layer antireflection coatings Baader applies to the ultra-smooth glass substrate.

I shared the Baader filters with a few advanced observers, and none noticed filter-induced reflections. I've been accused of having a shiny corneas, so perhaps that explains the faint ghosting I experienced at rare moments while enjoying these Baader filters. The fact that the dim reflections moved in concert with movement of my eye may be evidence that it is indeed my eye and not the filter-eyepiece combination. The fact that I did not notice these occasional reflections when viewing through the same eyepiece sans filters argues that the reflections are filter related. In either case, I don't mean to make too much of it. The reflections I noticed were infrequent and faint, and did not distract meaningfully from my enjoyment of the views.

Back to Jupiter

The daylight DSLR images we took through the Contrast-Booster and AT102F11 were simply astounding – enough so to reset my preconceptions of what constitutes acceptable performance by an anti-fringing filter. I went back to the 6-inch f/15 achromat on the next night of steady seeing and enjoyed some of my best views of Jupiter after adding the Baader Contrast-Booster. The seeing let me crank the magnification up well past 250x, where views remained as crisp and contrasty as any of Jupiter I can recall. I knew the old long-focus 6-inch was good, but these were

the best views I'd managed through it.

Given these experiences, I conclude that the Baader Fringe Killer filter is still well worth the price of admission as the most benign of the Baader anti-fringing options. If you already have the Neodymium Moon & Skyglow filter, and you should, then you need only add the Fringe Killer to achieve correction of violet fringing similar to that of the excellent Semi-APO filter. Meanwhile, I still like the Semi-APOs as the most color-neutral of the three. But, when I want removal of virtually all visible fringing and maximum contrast from a quality achromat, the Baader Contrast-Booster is now my go-to solution. ATT