Improved Sensitivity Tri-Bahtinov Mask

Focusing and Collimating Tool

The Skylabs Improved Sensitivity Tri-Bahtinov masks are designed to obtain a very accurate focus and very precise collimation of reflector telescopes, including Schmidt-Cassegrain, Maksutov-Cassegrain, Classical Cassegrain, Ritchey-Chretien, Maksutov-Newtonian, and Newtonian Telescopes.

The Tri-Bahtinov mask improved by **C.Y. Tan** and **Satoru Takagi** has incorporated several enhancements compared to the traditional Bahtinov mask. It allows evaluating an even more accurate focus and it also allows detecting and correcting a misscollimation of a reflector telescope. This affordable tool is the result of vibrant cooperation and open-source contributions inside the astrophotography community.

While the traditional Bahtinov masks deliver a diffraction pattern, creating a set of three fine spike lines around a bright star, the Tri-Bahtinov masks generate a set of 18 spikes, which is crucial to assess an accurate focus in astrophotography.

The Skylabs Improved Sensitivity Tri-Bahtinov mask is based on eco-friendly 600gsm cardboard with a waterproof coating. The material is not only durable but also delicate with the telescope optics, especially for MCT, MNT, and SCT. The thin material and the CNC precision cut shape ensures an extraordinary precise diffraction pattern.

Each Skylabs Improved Sensitivity Tri-Bahtinov is created on-demand as it depends on each telescope's characteristics. To request one of these masks, you will need to provide the following accurate values in millimeters:

- Telescope **brand** and **model**.
- **Focal Length**.
- **Outer Diameter**: is the diameter of the inside wall of the telescope tube.
- **Inner Diameter**: is the diameter of the secondary holder.
- **inW**: is the difference between the radius of the secondary holder and the secondary mirror.
- **outW**: is the difference between the radius of the inside wall of the telescope tube and the radius of the primary mirror.

We recommend this type of mask for telescopes over 140mm of aperture. If you have a smaller telescope, consider using the Skylabs Enhanced Bahtinov masks, which has been designed for camera lenses and small telescopes, and it is several times brighter than traditional ones.
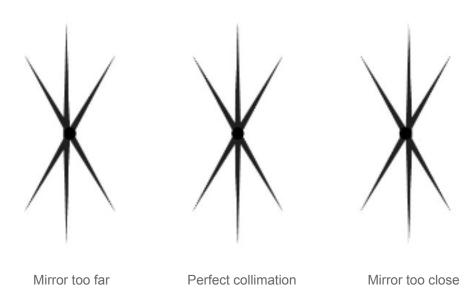
Each order includes:
- Tri-Bahtinov Mask
- Tri-Bahtinov Mask Cover (for collimation)
- Quick Guide

How to use the Skylabs Improved Sensitivity Tri-Bahtinov Mask for focusing

1. Set up the telescope and the camera for standard astrophotography.

2. Set the shutter to few seconds

3. Introduce the Skylabs Enhanced Bahtinov Mask in front of your telescope.

4. Point your telescope to a bright star.

5. Enable the zoom in the live view mode.

6. Move the focus to align the six central spikes with the other 12 spikes and take a shot.
   → If the image shows the central spikes are off to the left, the focus is too far.
   → If the central spikes are off to the right, then the focus is too close.

7. Iterate step 5 until you achieve the perfect focus.

8. Take the mask from the filter holder and proceed with the dark, flat, and bias frames as usual.

How to use the Skylabs Improved Sensitivity Tri-Bahtinov Mask for collimation

1. The initial collimation must be done with another tool, like a laser beam or Cheshire eyepiece. The secondary mirror needs to be correctly adjusted because the tri-Bahtinov mask will only help you to align the primary mirror.

2. Then introduce an artificial star in the center of the field of view and focus. You can do it with a kitchen aluminum foil wrapping a LED torch and drill a hole in the center with a pin. Move the torch to a reasonable distance.

2. Set up the tri-Bahtinov mask in front of the telescope, either over the spider or over the correction lens (SCT, MCT, etc.). Try matching the orientation of the three little holes located at the edge of the mask with the adjustment screws of the primary mirror. This will help you to identify which screw you should use.

3. Focus the artificial star following the instructions defined in the previous section until you get the best alignment in the diffraction pattern.

3. Introduce the mask cover on top of the Tri-Bahtinov mask and align the small holes of the mask and cover. This will generate a classical Bahtinov diffraction pattern.

4. Move the primary mirror collimation screw aligned to the uncovered mark to adjust the central spike with the other two.
   → If the image shows the central spike is off to the left, the mirror is too far.
   → If the central spikes are off to the right, then the mirror is too close.

| Mirror too far | Perfect collimation | Mirror too close |

5. Rotate the mask cover 120° and repeat step 4.

6. The changes introduced by the other two screws may introduce minor changes in the first screw. Iterate the steeps 4 and 5 until the three positions of the cover provide a perfect aligned classical Bahtinov diffraction.