

# Blake's funny foibles and frustrations trying to find focus during astrophotography, for free! A journey.

Thought I'd share a few discoveries in my long path to achieve better focus with telescopes or camera lenses using available free options. **Focusing is hard.**

**Consider a focusing mask.** Symmetrical diffraction patterns are produced and it becomes extremely obvious when out of focus (either inward or outward) and when at perfect focus. It is fantastic. Focusing becomes easy, fast, accurate, and repeatable. I use focusing masks during telescope collimation, when viewing surface details on planets, when splitting tight double stars, and during astrophotography.

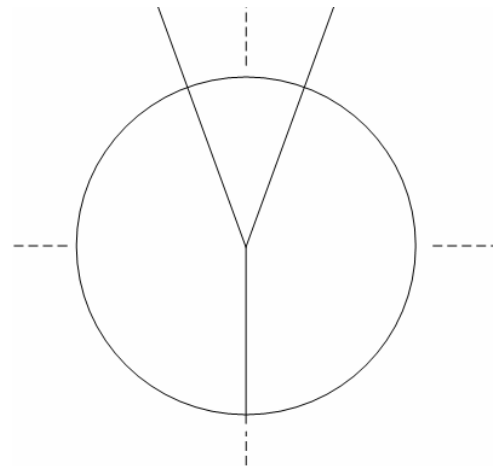
There are many types and designs for focusing masks. I learned of some at Jerry Lodriguss's astrophotography site (<http://www.astropix.com>). There's the Hartmann mask (two circles), Carey mask (slots at two different angles), and the triangle mask (with three openings). There is also the Gold Focus "system" with includes a mask (slots at five angles) and software analyses tools.

The most popular focusing mask is **the Bahtinov design** (slots at three different angles). Astronomy shops sell these masks. Typically they are made of plastic. For example, Jim Kendrick sells rigid and flexible Bahtinov masks (<http://kendrickastro.com/astro/index.html>).

You can **make your own** for free! That's what I did. Using the Bahtinov mask generator (<http://astrojargon.net/MaskGen.aspx>) I printed out a template for my 8" Celestron Schmidt-Cassegrain telescope, glued it to a sheet of cardboard, and with a box cutter knife, cut out the slots. It works great!

There do not appear to be focusing masks for **very small apertures**. The free templates, calculators, and generators do not seem to work at the small values required for camera lenses. I tried making a "baby" Bahtinov for the Canon EFS 18-55mm lens—it actually worked. However, the aforementioned masks block off a lot of the telescope or lens aperture. This is OK for a big telescope with lots of light grasp; dim stars will be significantly attenuated by a mask that blocks 50% or more of the light.

Happily, I learned of **The Y Mask!** It is a very open porous design that transmits the maximum amount of light. The angle of the Y-bars is 20° from the main bar. The Y Mask yields a diffraction pattern exactly like the Bahtinov mask. I made one out of regular paper and 20 or 22 gauge wire. It works great too!



In my travels I discovered **Bahtinov Grabber** (<http://www.njnoordhoek.com>). It is a free software tool (for Windows) that detects the diffraction pattern produced by a focusing mask. It can be quite helpful. It issues visual and audible alerts when the diffraction pattern is near or at perfect symmetry. By the way, Backyard EOS (<http://www.backyardeos.com>), the popular astrophotography application for Canon cameras, supports focusing with the Bahtinov mask. Hint: turn on Exposure Simulation.

For imaging on the Canon DSLR with the camera lens or with the DSLR body on the telescope, with a focusing mask, using **Live View** on the camera's built-in display, zoomed in 10 times, aimed at a bright star or planet, now I can reach excellent focus quickly with **few test shots**. I prefer to use the camera tethered a computer so to use the Canon **EOS Utility** software with Live View zoomed 2 times along with the Bahtinov Grabber app. EOS Utility also allows **remote focusing**. The large screen at **maximum brightness** and a **comfortable angle** combined with the ability to **immediately review** test shots at an even higher zoom level ensures **excellent focus**.

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