

# MLAstro SHG700 Spectroheliograph

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The **MLAstro SHG 700** is a state-of-the-art, high-resolution solar spectroheliograph engineered for precise solar imaging. Designed with advanced features and intuitive operation, it is designed to serve both novice and seasoned astrophotographers. Unlike traditional etalon-based systems, the SHG 700 offers superior spectral resolution and enhanced flexibility in wavelength selection, enabling detailed monochromatic imaging of solar features such as H-alpha, Calcium K, and Sodium D. Its robust construction, digital integration, and user-friendly interface position it as a compelling instrument for solar observation, particularly within the amateur astronomy community. By merging modern optical technology with accessible design, the MLAstro SHG 700 represents a significant advancement in narrowband solar imaging.

The **SHG700** (Figure 1, 2 & 3) was developed by Nguyen T. Minh (PhD). Mihn runs a website (<https://mlastro.com/>) and sells not only the SHG700 but also lens kits for the Sol'Ex (<https://solex.astrosurf.com/sol-ex-presentation-en.html>) and accessories too.

## **Main Specifications:**

### *Optical Components:*

- 2x MLAstro 72mm flat-field compound lenses
- 1x 2400 l/mm holographic grating (25x25x6mm)
- 1x 7mm long, 7-micron wide Quartz slit (optional 10mm quartz slit)

### *Performance:*

- Enables full-disk scans with telescopes up to 730mm focal length in one pass.
- Comes fully assembled and calibrated, ready for immediate use.

### *Additional Accessories:*

- T2 (M42) to 1.25" adapter (for connecting the camera)
- 2" to M42 nosepiece (for attaching to the telescope)

## **Operational Principles of the MLAstro SHG 700 Spectroheliograph**

The MLAstro SHG 700 spectroheliograph enables high-resolution solar imaging by scanning the solar disk line-by-line in narrow spectral bands. Unlike etalon-based systems that provide real-time full-disk views, this instrument utilizes a precision quartz slit to isolate a narrow segment of incoming sunlight. The collimated beam is diffracted through a 2400 lines/mm holographic grating, producing a dispersed spectrum from which a monochrome camera records spectral slices at a selected wavelength. These slices are acquired sequentially—either manually or via motorized right ascension tracking—and subsequently reconstructed into a monochromatic image using dedicated software such as SHG GUI<sup>1</sup> or JSol'Ex<sup>2</sup>. Final image processing involves stacking, sharpening, and contrast enhancement, following

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<sup>1</sup> [https://github.com/thelondonsmiths/Solex\\_ser\\_recon\\_EN](https://github.com/thelondonsmiths/Solex_ser_recon_EN)

<sup>2</sup> <https://melix.github.io/astro4j/1.3.0/en/jsolsex.html>

workflows similar to planetary imaging. This technique offers superior spectral resolution and wavelength flexibility, making it a valuable tool for detailed solar studies.



Figure 1- MLAstro SHG700 Spectroheliograph.

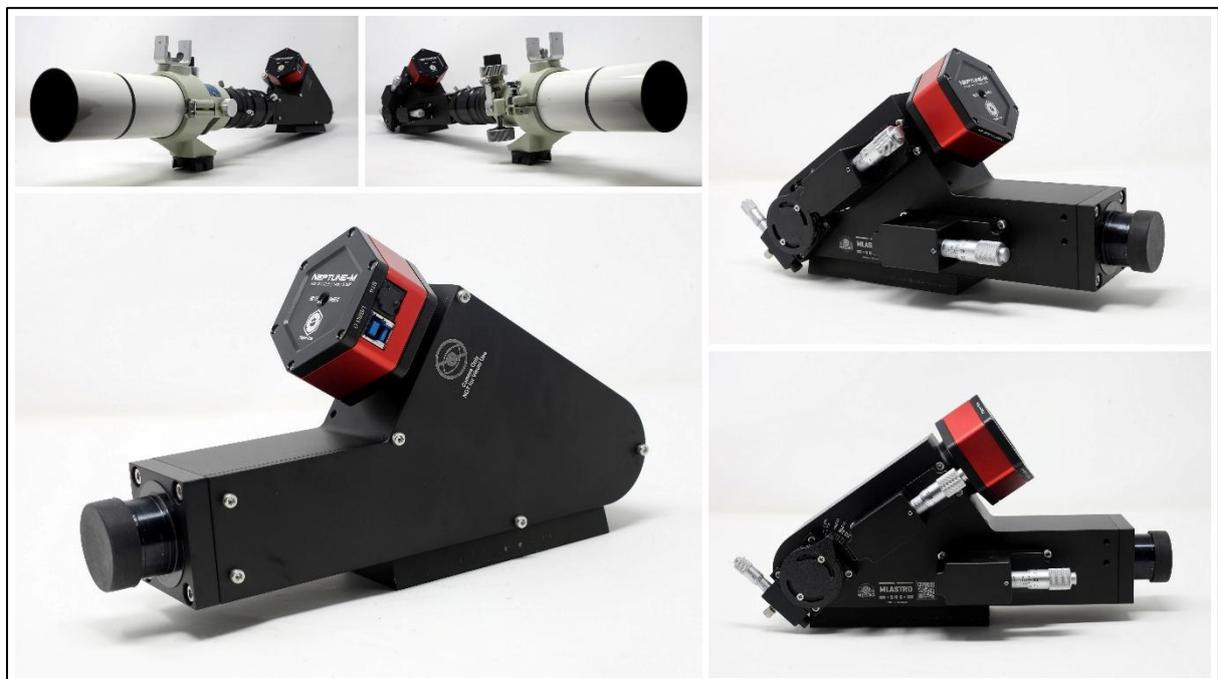


Figure 2- MLAstro SHG700 Spectroheliograph. Takahashi S60C & Player One Neptune M (IMX178).

## ✓ Pros of the MLAstro SHG 700

### ***Optical and Spectral Performance***

- Ultra-narrowband resolution ( $\sim 0.3 \text{ \AA}$  FWHM): Captures fine solar features with exceptional contrast.
- High spectral resolution ( $\sim R = 20,000$ ): Suitable for solar imaging

### ***Build Quality and Design***

- Preassembled and calibrated: No need for 3D printing or DIY alignment—ready to use out of the box.
- Premium materials: CNC-machined aluminium body,  $7\mu\text{m}$  quartz slit, and flat-field compound lenses ensure durability and optical precision.
- Micrometre-driven focus points: Allows fine control over image sharpness and slit alignment.

### ***Software and Workflow***

- Compatible with SHG GUI and JSOLEX for image reconstruction.
- Produces full-disk solar images with rich spectral detail, surpassing typical etalon-based systems.

### ***Versatility***

- Can be adapted for stellar spectroscopy with optional kits.
- Works with a wide range of telescopes and monochrome cameras.

### ***Cost Efficiency***

- Offers performance comparable to high-end etalon filters (which can cost tens of thousands of dollars) at a fraction of the price.

## ✗ Cons of the MLAstro SHG 700

### ***Imaging Time and Workflow***

- Not real-time: Requires scanning the Sun line-by-line, which takes several minutes depending on setup.
- Post-processing required: Image reconstruction and enhancement are essential, demanding familiarity with stacking and spectral software.

### ***Learning Curve***

- Requires technical understanding: Users must grasp slit-based spectroscopy and spectral alignment principles.
- Less intuitive than plug-and-play solar scopes

### ***Hardware Requirements***

- Needs a fast computer: Image acquisition and processing demand a modern Windows-based laptop or desktop (Linux support may be limited).
- Camera and telescope not included: Users must supply compatible gear

### ***Availability***

- Batch-based production: Units are released in limited batches, so availability may fluctuate.

## Step-by-Step Operation of the MLAstro SHG 700

### **1. Setup and Alignment**

- **Mount the SHG 700** securely to your telescope.
- Ensure the telescope is **polar-aligned** and tracking accurately (manual or motorized RA drive).
- Attach a **monochrome camera** to the SHG's output port.
- Connect the camera to your computer and launch your capture software (e.g., SharpCap or Firecapture).

## 2. Focusing the Optical Train

- Use the **micrometre focus knobs** to adjust:
  - **Slit focus:** Ensures the solar image is sharply defined at the slit (dust on the slit can be used for precise focusing).
  - **Collimator lens focus:** Optimizes the beam entering the grating.
  - **Camera focus:** Sharpens the spectral image on the sensor.
- Look for **scintillating vertical lines** in the preview—these indicate **critical focus**.

## 3. Targeting the Sun

- Slew the telescope until the Sun is centered on the slit.
- Use live view to confirm that the solar image is aligned and stable.
- Adjust tilt if necessary to remove vertical light band artifacts.

## 4. Spectral Scanning

- Begin the scan:
  - **Manual:** Slowly move the telescope across the solar disk.
  - **Automated:** Use a SharpCap script to control mount and camera synchronously.
- Record the scan as a **SER video file** or image sequence at the desired wavelength (*e.g.*, H-alpha, Ca K...).

## 5. Image Reconstruction

- Load the scan into **JSOLEX** or **SHG GUI**.
- The software stitches thousands of spectral slices into a full monochromatic image.
- Apply **stacking, sharpening, and contrast enhancement** if needed.

## 6. Post-Processing

- *Optional:* Colorize the image using false-colour palettes.
- Save final images in standard formats (TIFF, PNG) for analysis or publication.

## 7. Maintenance and Storage

- Clean the quartz slit gently if dust is present.
- Store the SHG 700 in a dry, padded case when not in use.

## Essential Accessories for the SHG 700

Accessory	Purpose
<b>T2 (M42) to 1.25" adapter</b>	Connects your monochrome camera to the SHG 700
<b>2" to M42 nosepiece</b>	Attaches the SHG 700 to your telescope's focuser or diagonal
<b>Monochrome camera</b>	Required for capturing spectral slices
<b>Tracking mount</b>	Enables smooth scanning across the solar disk
<b>Windows laptop or PC</b>	For image acquisition and processing with SHG GUI or JSOLEX

## Optional Enhancements

- **Solar finder scope:** Helps align the Sun quickly and safely
- **Neutral density or ERF filters:** Protect optics and reduce heat load (especially for larger apertures)
- **Custom mounting plates or dovetails:** For rigid integration with your existing setup



Figure 3- MLAstro SHG700 Spectroheliograph. Takahashi S60C & Player One Neptune M (IMX178).

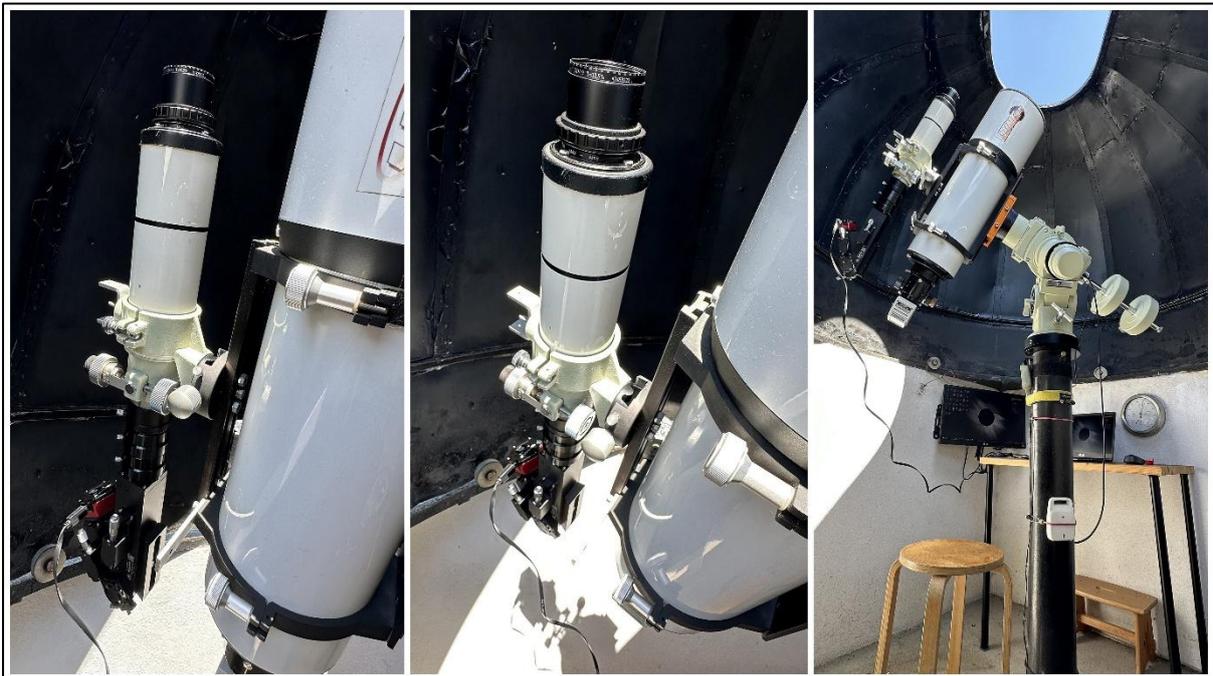


Figure 4 – MLAstro SHG700, Takahashi S60C & Player One Neptune M (IMX178), Takahashi EM-400 equatorial mount. Pedro RÉ (2025).

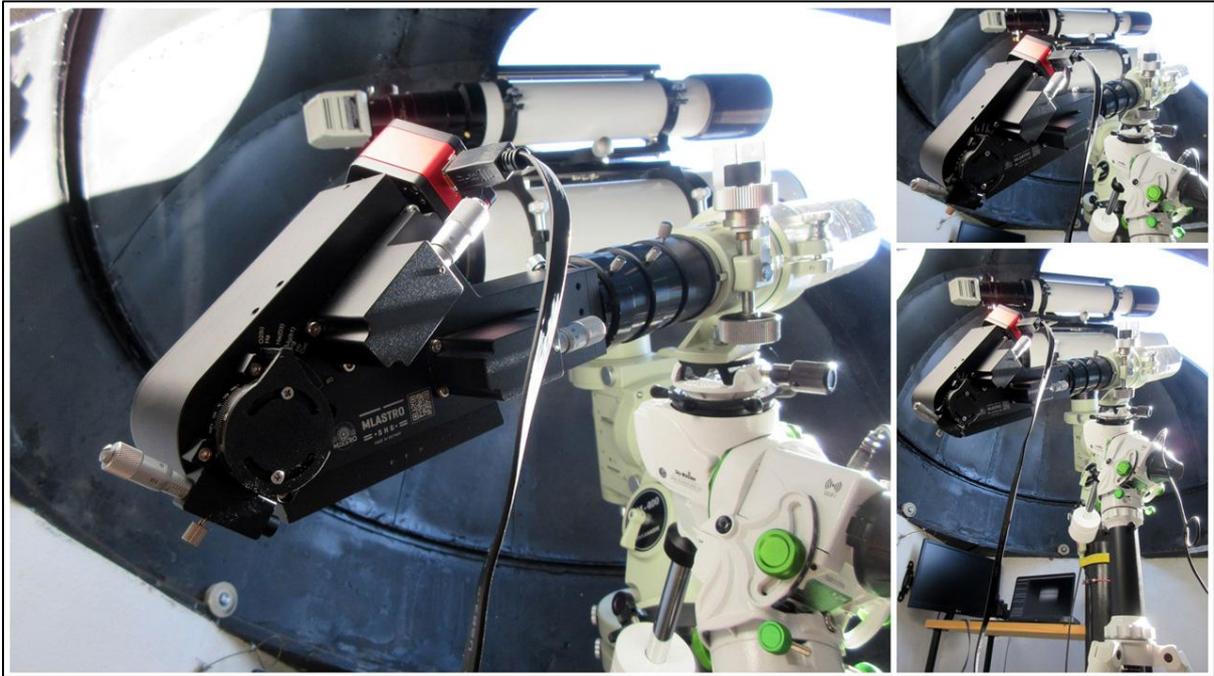


Figure 5 - MLAstro SHG700, Takahashi S60C & Player One Neptune M (IMX178), Sky Watcher star adventurer Gti equatorial mount. Pedro RÉ (2025).

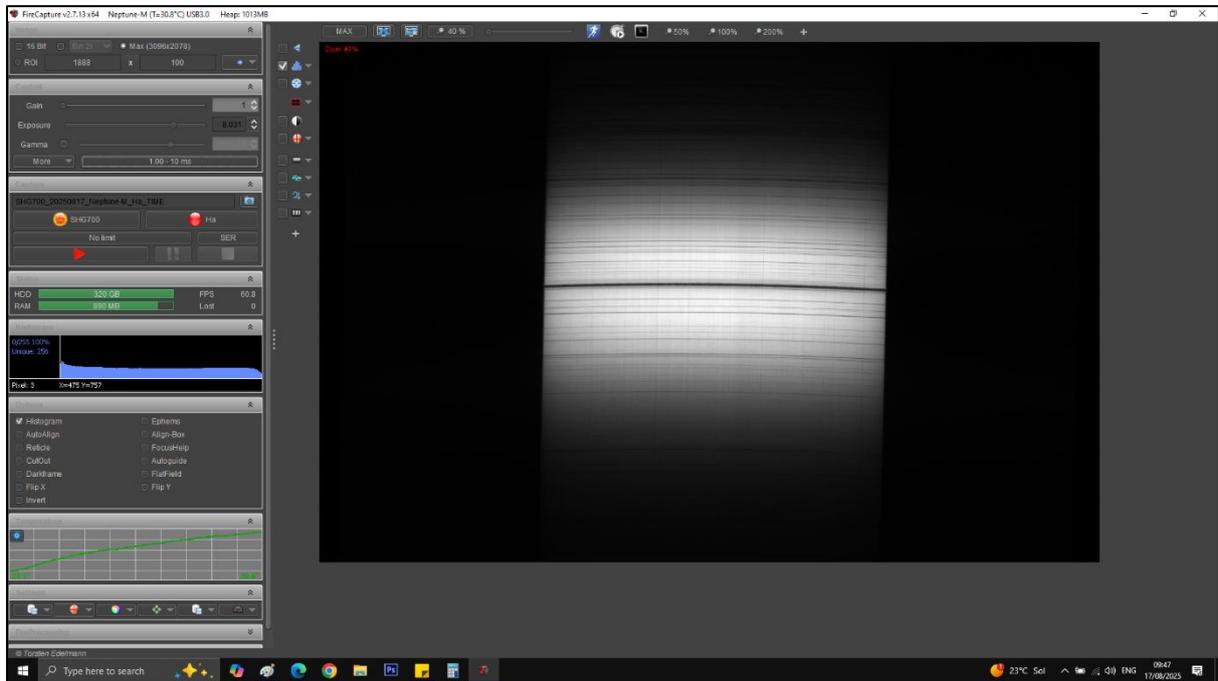


Figure 6 - MLAstro SHG700, Takahashi S60C & Player One Neptune M (IMX178), Sky Watcher star adventurer Gti equatorial mount. Firecapture acquisition software. Pedro RÉ (2025).

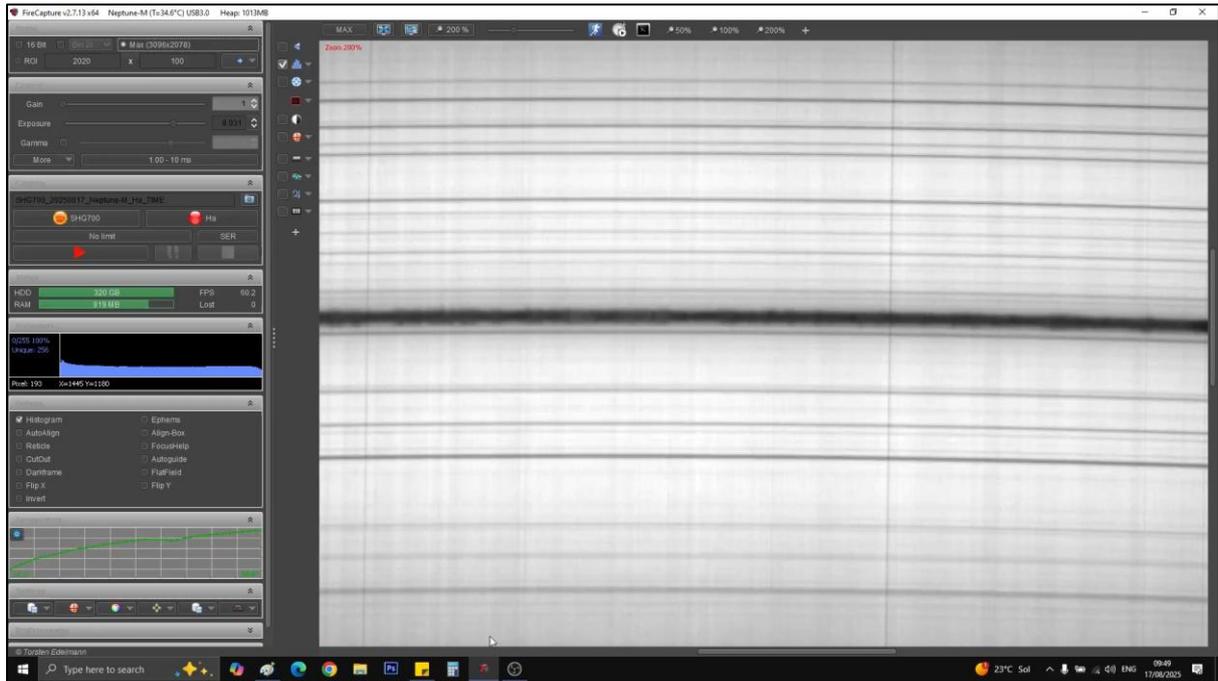


Figure 7 - MLastrO SHG700, Takahashi S60C & Player One Neptune M (IMX178), Sky Watcher star adventurer Gti equatorial mount. Firecapture acquisition software. Pedro RÉ (2025). *In Focus*

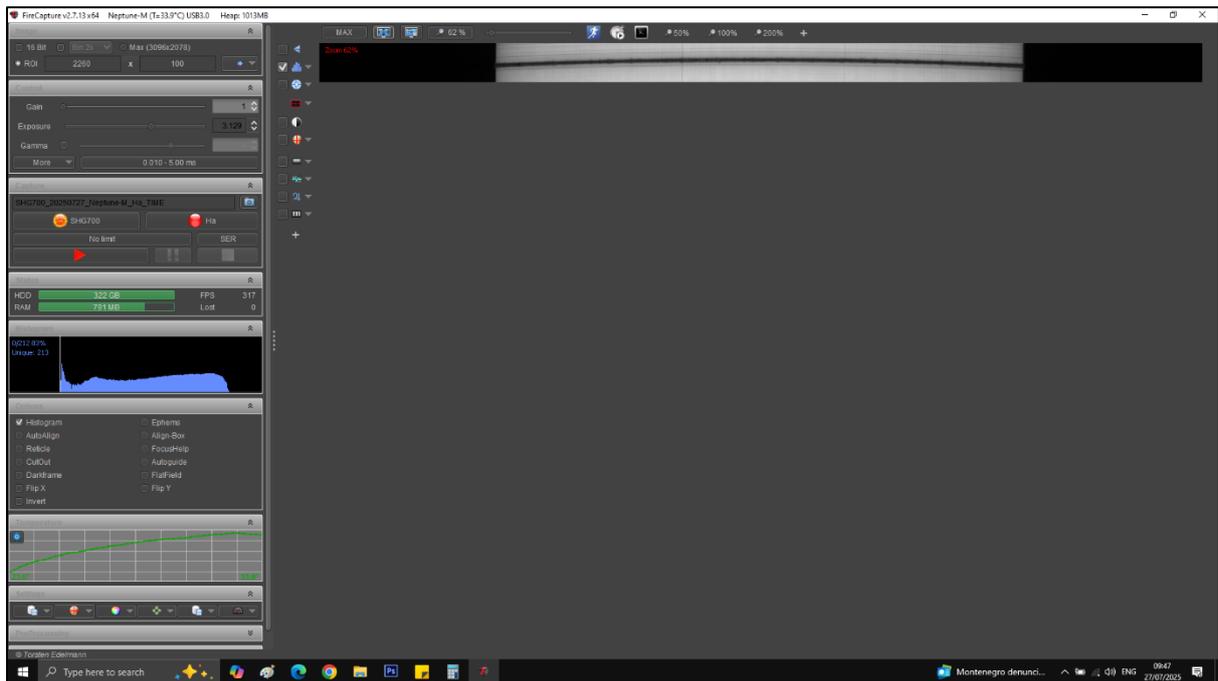


Figure 8 - MLastrO SHG700, Takahashi S60C & Player One Neptune M (IMX178), Sky Watcher star adventurer Gti equatorial mount. Firecapture acquisition software. Pedro RÉ (2025).

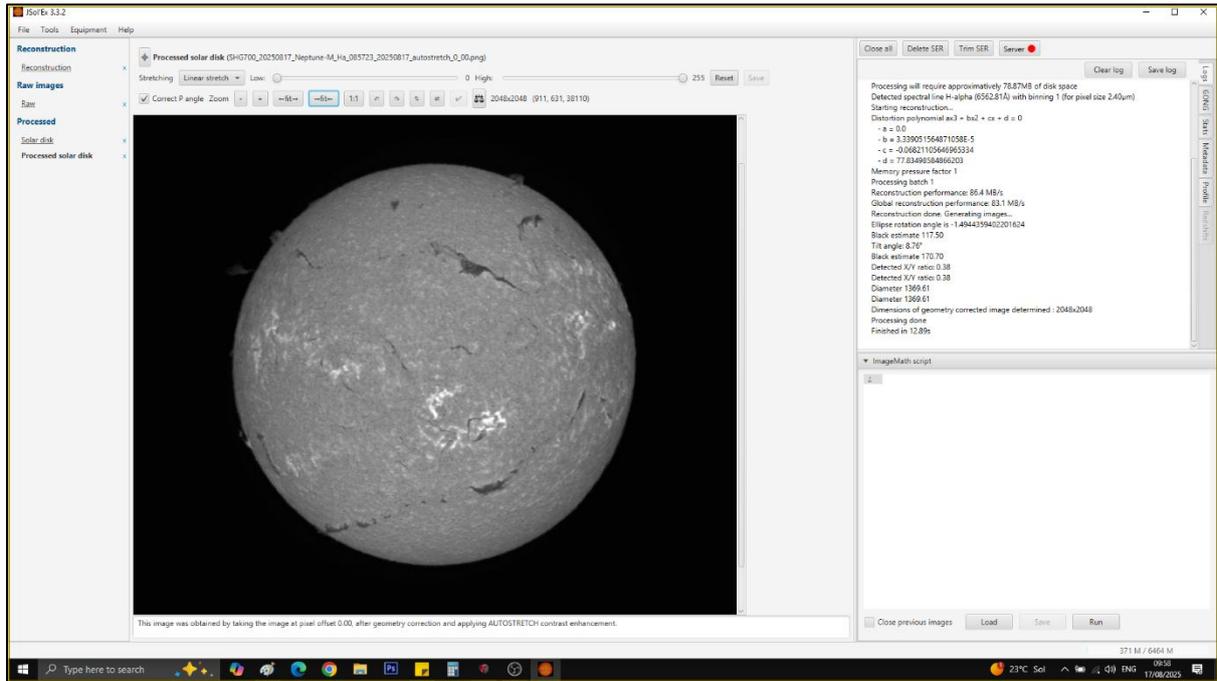


Figure 9 - MIAstro SHG700, Takahashi S60C & Player One Neptune M (IMX178), Sky Watcher star adventurer Gti equatorial mount. Firecapture acquisition software. Pedro RÉ (2025). **JSOLEX Software.**

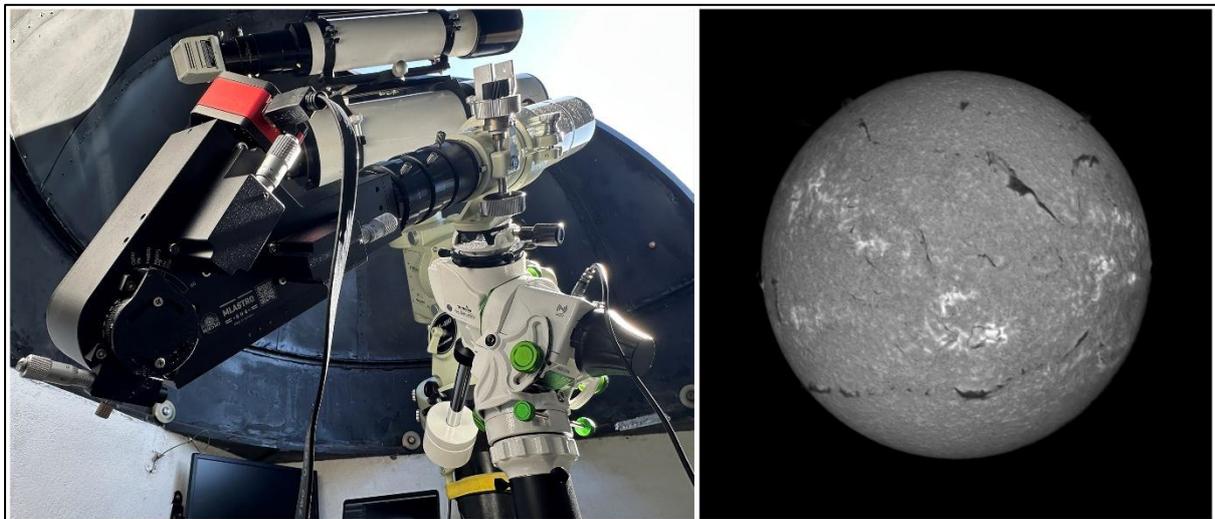


Figure 10 - SUN (20250817) H-alpha. FS60C f/5.9 MIAstro SHG700, Player One Neptune-M SW Star Adventurer Gti (10 stacked images). Pedro RÉ (2025).

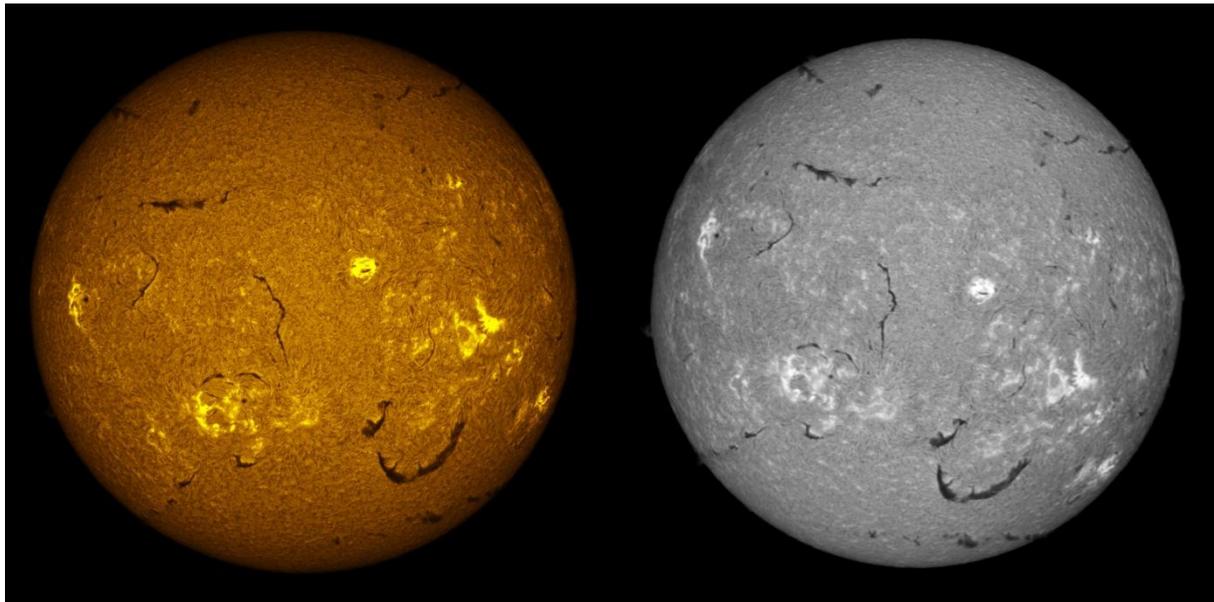


Figure 11 - SUN (20250801) H-alpha. TV NP101 F/5.4, Double Stack SM90II/SM60, FS60C f/5.9, MLAstro SHG700. Pedro RÉ (2025).

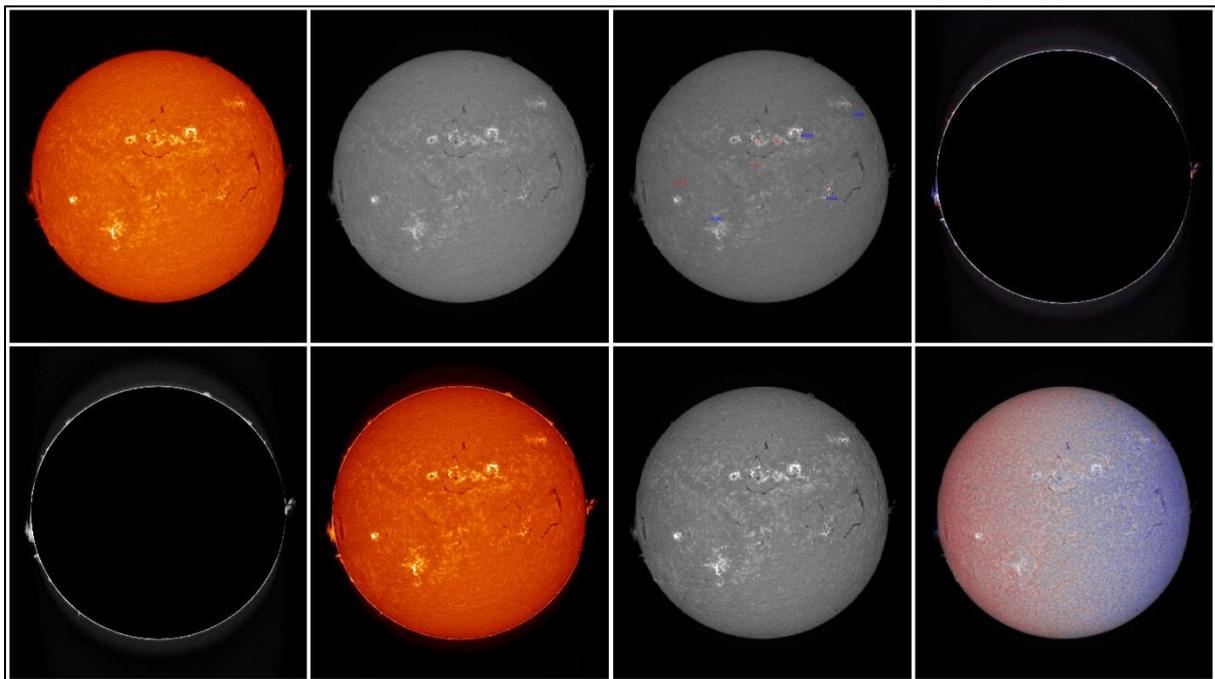


Figure 12 - SUN (20250715) H-alpha. FS60C f/5.9, MLAstro SHG700, Player One Neptune-M, SW Star Adventurer GTi | JSolEx. Pedro RÉ 2025).

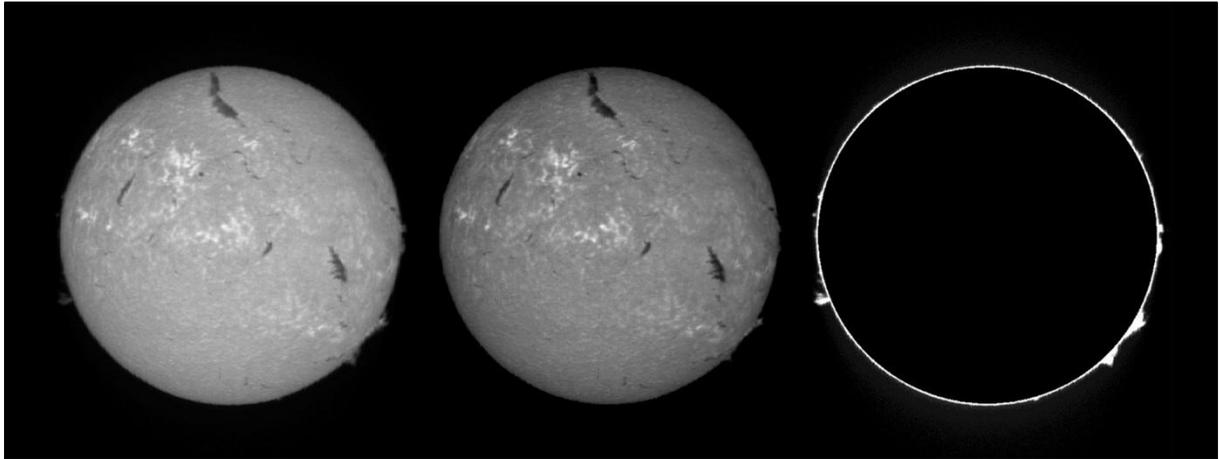


Figure 13 - SUN (20250517) H-alpha. FS60C f/5.9, MLAstro SHG700, Player One Neptune-M. SHG GUI. Pedro RÉ (2025).

### **References:**

<https://mlastro.com/> MLAstro Web site

<https://solex.astrosurf.com/sol-ex-presentation-en.html> Sol'Ex Web site

<https://espace-infini.fr/en/operating-principle-overview/> Sol'Ex overview

<https://espace-infini.fr/en/first-implementation/> User guide

<https://melix.github.io/astro4j/1.3.0/en/isoalex.html> JSol'Ex Web site

[https://github.com/thelondonsmiths/Solex\\_ser\\_recon\\_EN](https://github.com/thelondonsmiths/Solex_ser_recon_EN) thelondonsmiths/Solex\_ser\_recon\_E

[https://pedroreastrophotography.com/SHG700\\_pre.html](https://pedroreastrophotography.com/SHG700_pre.html) Pedro RÉ's Web Site

### **Youtube Videos (Pedro RÉ):**

<https://youtu.be/OuZavSBNPRo>

Solar imaging session (20250517) | Pedro RÉ

MLAstro SHG700 (First Light) | FS60C F/5.9 | Player One Neptune-M | Takahashi EM-400

<https://youtu.be/gkbT8e7Qckw>

Solar imaging session (20250608) | Pedro RÉ

MLAstro SHG700 (First Light) | FS60C F/5.9 | Player One Neptune-M | SW Star Adventurer GTi

<https://youtu.be/AtczYWC1lfE>

Solar imaging session (20250622) | Pedro RÉ

MLAstro SHG700 | FS60C F/5.9 | Player One Neptune-M | SW Star Adventurer GTi

<https://youtu.be/6O4VpVgddiU>

Solar imaging session (20250708) | Pedro RÉ

MLAstro SHG700 | FS60C F/5.9 | Player One Neptune-M | SW Star Adventurer GTi

<https://youtu.be/BAlkzvzGpJM>

Solar imaging session (20250722) | Pedro RÉ

MLAstro SHG700 | FS60C F/5.9 | Player One Neptune-M | SW Star Adventurer GTi

<https://youtu.be/Amqmc9oxXrs>

Solar imaging session (20250722) | Pedro RÉ

MLAstro SHG700 | FS60C F/5.9 | Player One Neptune-M | SW Star Adventurer GTi

<https://youtu.be/SxtlHoexTDs>

Solar imaging session (20250727) | Pedro RÉ

MLAstro SHG700 | FS60C F/5.9 | Player One Neptune-M | SW Star Adventurer GTi

<https://youtu.be/GEM8nX858J0>

Solar imaging session (20250817) | Pedro RÉ

MLAstro SHG700 | FS60C F/5.9 | Player One Neptune-M | SW Star Adventurer GTi