



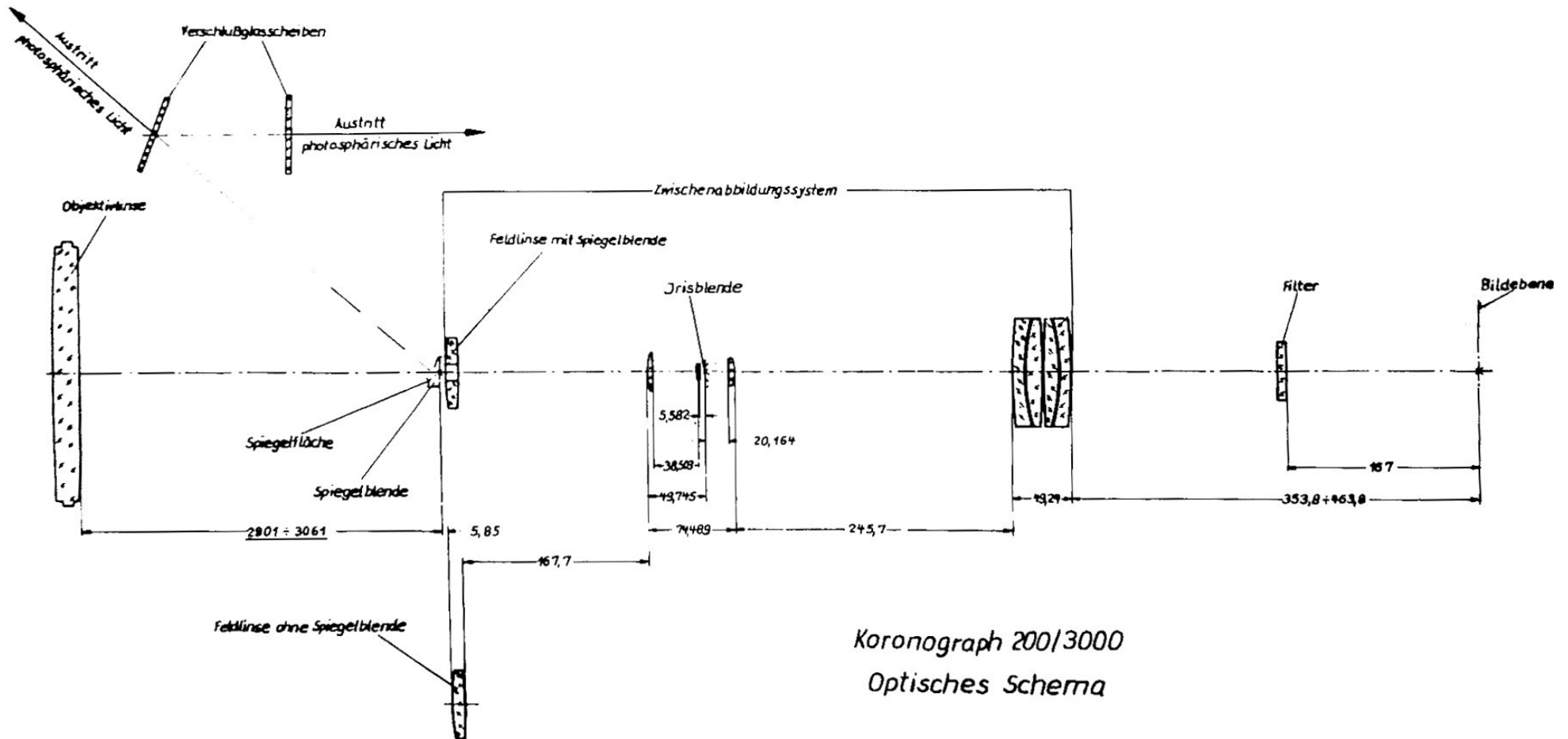
Practice at the LSO (in 30 minutes...)

Jan Rybak and the LSO group



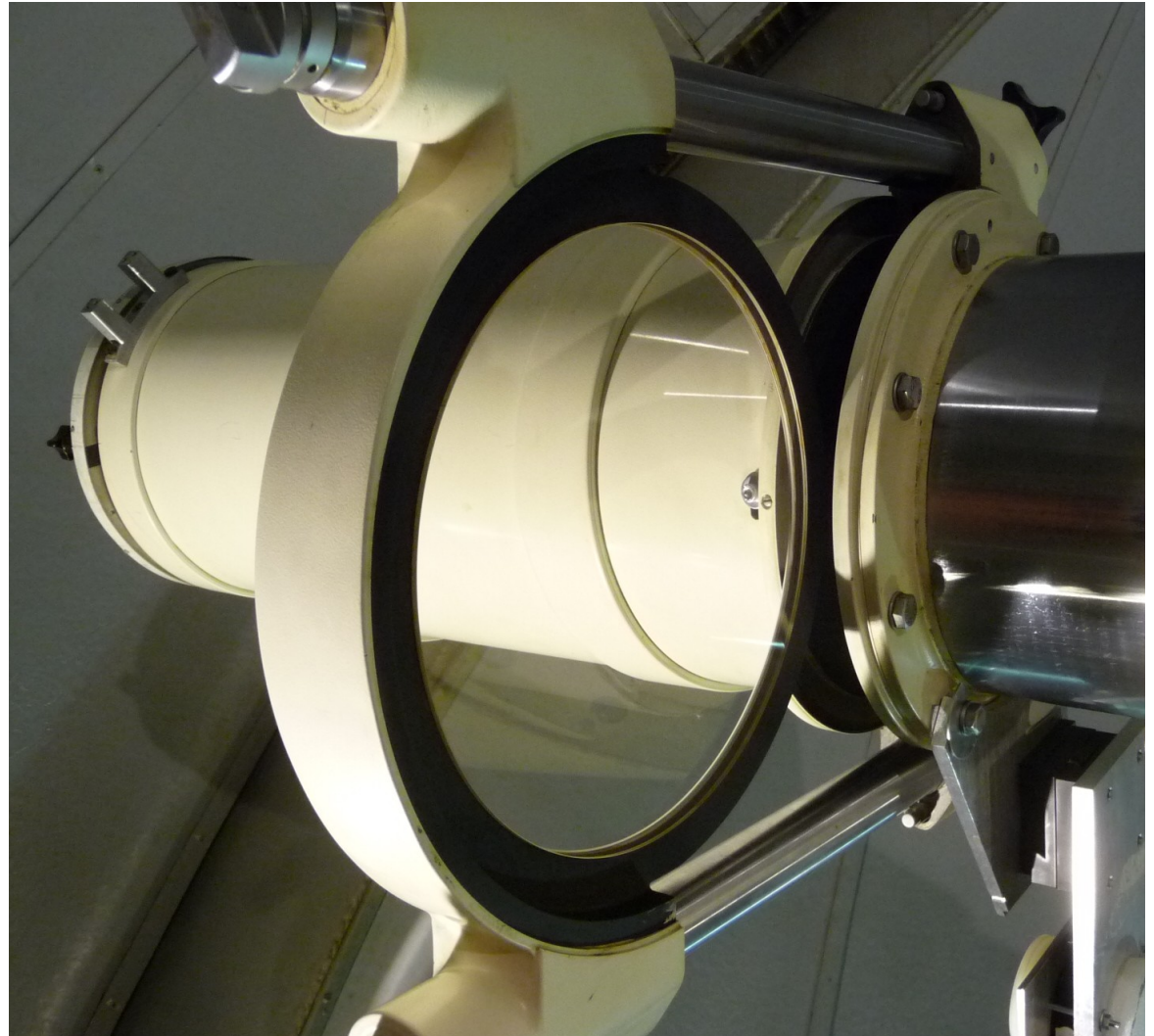
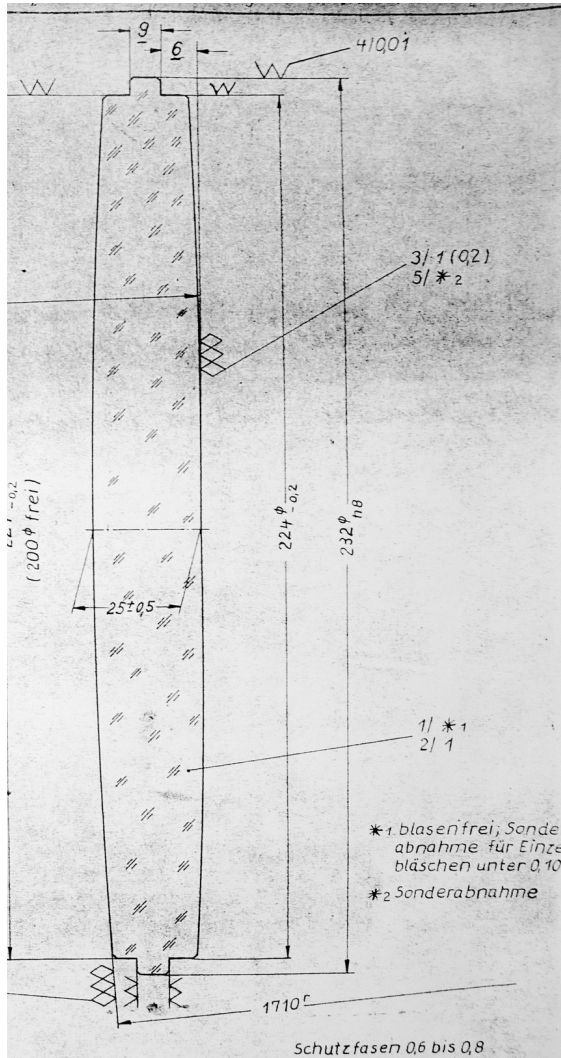
LSO ZEISS (Lyot) coronagraph

ZEISS coronagraph 200/3000/4000

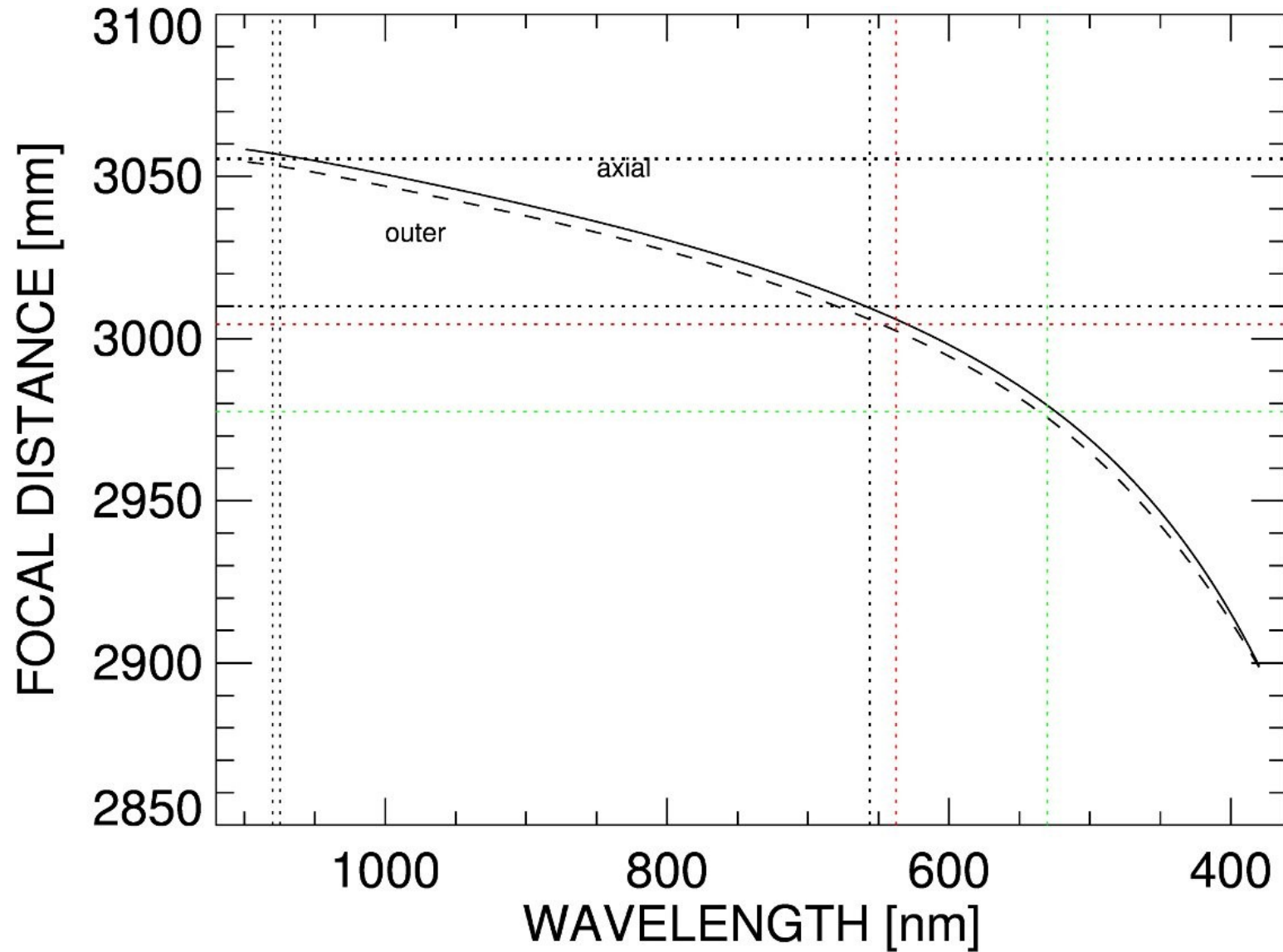


Koronograph 200/3000
Optisches Schema

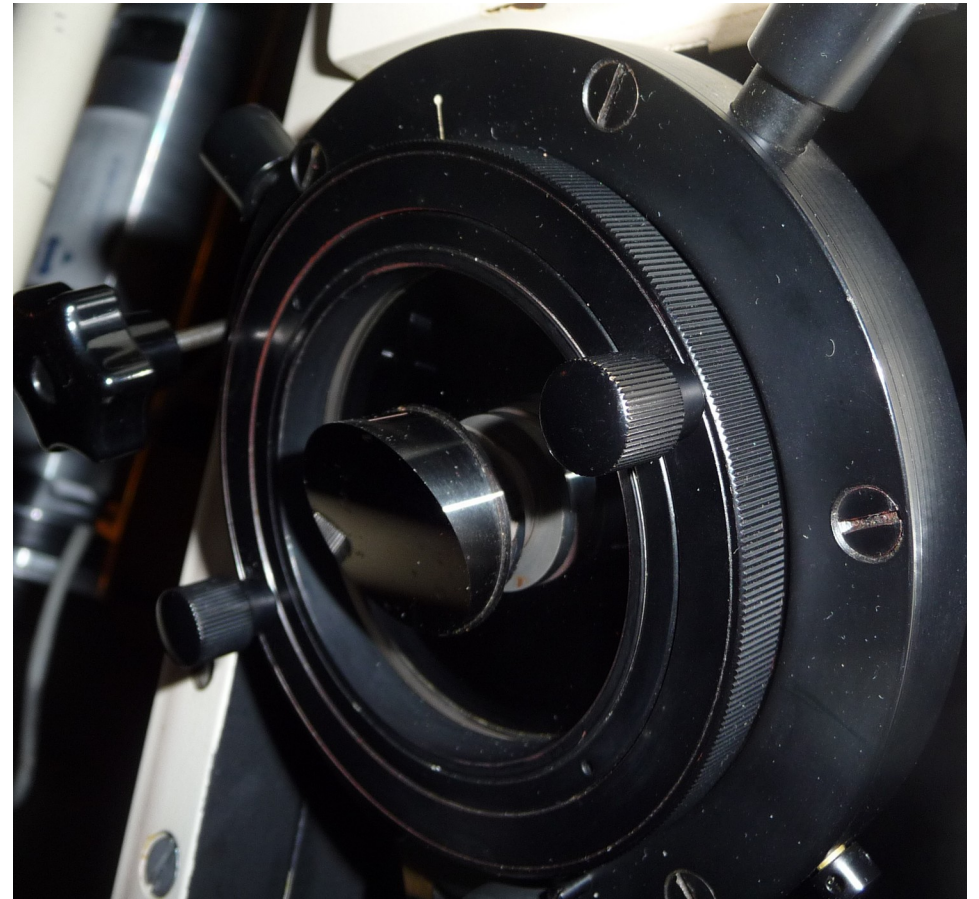
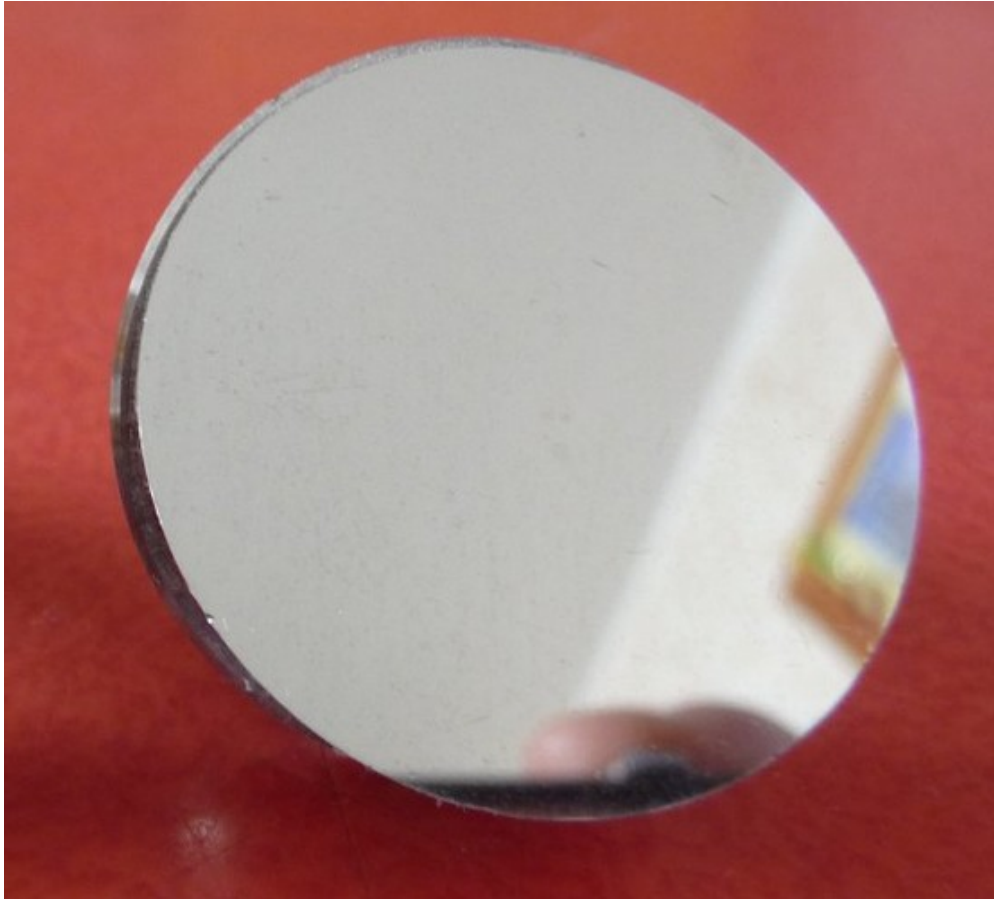
ZEISS coronagraph 200/3000/4000



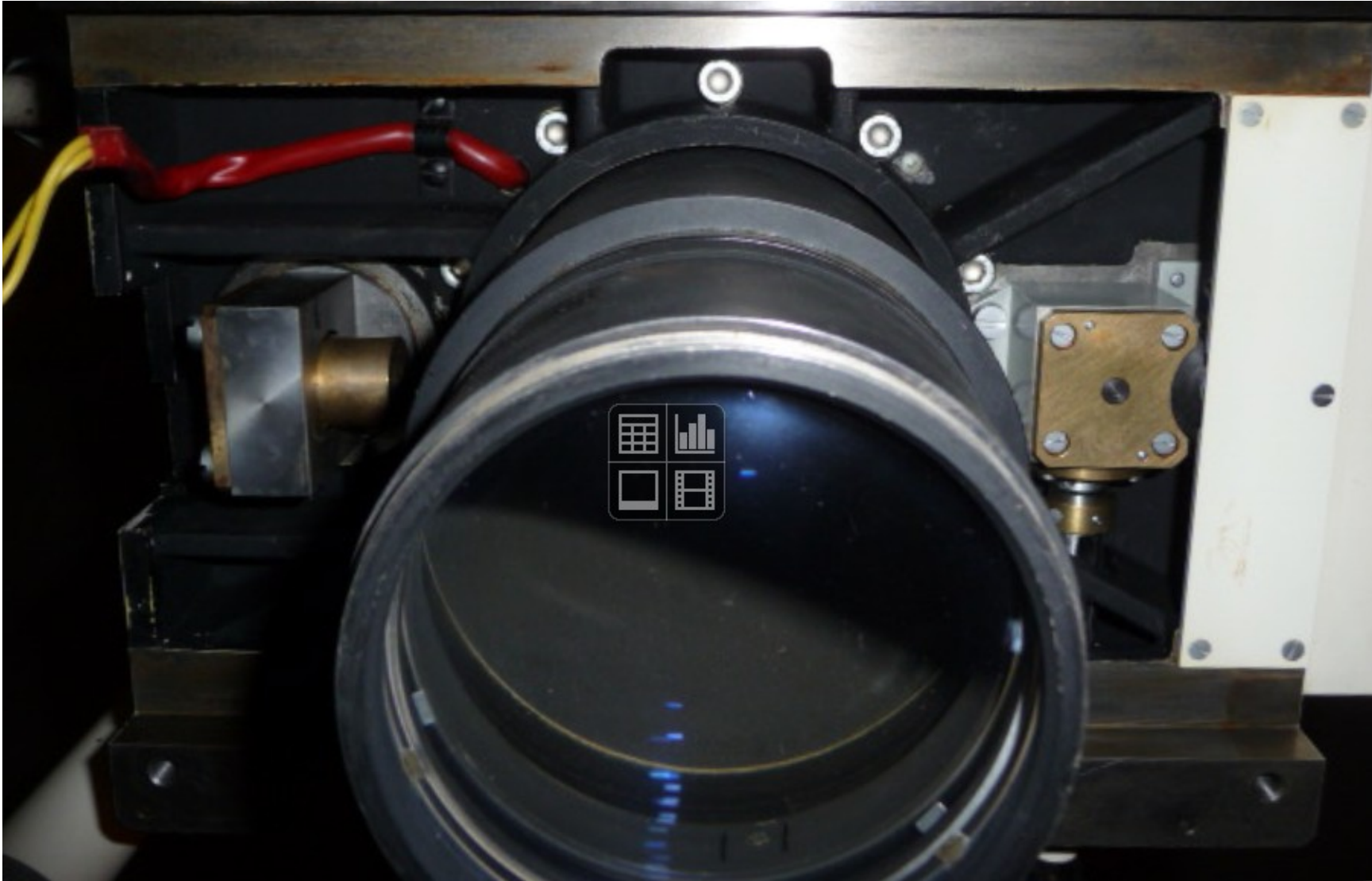
ZEISS coronagraph 200/3000/4000



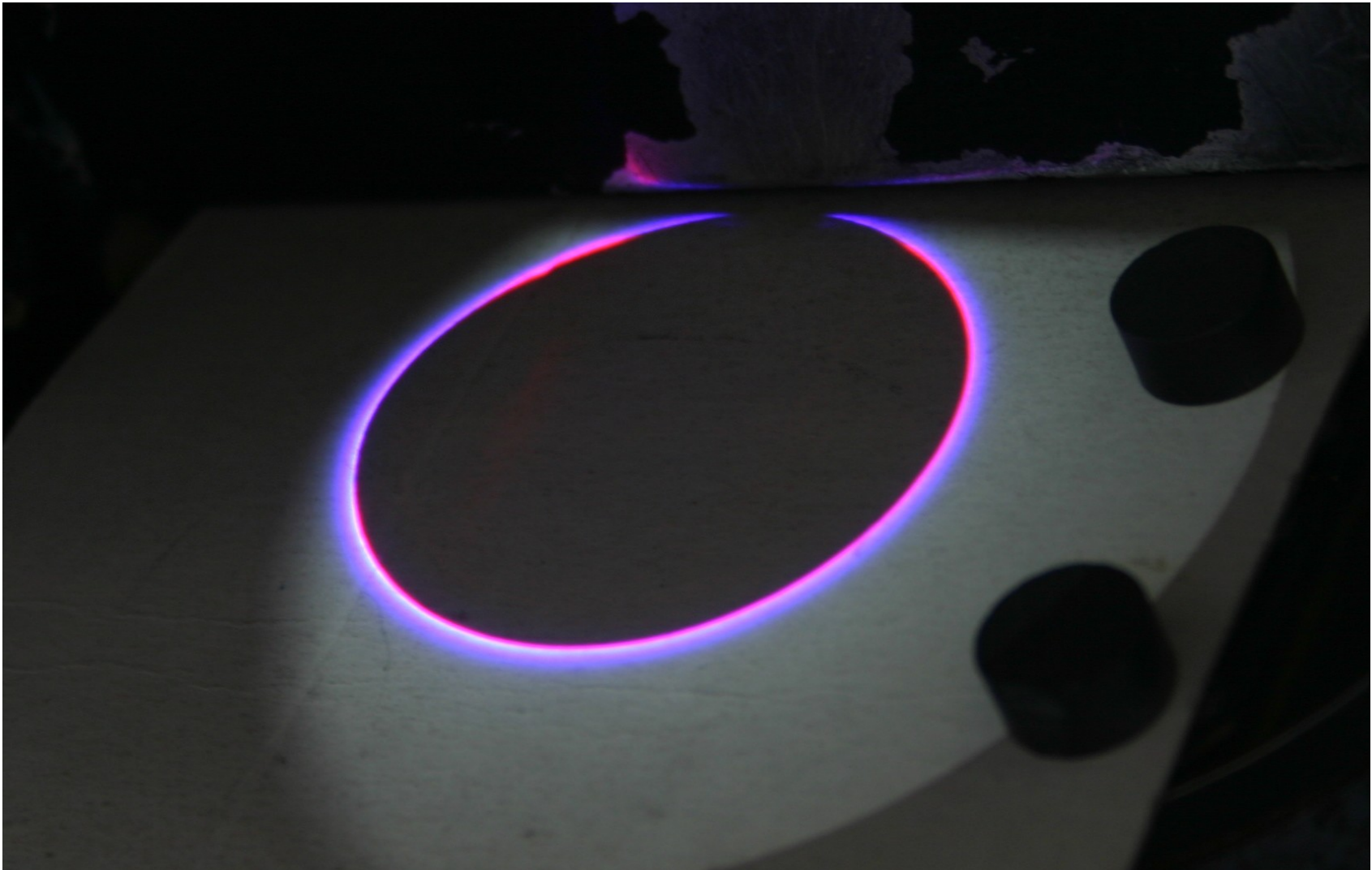
ZEISS coronagraph 200/3000/4000



ZEISS coronagraph 200/3000/4000



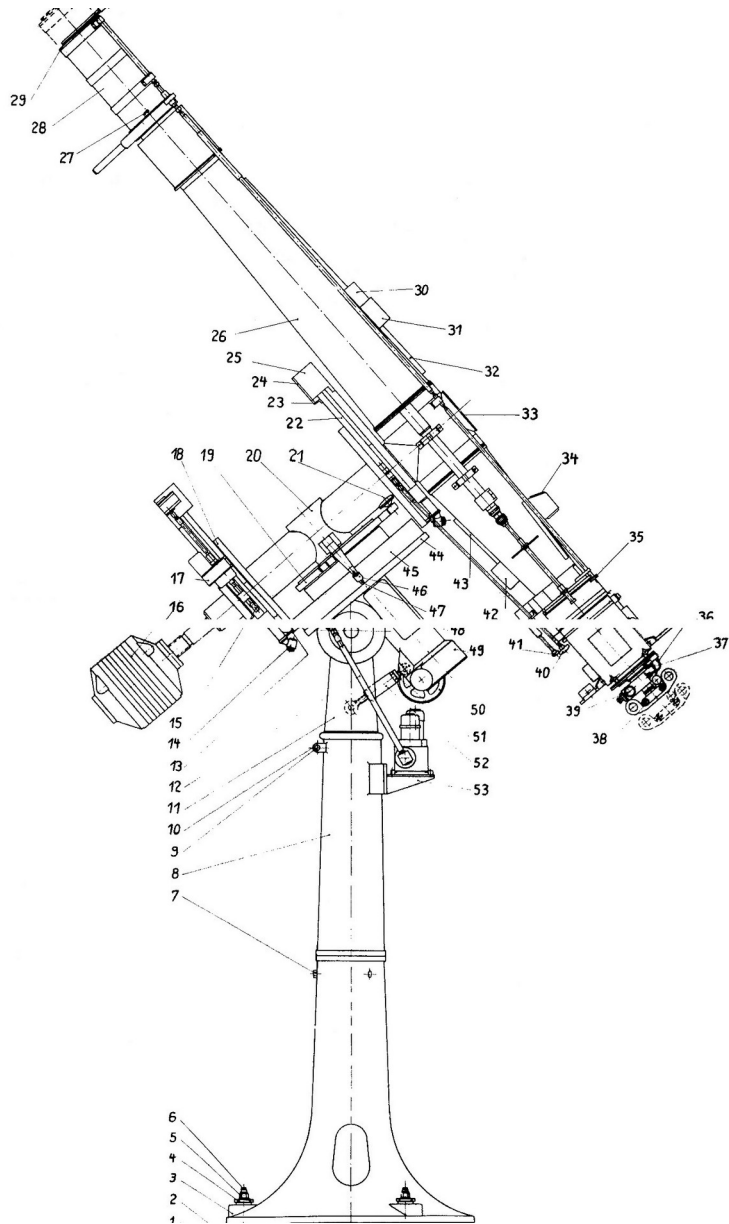
ZEISS coronagraph 200/3000/4000





Mount

ZEISS mount VII a



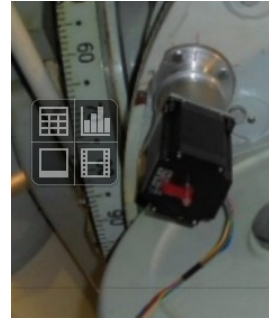
ZEISS mount VII a

- Theory ~ reality: all parts are bended depending on relative orientation of mechanical structures to the gravity vector direction → differential bending of the coronagraph → the solar disk image shift in the coronagraph focal plane
- Pointing systems correcting also for such effects are needed
- LSO: no active and/or adaptive optics



Pointing

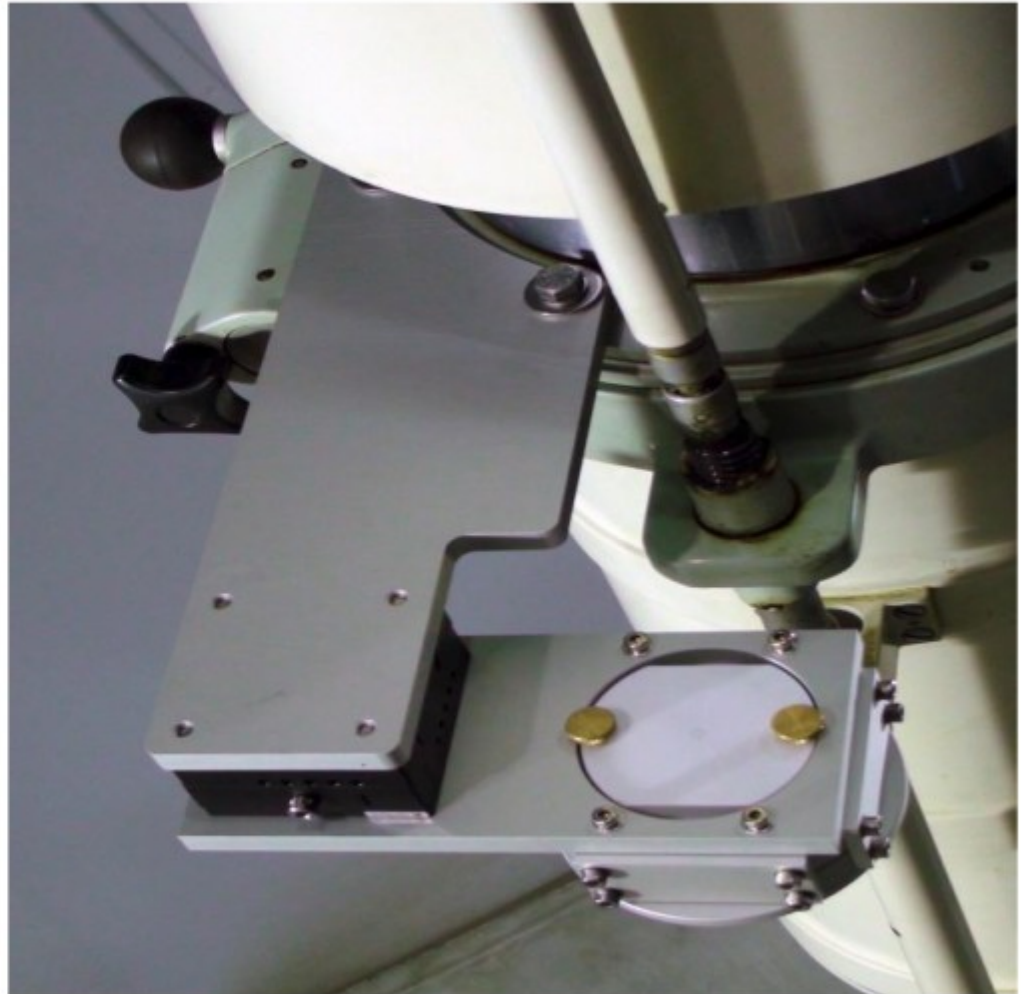
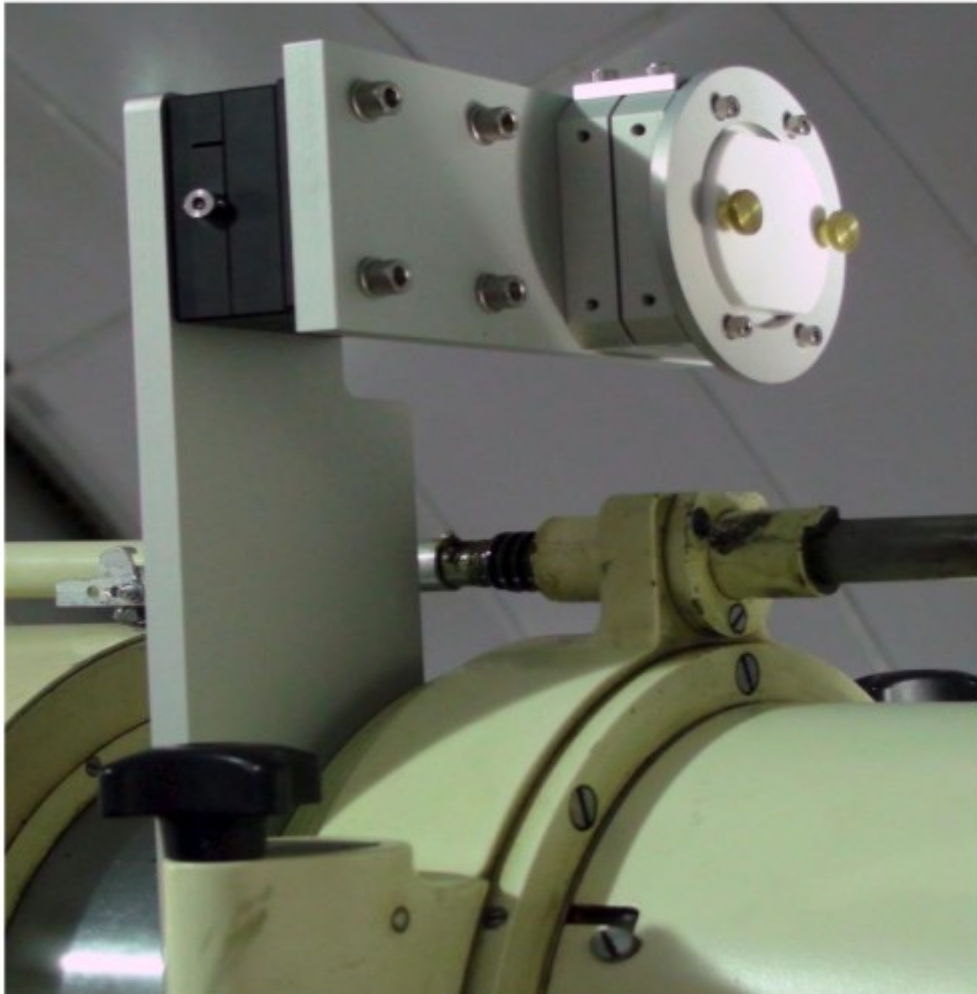
AISAS pointing for single coronagraph



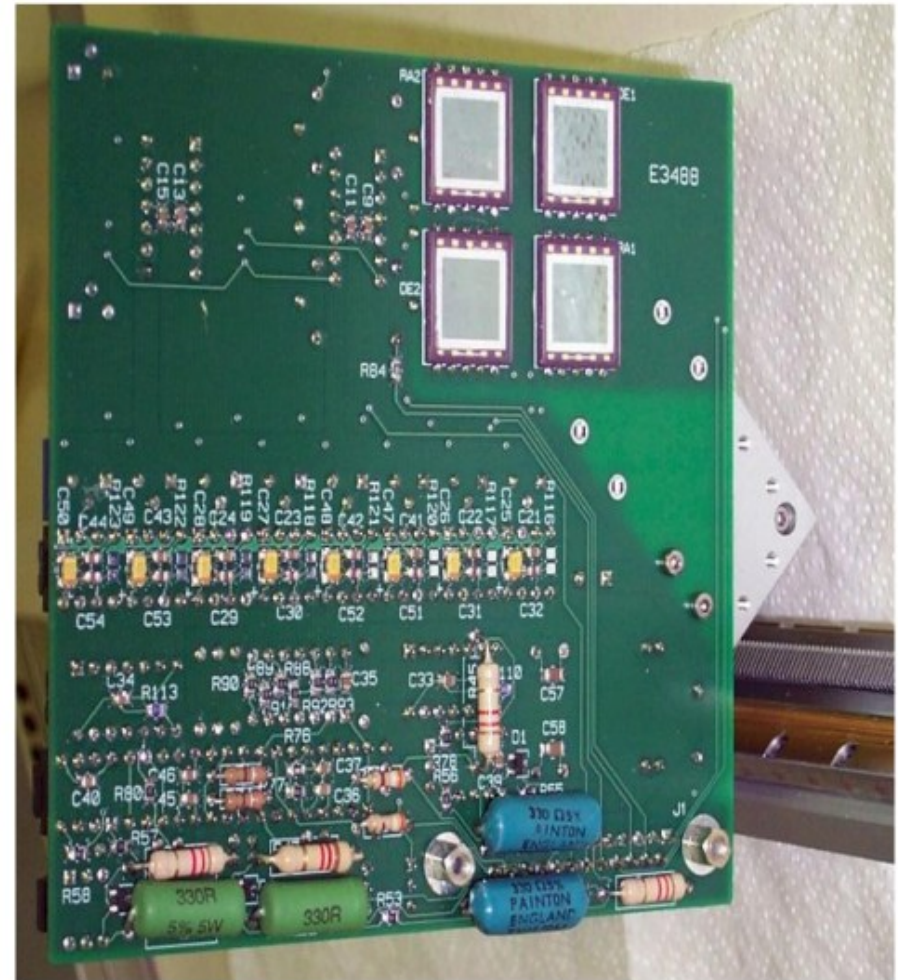
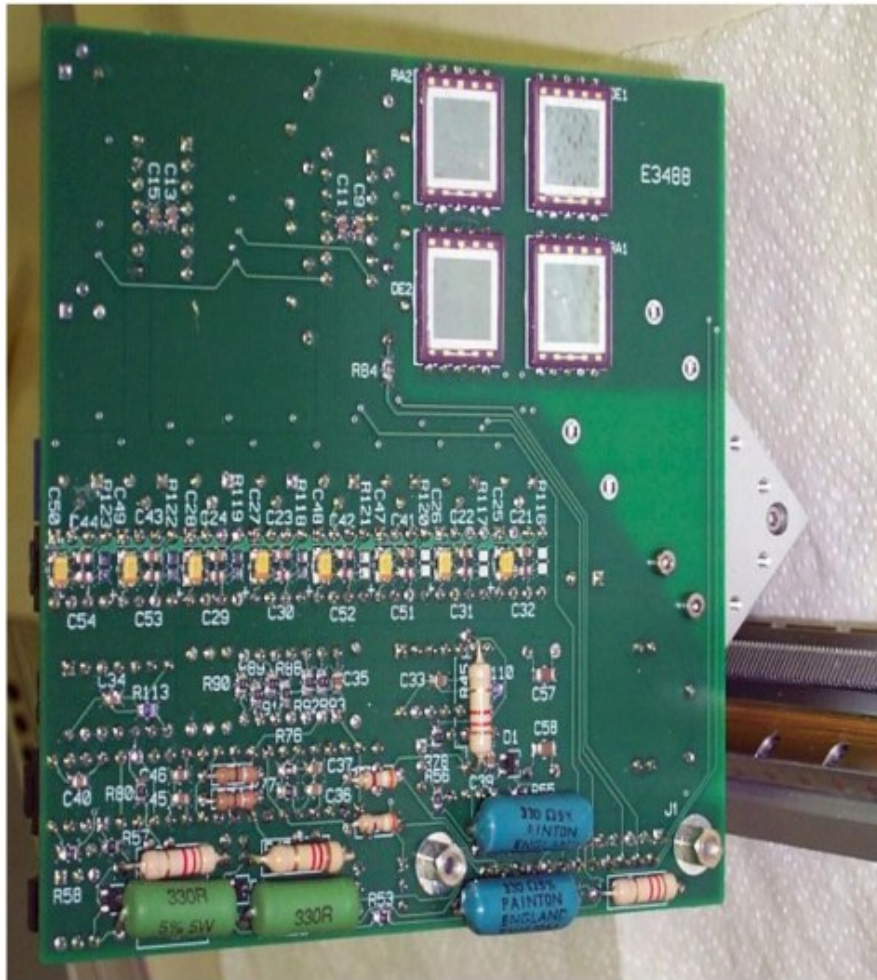
AISAS pointing for single coronagraph



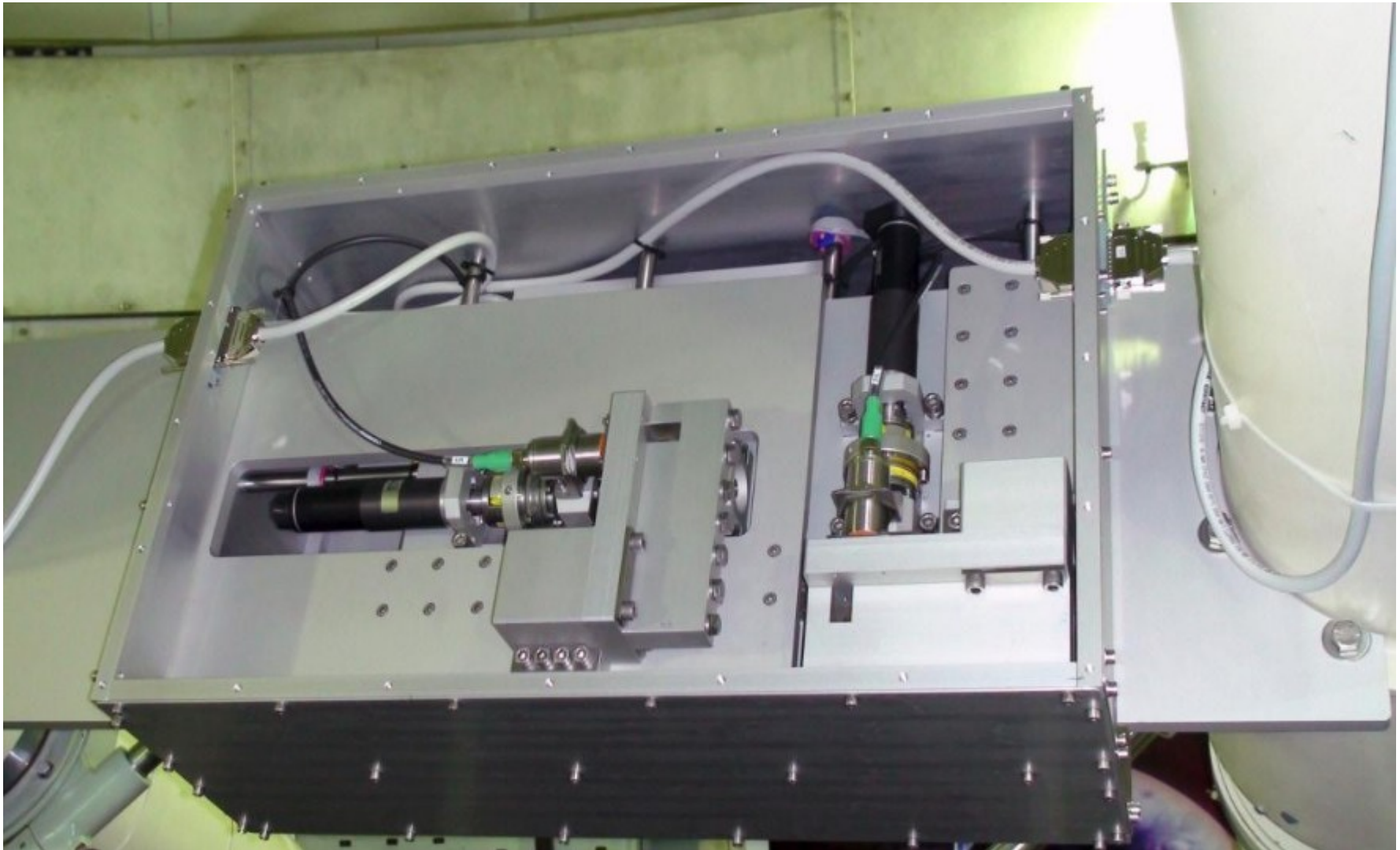
HANKOM pointing - the coronagraph twins



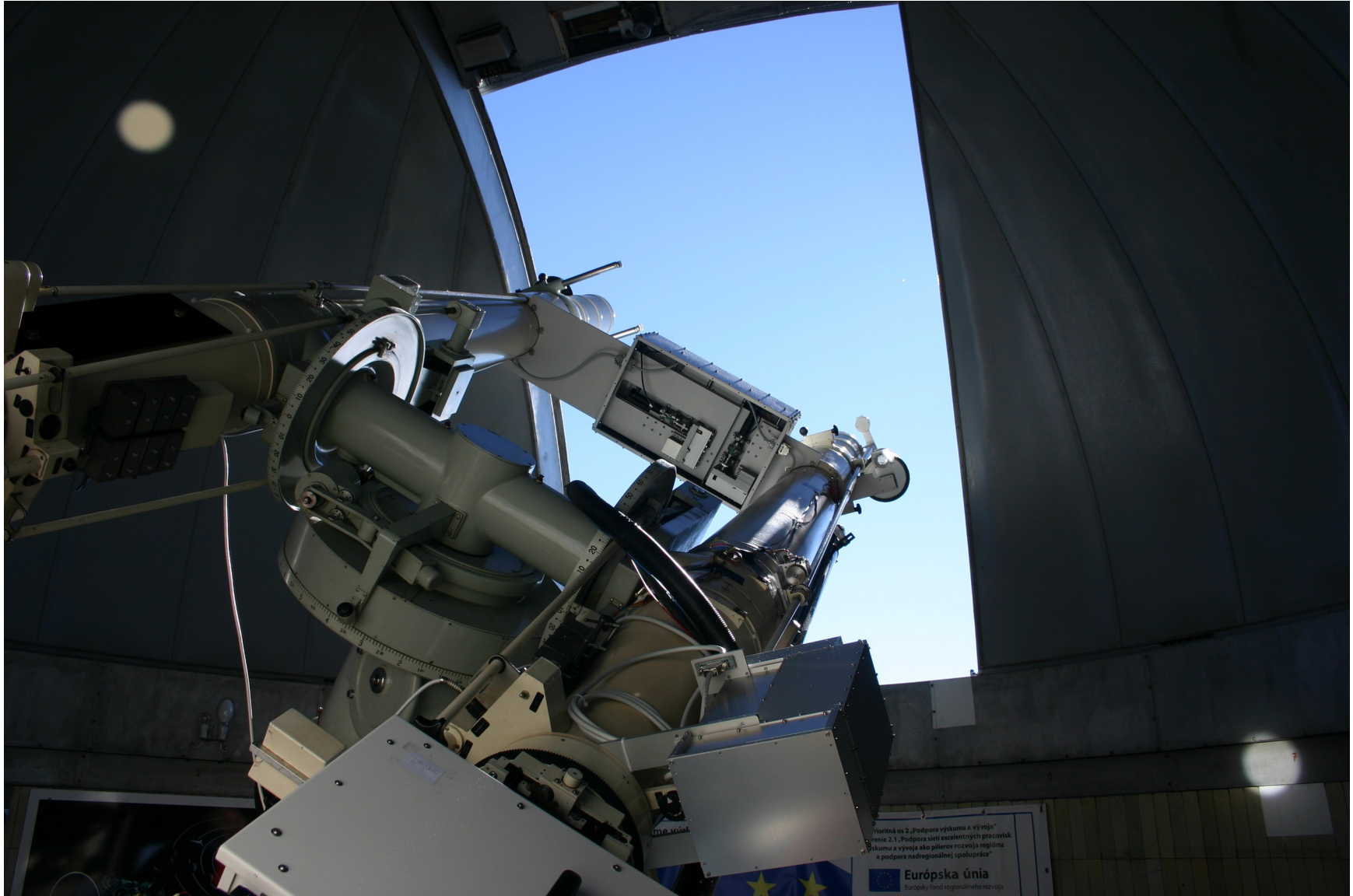
HANKOM pointing - the coronagraph twins



HANKOM pointing - the coronagraph twins



HANKOM pointing - the coronagraph twins



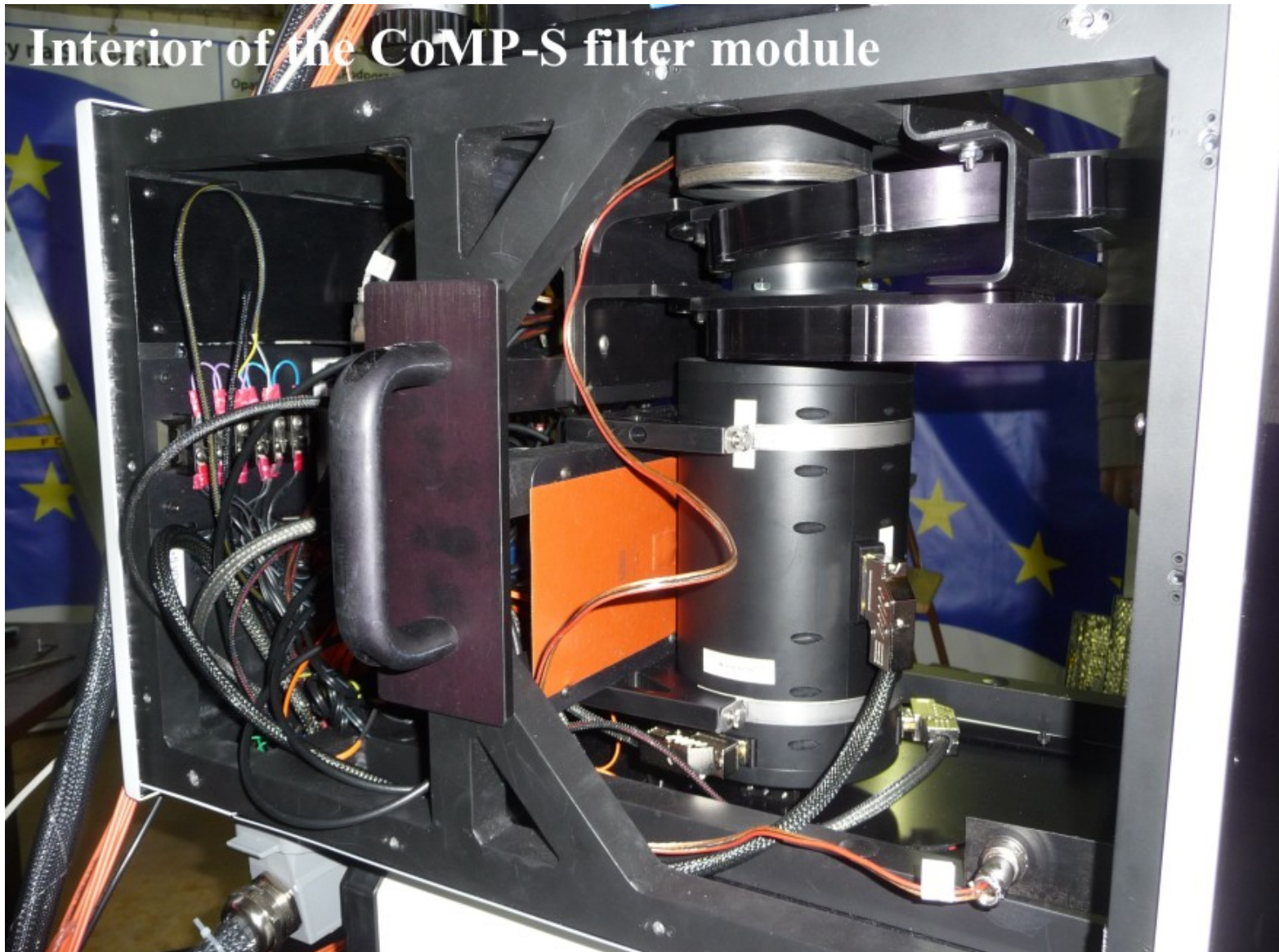


CoMP-S

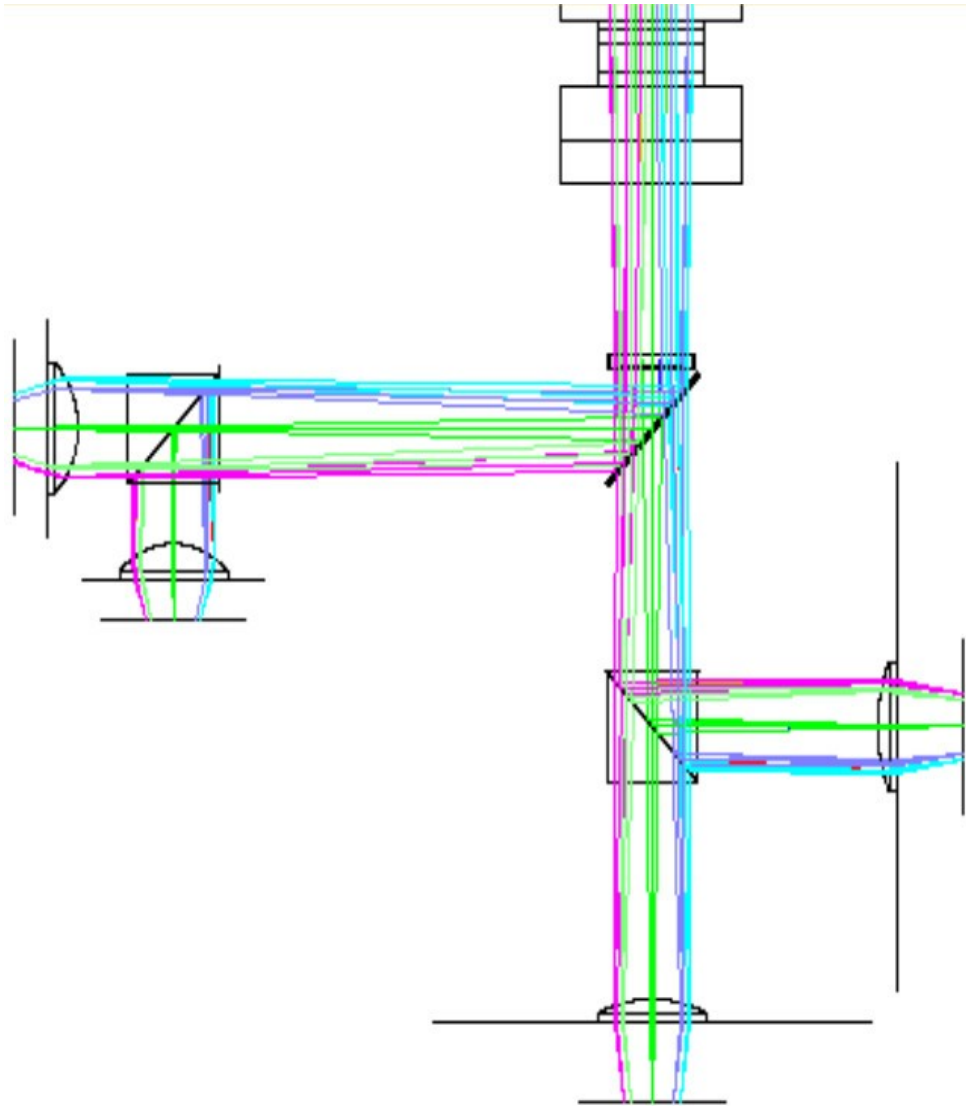
CoMP-S

- NCAR/HAO product (S.Tomczyk) for the EU structural funds for science in Slovakia
- 4-stage Lyot filter + polarimeter
- Pre-filters + calibration optics
- Dichroich mirror
- Polarizing splitting cubes
- Pairs of detectors for the VIS and the IR
- Optics, heating, cooling

CoMP-S: filter module



CoMP-S: camera module

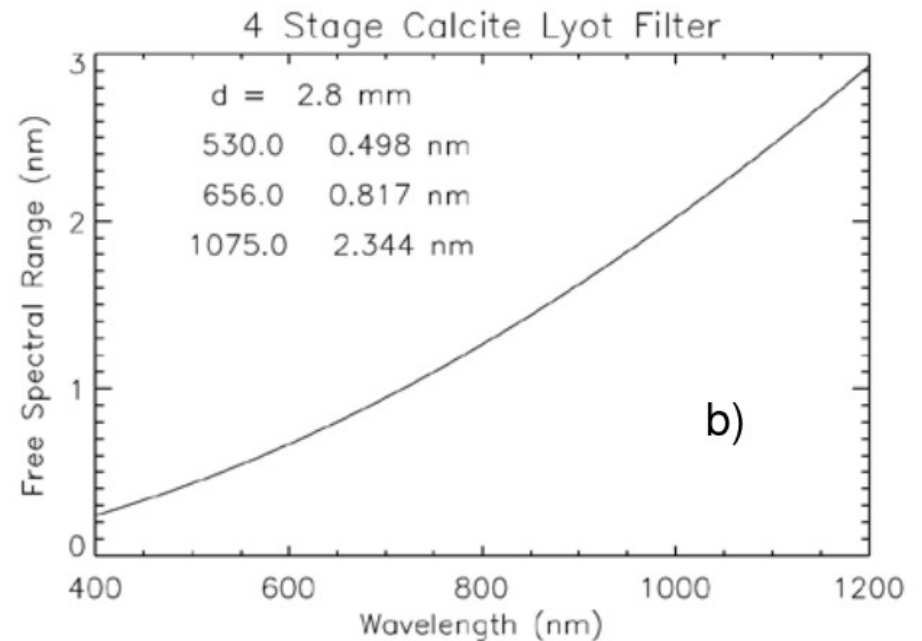
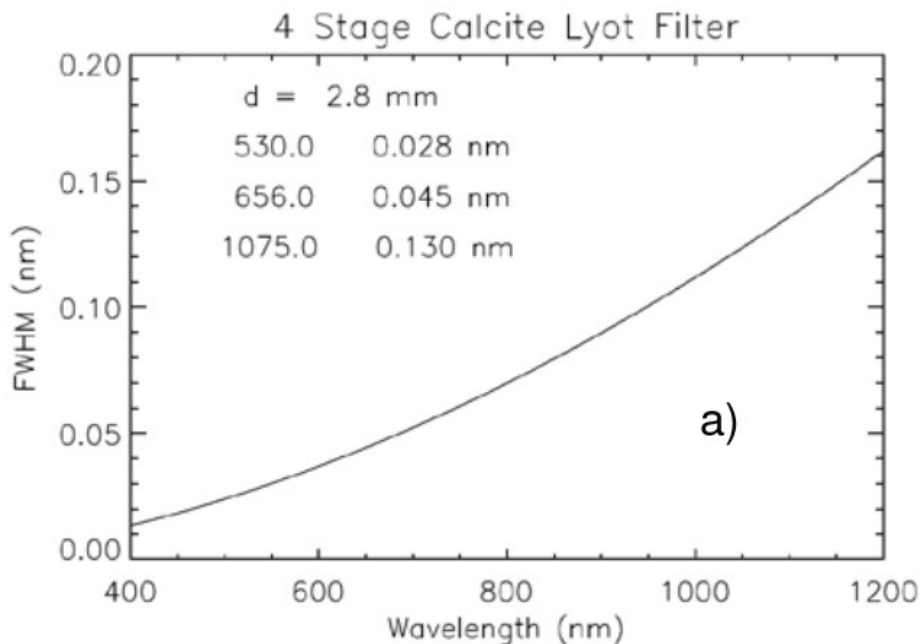


CoMP-S: camera module

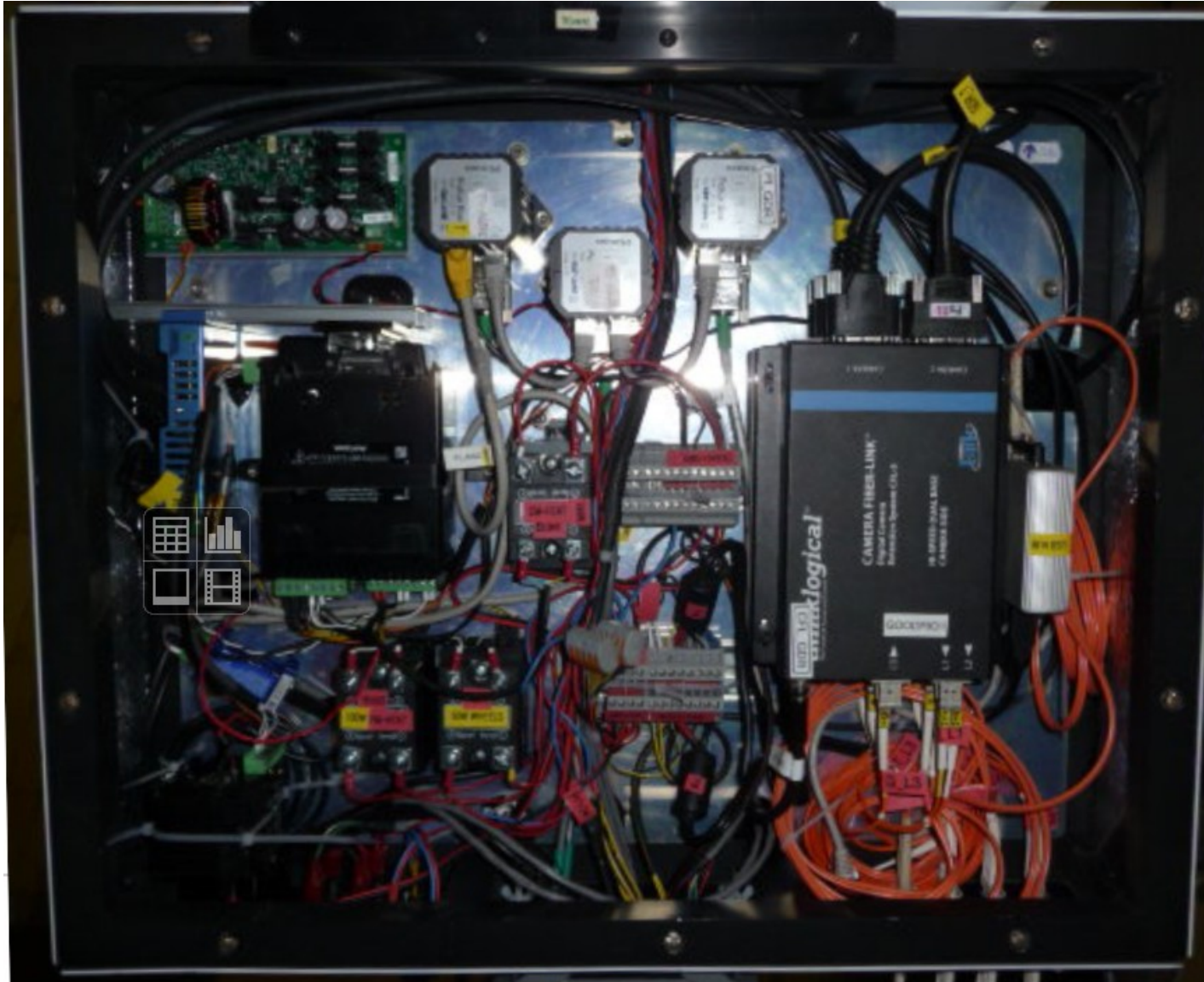


CoMP-S: the spectral lines

- Coronal lines: **Fe X 637 nm** (Fe XIV 530 nm, FE XIII 1074+1079 nm)
- Prominence lines: **He D3 587 nm, He I 656 nm, Ca II 854 nm** (He I 1083 nm)



CoMP-S: electronics



CoMP-S: electronics + computers



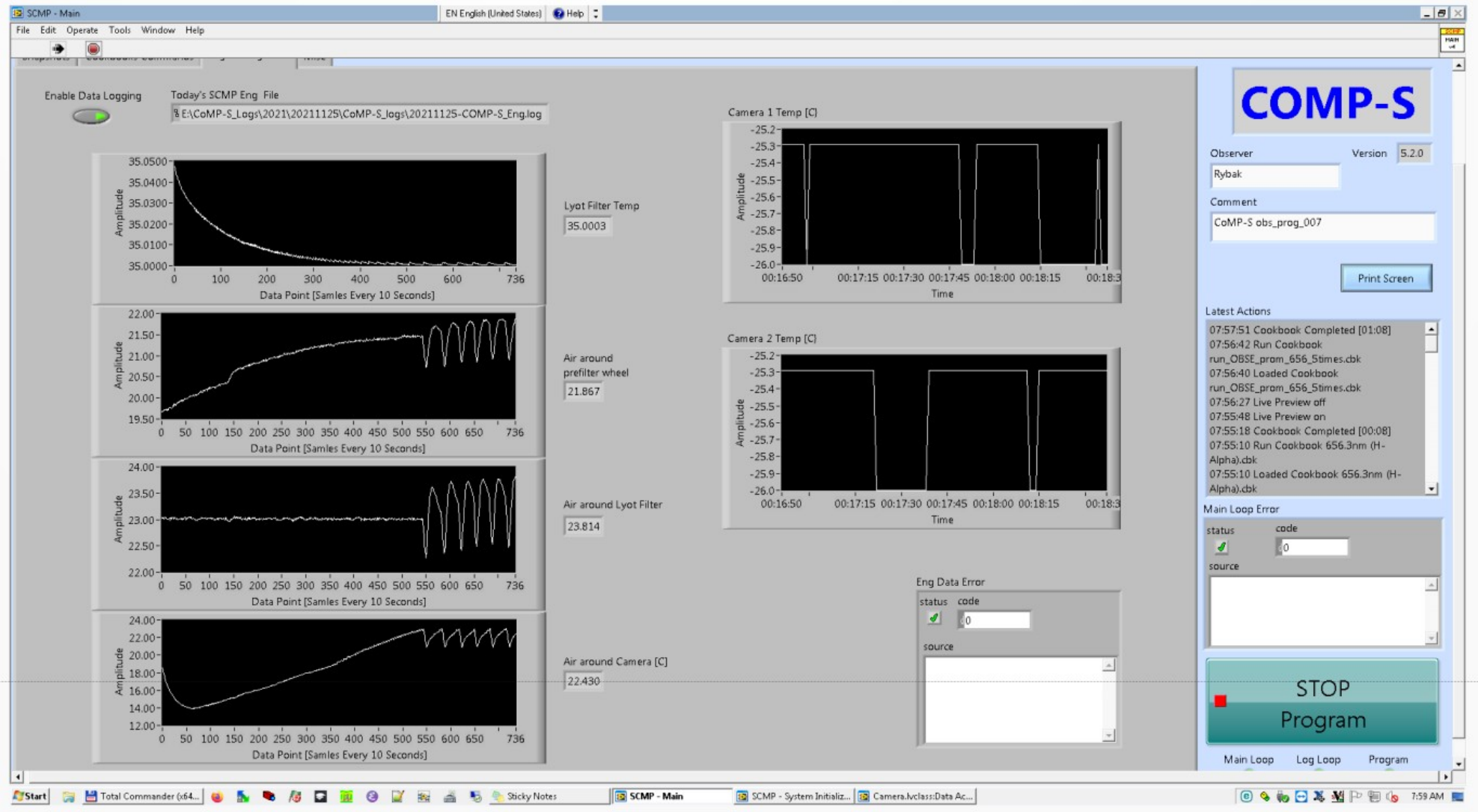
CoMP-S: operation

The screenshot displays the SCMP - Main software interface, which is used for operating the CoMP-S system. The interface is divided into several sections:

- Camera Images:** Two main image windows, "Camera T Image" and "Camera R Image", showing grayscale data. Below them is a "Camera T Image Zoom" window. Each image has a vertical color scale on its right side, ranging from 0 to -215 or -209.
- Histograms:** Two histogram graphs, "Histogram Graph" and "Histogram Graph 2", showing the distribution of pixel values. The x-axis is "Pixel value" (0 to 250) and the y-axis is "count" (0 to 2M).
- Control Panels:**
 - Camera Settings:** Includes fields for "Exposure (s)" (20.0), "Binning" (1x1), and "PI cam 1 (mm)", "PI cam 2 (mm)", "PI cam 3 (mm)" (all 20.0). Buttons for "Snap Image" and "Live Preview" are present.
 - Filter Wheels:** Includes "Andover Filter" (530.3nm/HWB 0.34nm (Fe XIV)), "Calibration Wheel" (Dark), and "Wavelength [nm]" (530.28).
 - Coronagraph+Instrument Setup:** Includes "focus/filter/PIs/tepx" (530.3nm (Fe XIV)) and a "Setup" button.
 - AISAS mechanisms:** Includes "In Beam" (Diffuser), "127.00 Focus", and "145.0 Rotation [deg]".
 - Occluder:** Includes a "Size" field (2R.R0).
- System Information:** A panel on the right side displays "COMP-S" in large blue letters, "Observer" (Rybak), "Version" (5.2.0), "Comment" (CoMP-S obs_prog_007), and a "Print Screen" button. Below this is a "Latest Actions" list showing "05:58:08 Snap Single Image" and "05:58:00 Program Started".
- Error Handling:** A "Main Loop Error" section shows "status" (green checkmark) and "code" (0).
- Emergency Stop:** A large green button labeled "STOP Program" is located at the bottom right.

The Windows taskbar at the bottom shows the Start button, several application icons, and the system tray with the time 5:58 AM and date 11/25/2021.

CoMP-S: operation



CoMP-S: operation

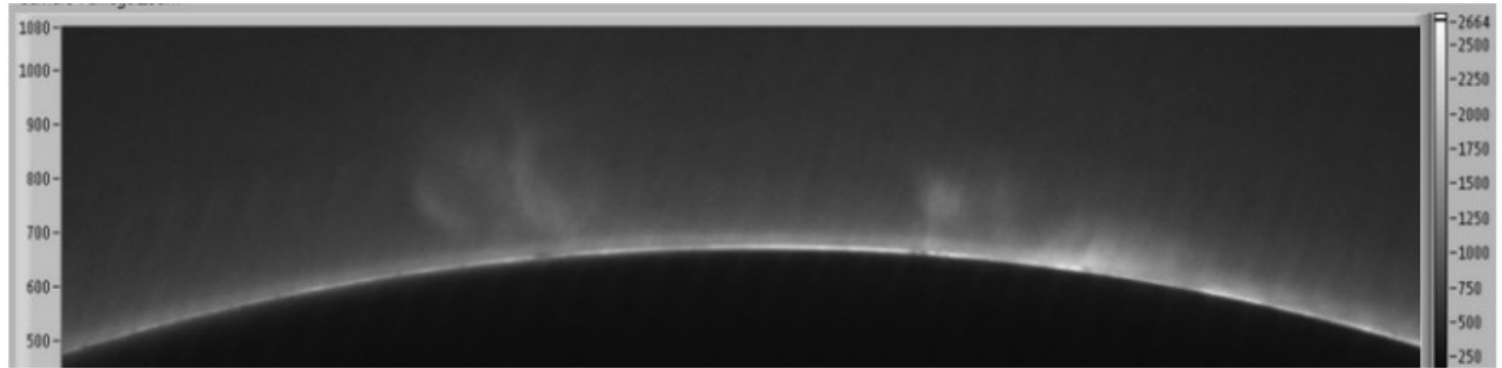
The screenshot displays the 'Camera.Ivclass:Data Acquisition - v8.vi' software interface. The window title bar includes 'EN English (United States)' and 'Help'. The interface is divided into several sections:

- Camera T Image:** A grayscale image showing a bright spot on a dark background. The vertical axis ranges from 0 to 2160, and the horizontal axis ranges from 0 to 2560. A color scale on the right ranges from 0 to 1046.
- Camera R Image:** A grayscale image showing a bright spot on a dark background. The vertical axis ranges from 0 to 2160, and the horizontal axis ranges from 0 to 2560. A color scale on the right ranges from 0 to 259.
- Camera T Image Zoom:** A zoomed-in view of the Camera T image. The vertical axis ranges from 0 to 1080, and the horizontal axis ranges from 0 to 2560. A color scale on the right ranges from -5 to 1046.
- Control Panel:** Located on the right side, it contains various input fields and buttons:
 - Exposure (s):** 5.00m
 - limit max FPS to:** 49.0
 - Actual FPS:** 37.8
 - Mod/Seq:** Modulation
 - Cycles:** 1
 - # Wavelengths:** 9
 - # Images to acquire:** 36
 - Actual Wavelength (nm):** 656.23
 - Image No:** 36
 - Image No 2:** 36
 - # Images in queue:** 20
 - # Images in queue 2:** 19
 - Image Processing:** A progress bar with green segments.
 - Image 2 Processing:** A progress bar with green segments.
 - Acquisition Estimate (s):** 2.75
 - Image Acq (s):** A progress bar with blue segments.
 - Image Acq Started:** A green indicator light.
 - FITS Path Out:** Two text boxes containing file paths: %E\CO...\20211125\Isob_comp-s_0656_LM_20211125_080005_obse_C1_00005_145_lev0.0.fits and %E\CO...\20211125\Isob_comp-s_0656_LM_20211125_080005_obse_C2_00005_145_lev0.0.fits.
 - error in:** A table with columns for status, code, and source. The status is green with a checkmark, code is 0, and source is empty.
 - error out:** A table with columns for code and source. The code is green with a checkmark, and source is empty.
 - ABORT:** A red button.

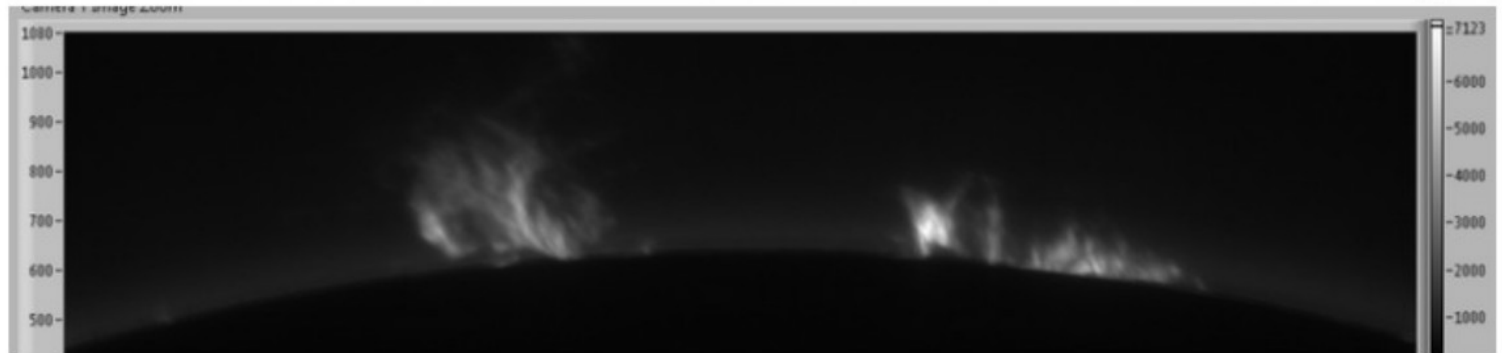
The Windows taskbar at the bottom shows the Start button and several open applications: Total Commander (x64...), Sticky Notes, SCMP - Main, SCMP - System Initializ..., Camera.Ivclass:Data A..., and Camera.Ivclass:Run Co... The system clock shows 8:00 AM.

CoMP-S: example frames

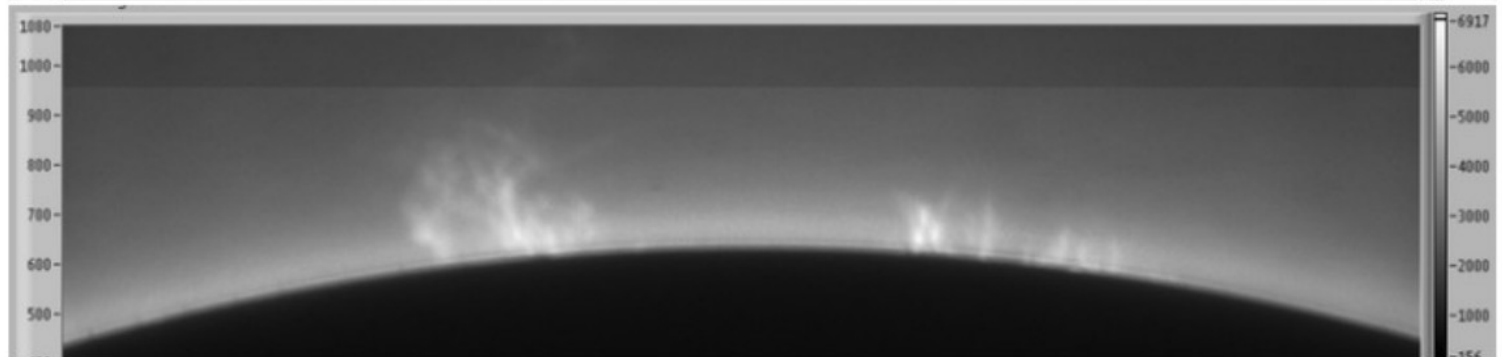
854 nm (100 ms)



656 nm (50 ms)

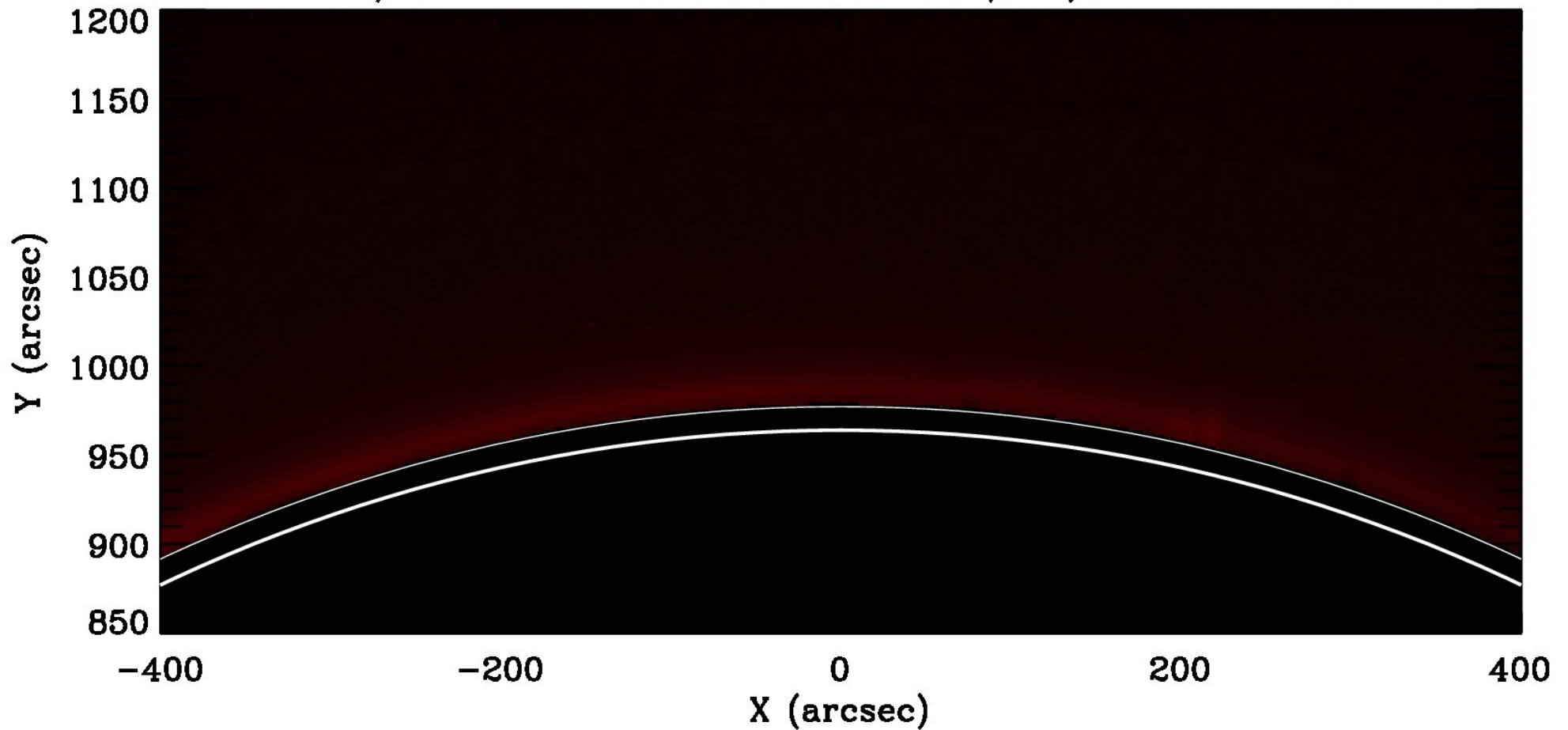


587 nm (500ms)



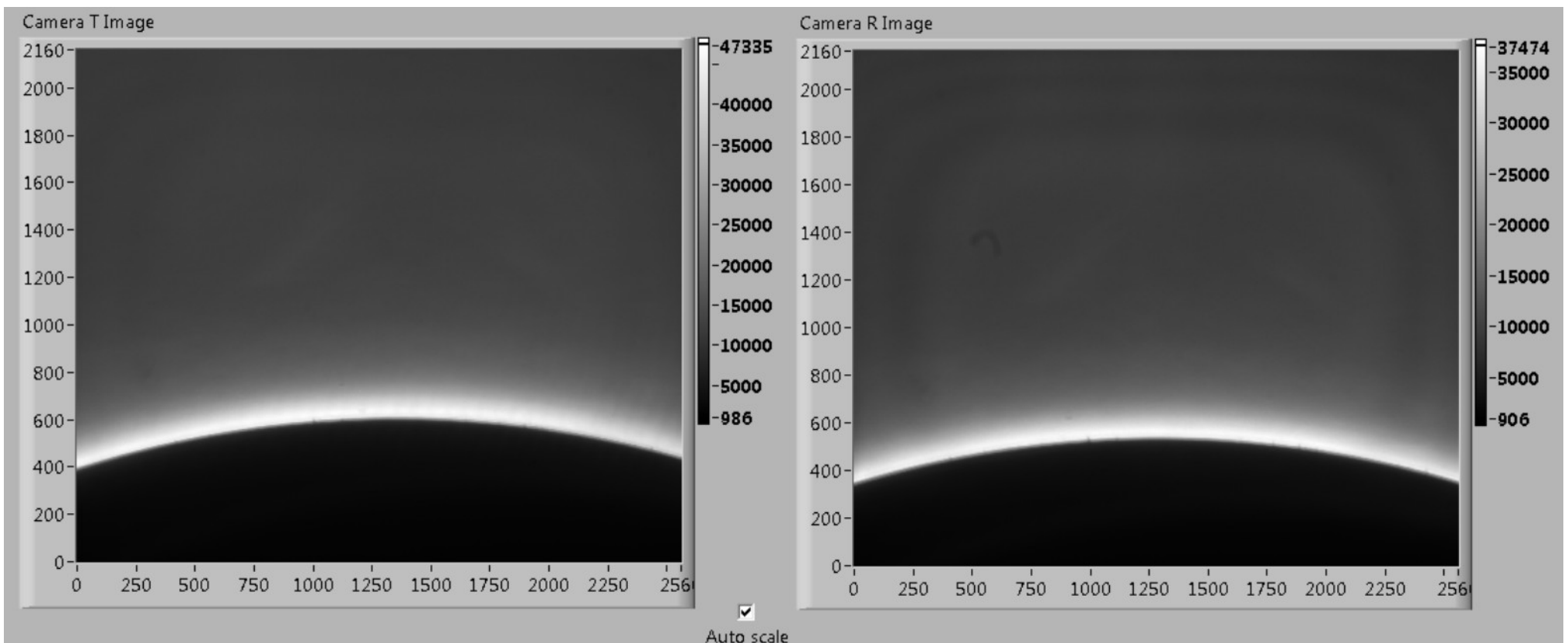
CoMP-S: example H alpha scan

CoMP-S/LSO: H I 656.160 nm - 23/10/2012 06:20:57 UT



CoMP-S: coronal Fe X 637 line

- On-line: no coronal emission seen using the automatic dynamic range due to large scattered light intensity range
- Pipeline in development: subtraction of the BKG scattered light (coalignment, intensity intercalibration, subtraction)



CoMP-S

- Observing programs:
 - old: H alpha tornadoes, Masses of proms
 - actual: He D3 in quiet/eruptive proms
 - future: 2023 open call
- Projects under development/improvements: CoMP-S instrument, SCD instrument, pointing system, LSO pipeline
- New projects for time to come: LSO → VSO, SLED instrument, dome motion, dome a la „THEMIS“, ...



LSO group and work

LSO group and work

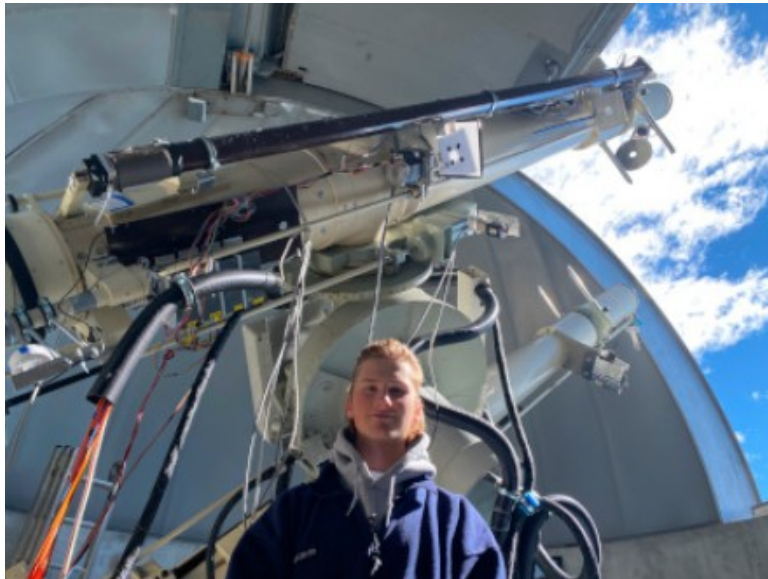
- LSO group:
 - handyman
 - observing assistants: 2 astronomers and 2 (+0.5) engineers
 - support from the headquarters: workshop, sys admin
- LSO duty shifts (~8 days):
 - cablecar transportation including all your things
 - cooking
 - observing or testing of instrumentation
 - own instrumental or scientific projects
 - day and night security officer as well
 - person on duty



LSO news for you

LSO (summer or autumn) internships

- Student interested in a stay at the LSO to learn more about the g-b coronagraphic observations are welcome! Just send an email...
- Conditions: stay at the LSO is free of charge, travel including the cable car ticket and foodstuff is up to you.
- Small groups are preferred



Student Mark Morris @ LSO (2022/07)

LSO position to be opened!

- In 2023 very probably a new position will be opened:
observing assistant/electronic engineer or
observing assistant/astronomer
with a 1-week long duty shift per month at the LSO



In fine



The LSO group thank you for your attention