Lomnicky Peak Observatory of AISAS (LSO) - Status Report

Ján Rybák on behalf of the LSO team -

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AGENTÚRA
NA PODPORU
VÝSKUMU A VÝVOJA

26-30/05/2014, 22. celoštátny slnečný seminár, Nižná nad Oravou

Presentation content

- LSO history
- LSO Zeiss coronagraphs
- LSO past science
- What's next, LSO?
- LSO instrumentation
- LSO infrastructure
- LSO “details“
- LSO future plans

Lecture for everybody
but especially for
Milan Rybanský

LSO history

LSO history

- Motivations: to perform measurements which can not be realized at lower altitudes (2633 m a.s.l.), politics of the „cold” war

- 1957-1962 – building
- 1962 - first coronagraph
- 1970 - second coronagraph

- 1962 - H alpha prominences
- 1965 - coronal emission lines
- 1991 - photoelectric data recording
- 2008 - CCD data recording

Foto: p. Koštial, ~1968

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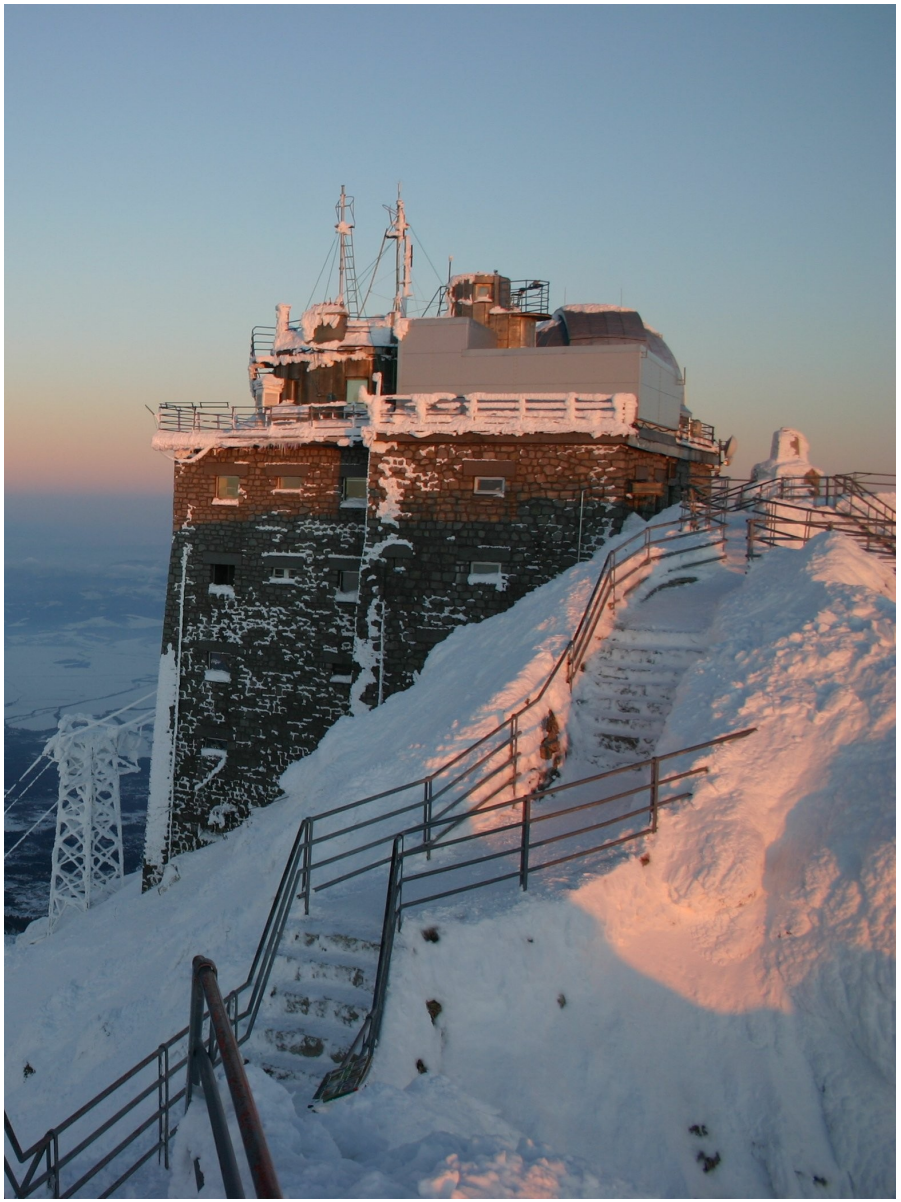
- Since 2012: the LSO is one of five ground-based high-altitude observatories performing regular coronagraphic observations of the Sun



Winter 2013/2014

LSO Zeiss coronagraphs

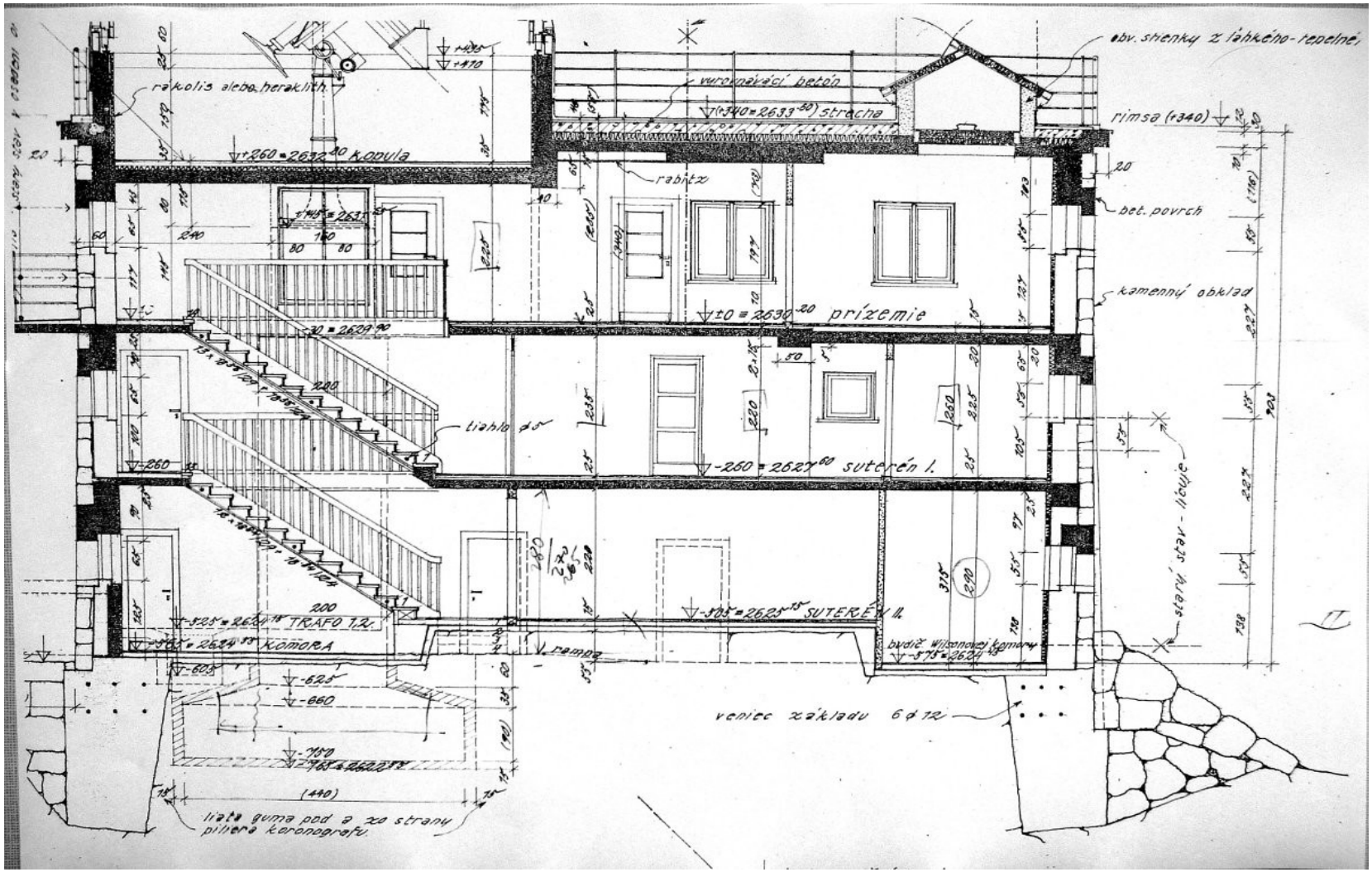
LSO Zeiss coronagraphs

- Building, dome and mount

Miro Švec, SME, 05/09/2013

LSO Zeiss coronagraphs

- Building, dome and mount



LSO Zeiss coronagraphs

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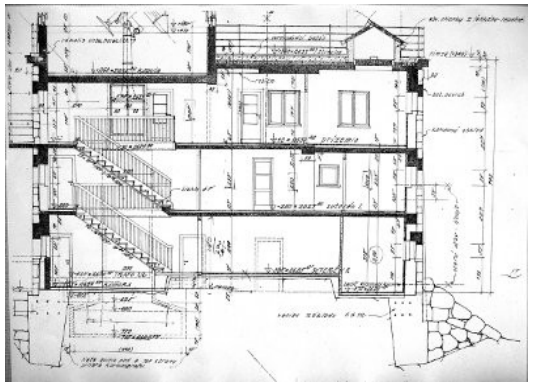
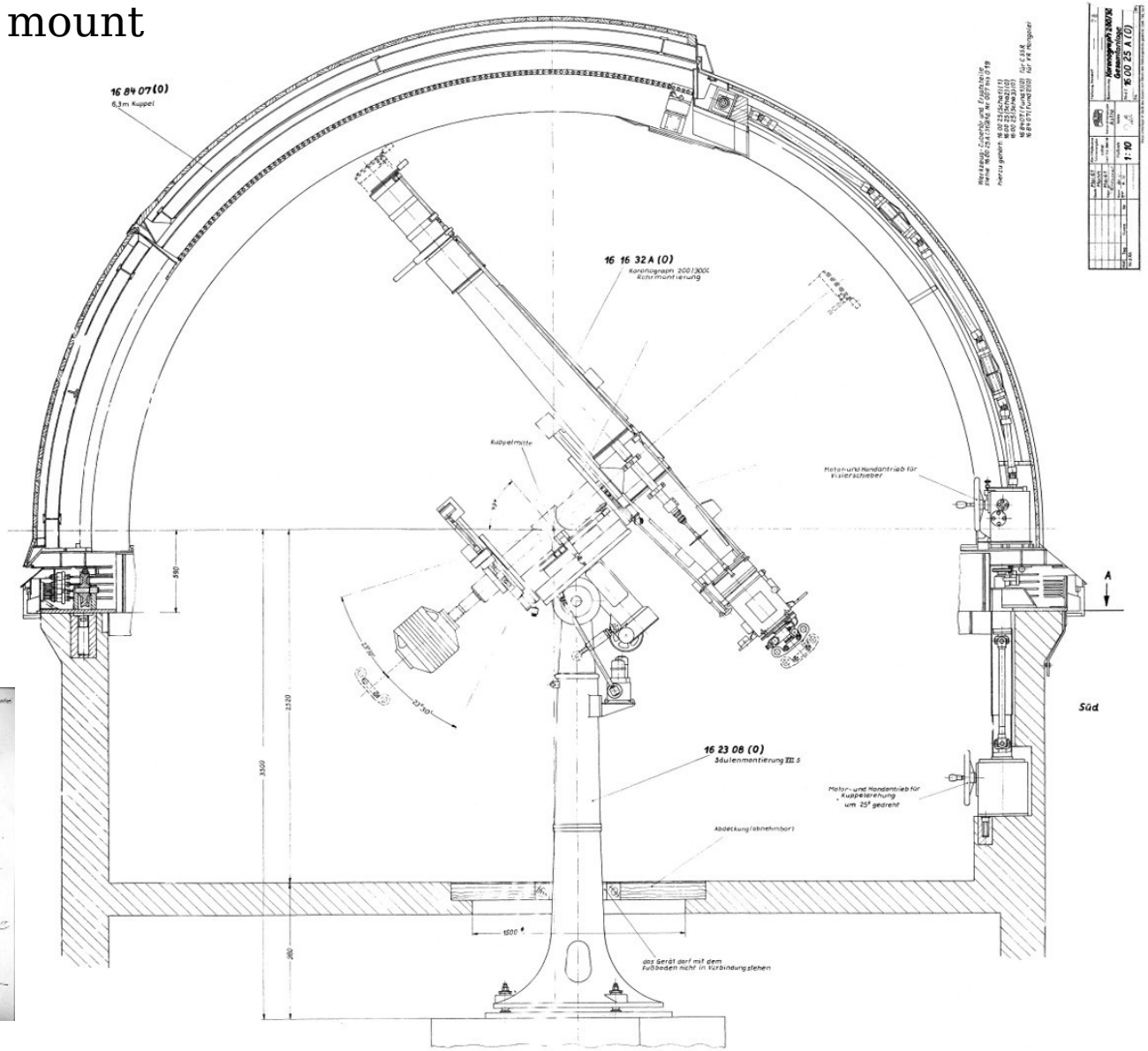
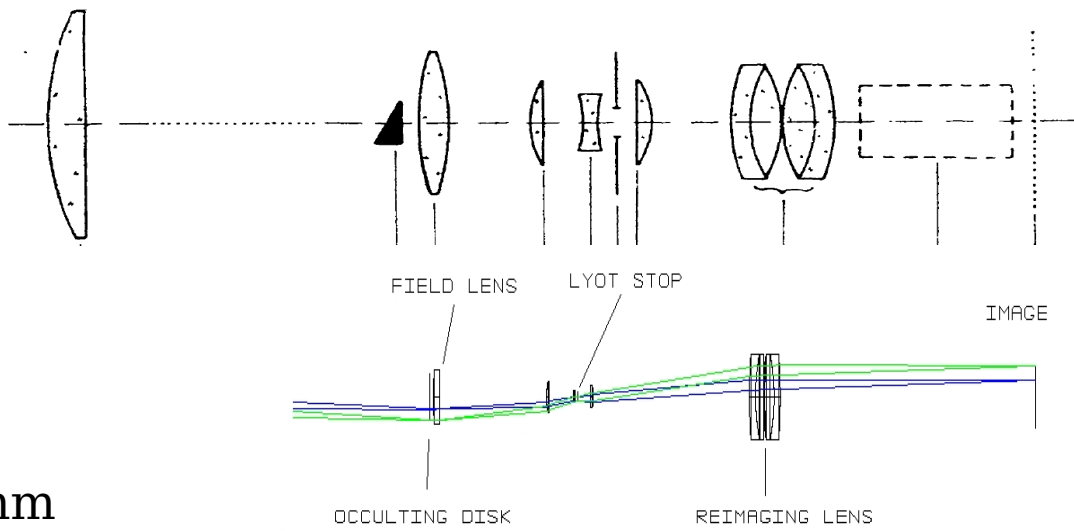
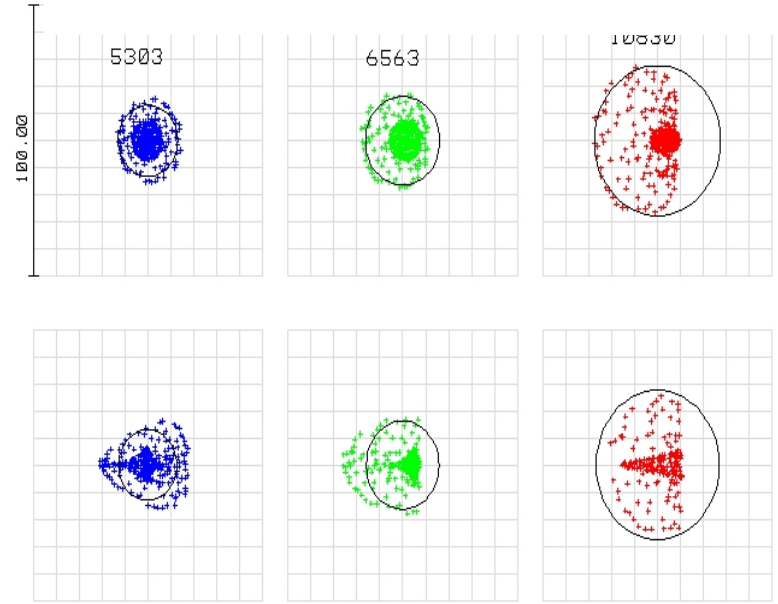




LSO Zeiss coronagraphs

- Carl Zeiss Jena (DDR)
- Lyot type
- primary single objective lens
- artificial moon
- single field lens
- 3 corrective single lenses
- Lyot stop
- achromatic reimaging lenses
- diffraction limited: 530 - 1100 nm
- theoretical spatial resolution: 0.7”@530nm,0.8”@656nm, 1.4”@1083nm
- post-focus instrument:
  - rotation parallel to optical axis
  - variable offset to optical exis
  - variable focusing along op. axis
- only as individual instruments





*Lexa, J., 1963, BAC **14**, 107*

LSO Zeiss coronagraphs

- A short historical note: Lexa, J., 1963, BAC **14**, 107

BAC Vol. 14 (1963) No. 3

NEW CORONOGRAPH OF THE ASTRONOMICAL OBSERVATORY OF THE SLOVAK ACADEMY OF SCIENCES AT SKALNATÉ PLESO

J. Lexa, Astronomical Institute of the Slovak Academy of Sciences, Skalnaté Pleso

At the summit of Mt Lomnický štít, 2634 m a. s. l., a new coronograph of the Astronomical Observatory of the Slovak Academy of Sciences at Skalnaté Pleso, built by C. Zeiss in Jena, has been installed in 1962. Fig. 1 shows the optical scheme of the instrument. Objective *1* is a simple lens, 20 cm in dia., and 300 cm focal length. In its focal plane is exchangeable Lyot diaphragm *2*. The instrument is focused by moving the objective along the optical axis, which permits observations in the spectral region from 3930 Å to 10 800 Å. The intermediate optical system of the coronograph is made up by field lens *3*, further three members together with iris diaphragm *6*, and imaging objective *8*. Behind this objective is the space reserved for filter *9*. The light pencils passing this space have the convergence 1 : 20 and the axes parallel to the optical axis of the instrument; thus, the maximum ray inclination to the optical axis is about 1°25′. The image of the Sun, 40 mm in diameter, is obtained in focal plane *10*, where it can be observed visually or taken on film with a "Practina" type camera.

So far prominences have been observed with the coronograph by using a Šolc filter 8 Å pass-band. A mirror spectrograph has been designed for observations of coronal lines.

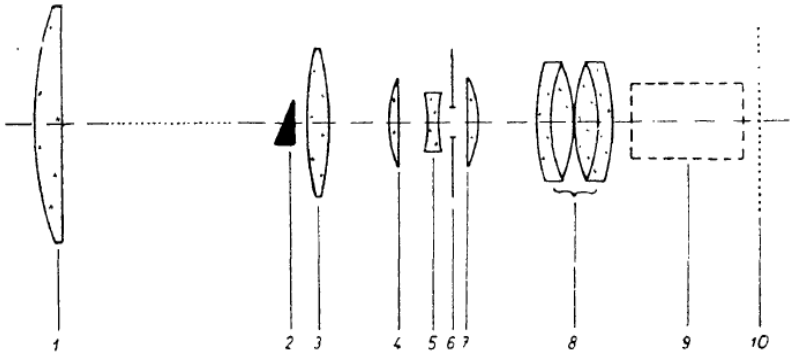
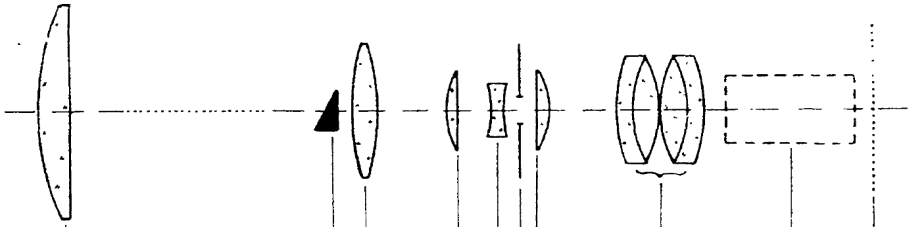


Fig. 1. Optical system of the coronograph.

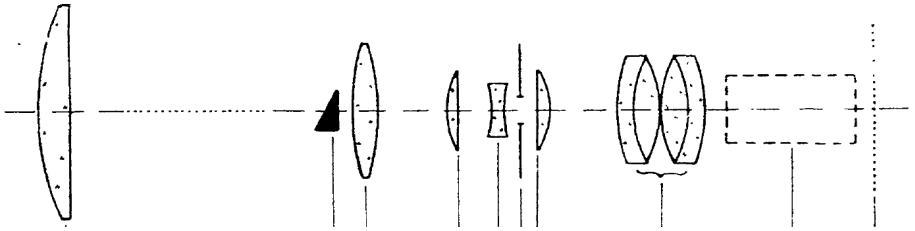
LSO Zeiss coronagraphs

- Front part of the coronagraph: scrollable lid and objective lens assembly



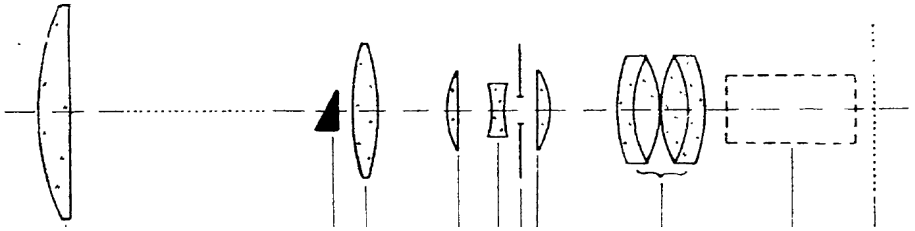
LSO Zeiss coronagraphs

- Central and rear part of the coronagraph: artificial moon assembly, rear part interface, handles for actions



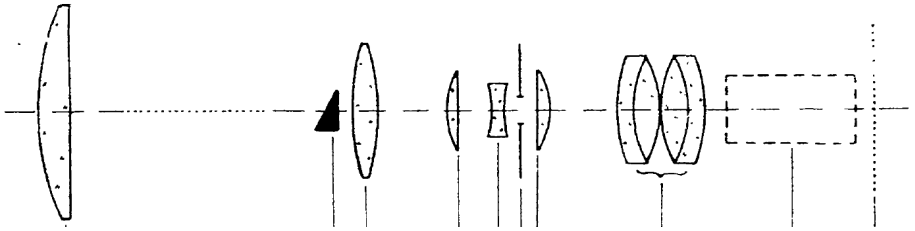
LSO Zeiss coronagraphs

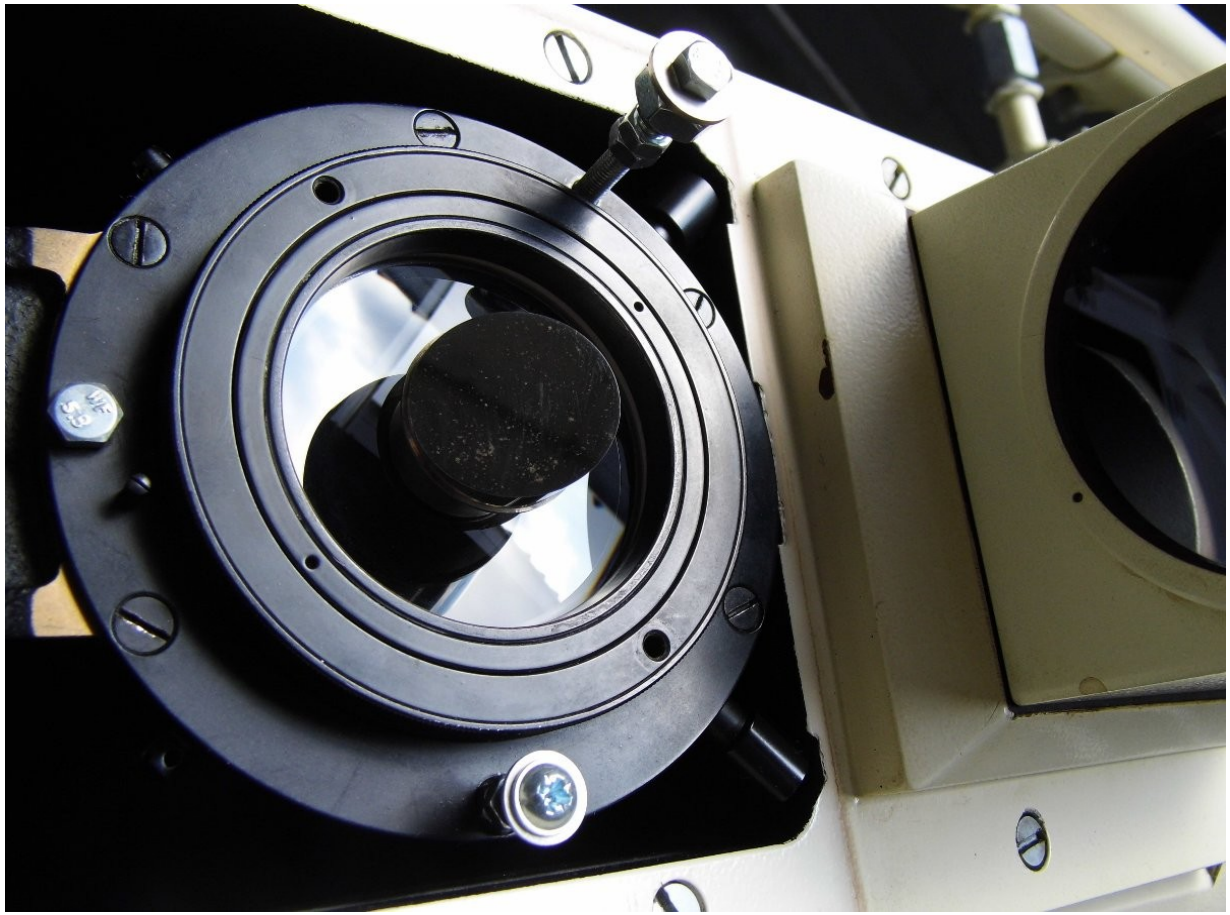
- Objective lens: ZEISS 200/3000, BK7, D = 224 mm, R_1=1.710 m, R_2=17.000 m,



LSO Zeiss coronagraphs

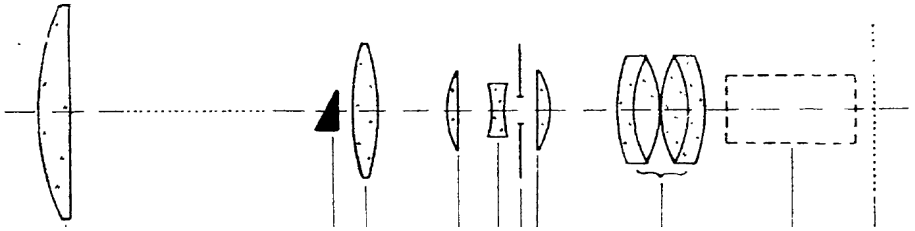
- Artificial moon and field lens

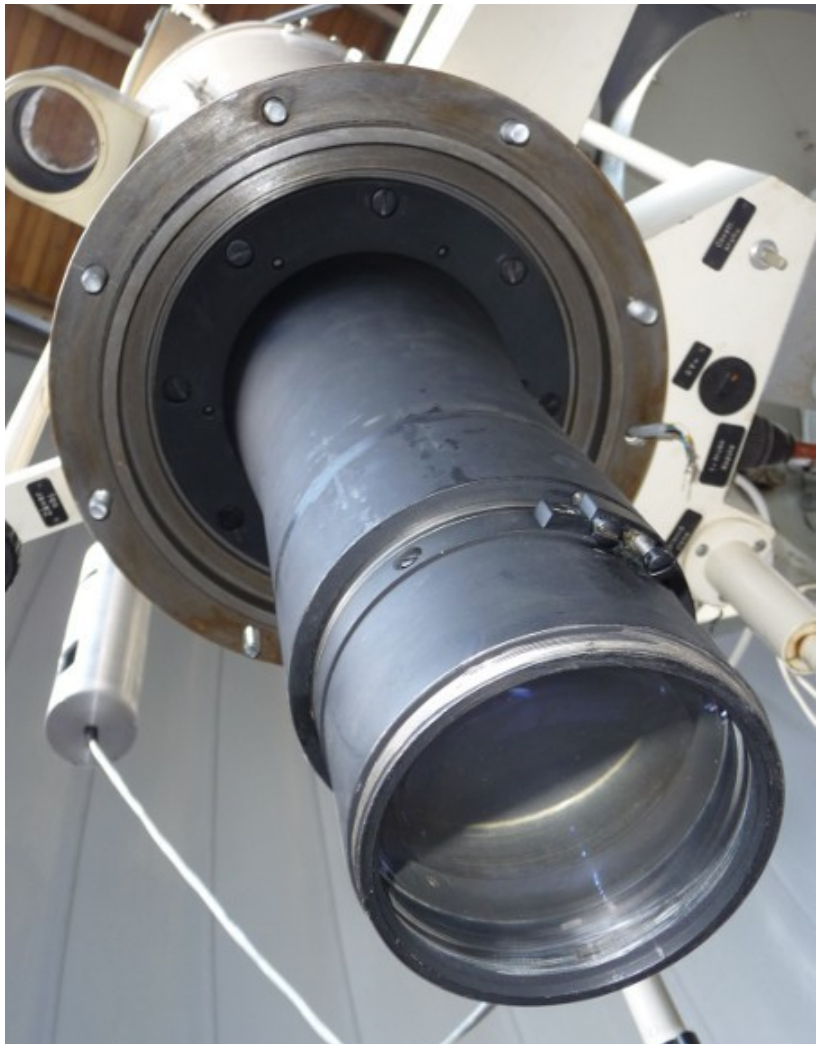




LSO Zeiss coronagraphs

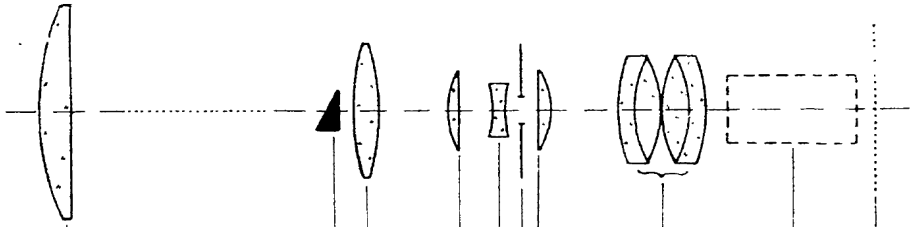
- Re-imaging lenses: D=100mm, BK7

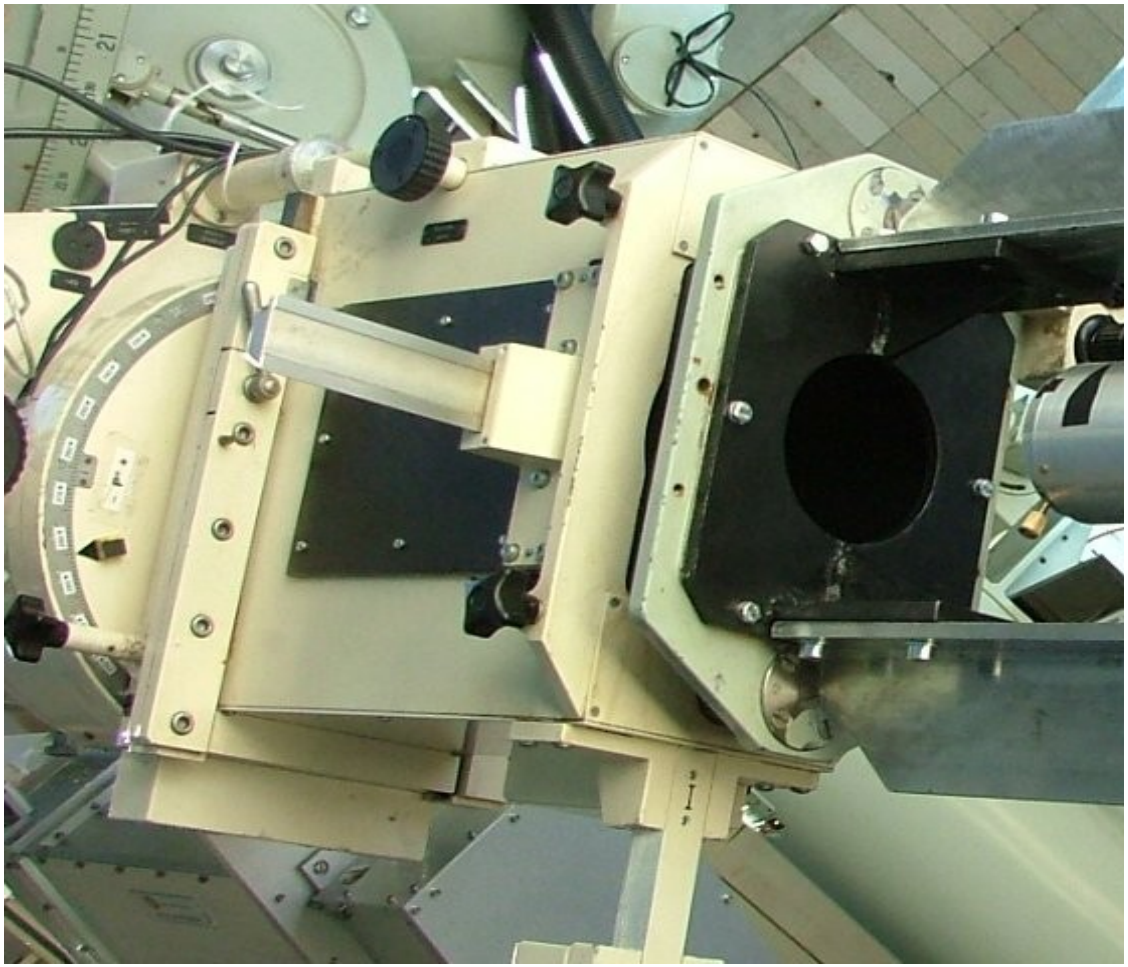




LSO Zeiss coronagraphs

- Rear part interface for post-focus instrument rotation, offset, and focusing





LSO past science

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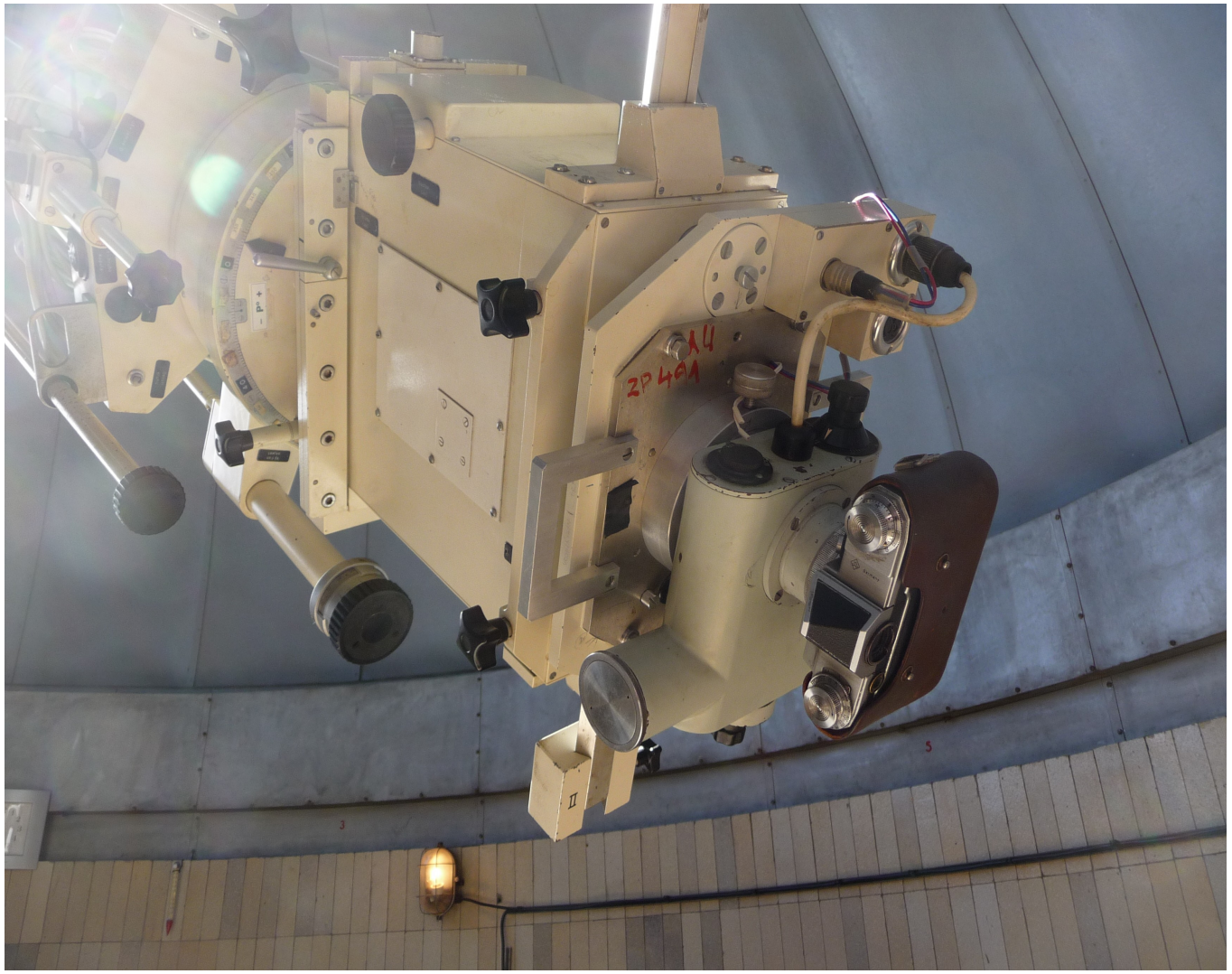
- patrol observations of the H alpha prominences → long-term data set of the H alpha prominence catalogue



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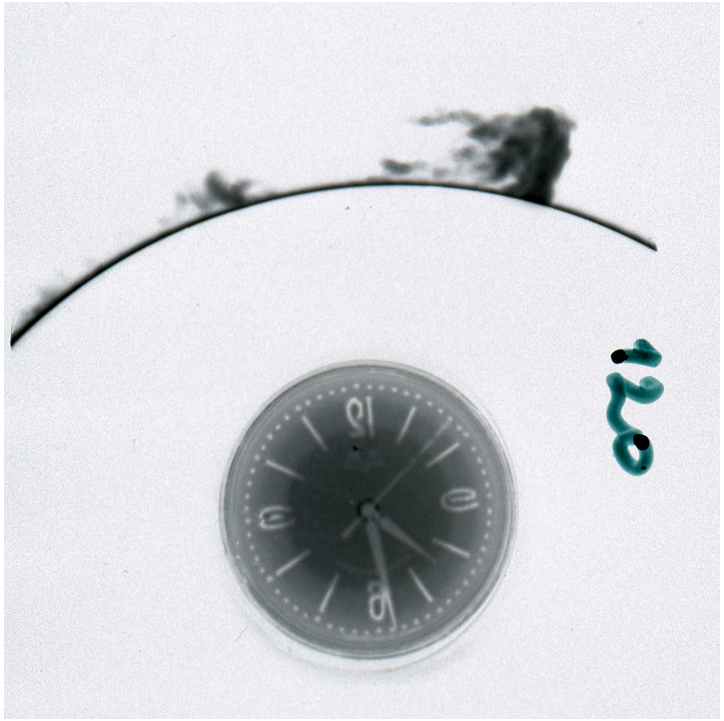

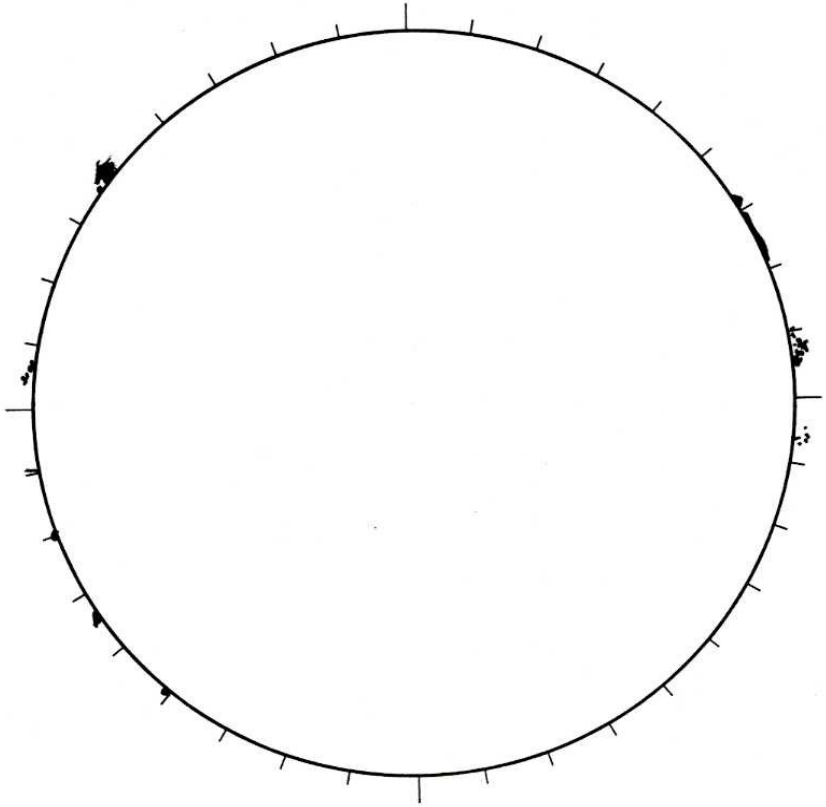

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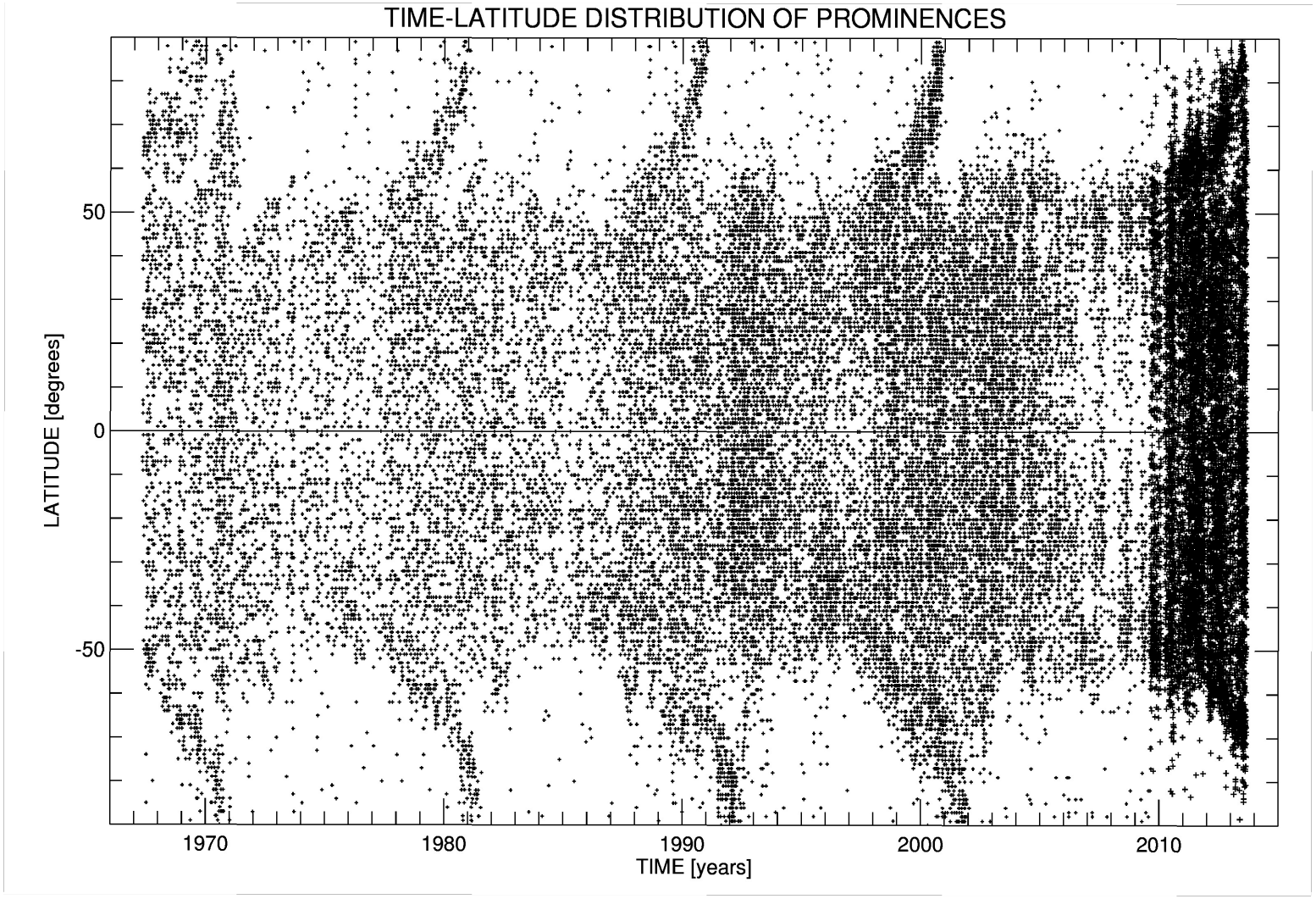
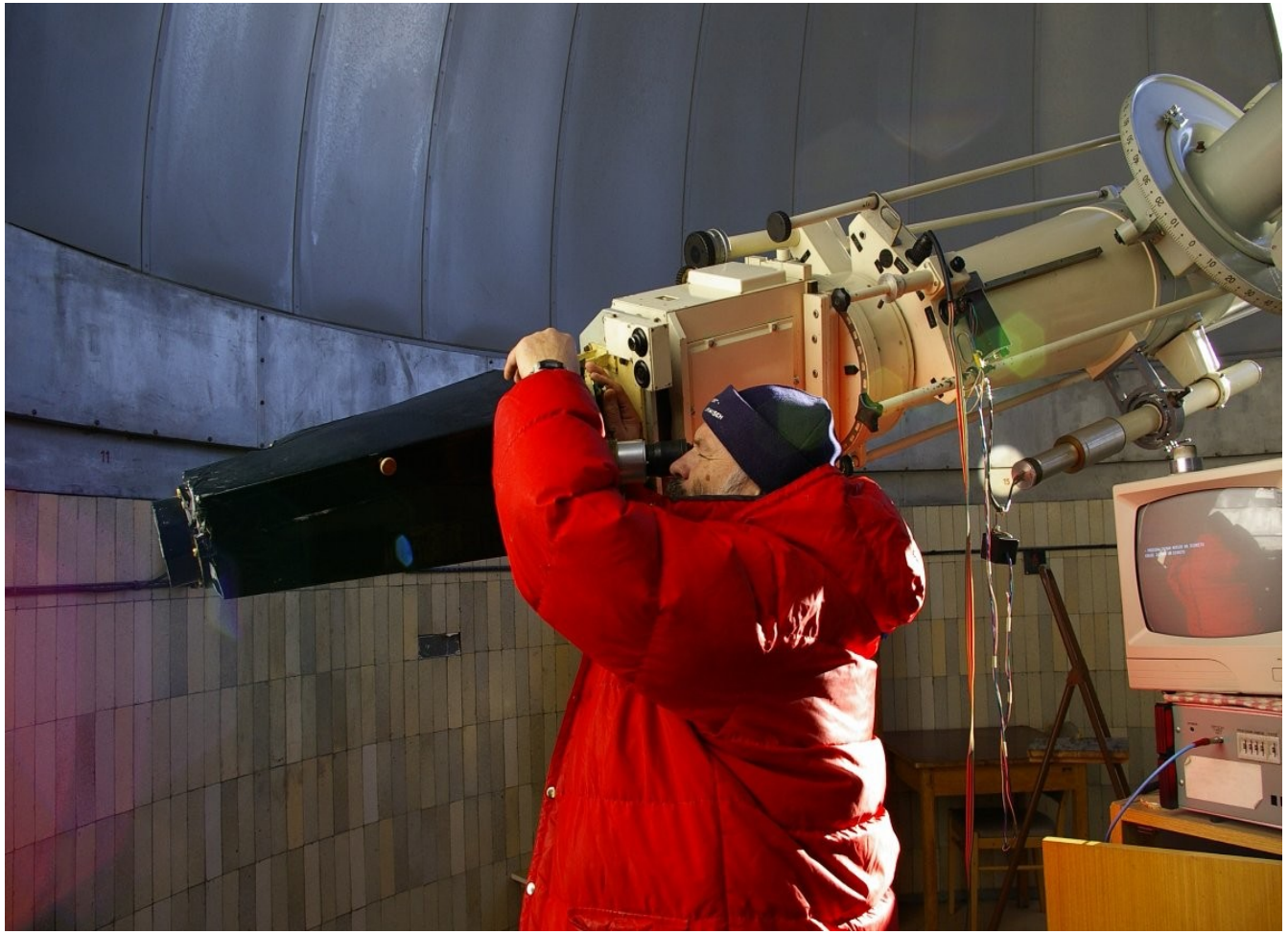


LSO past science

- patrol observations of the coronal emission lines intensities → long-term data set of the Homogenous green line intensity catalogue / the green line coronal index



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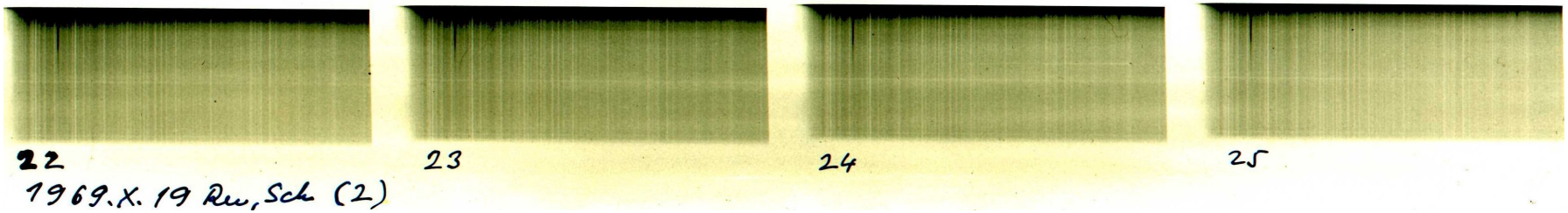

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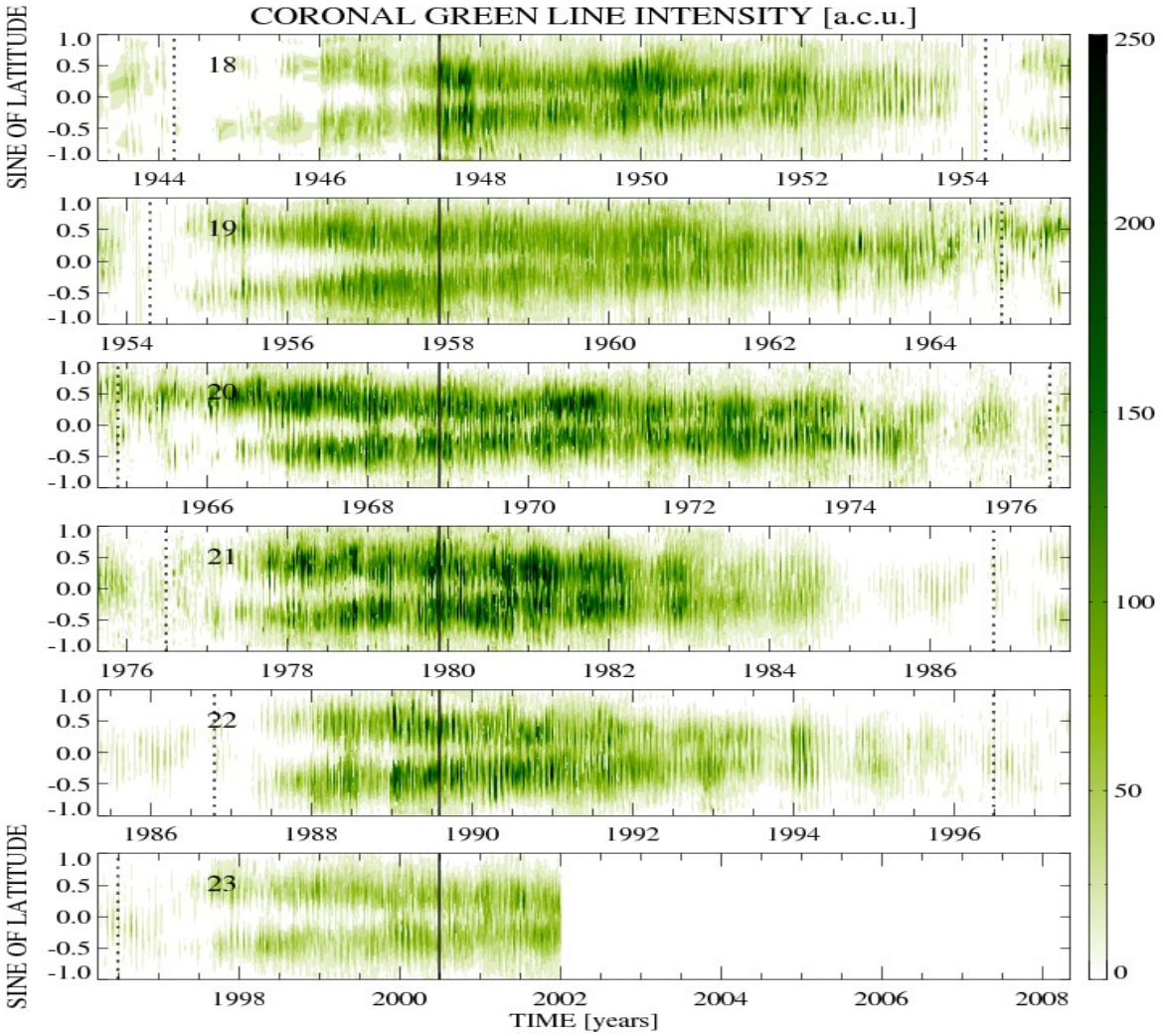

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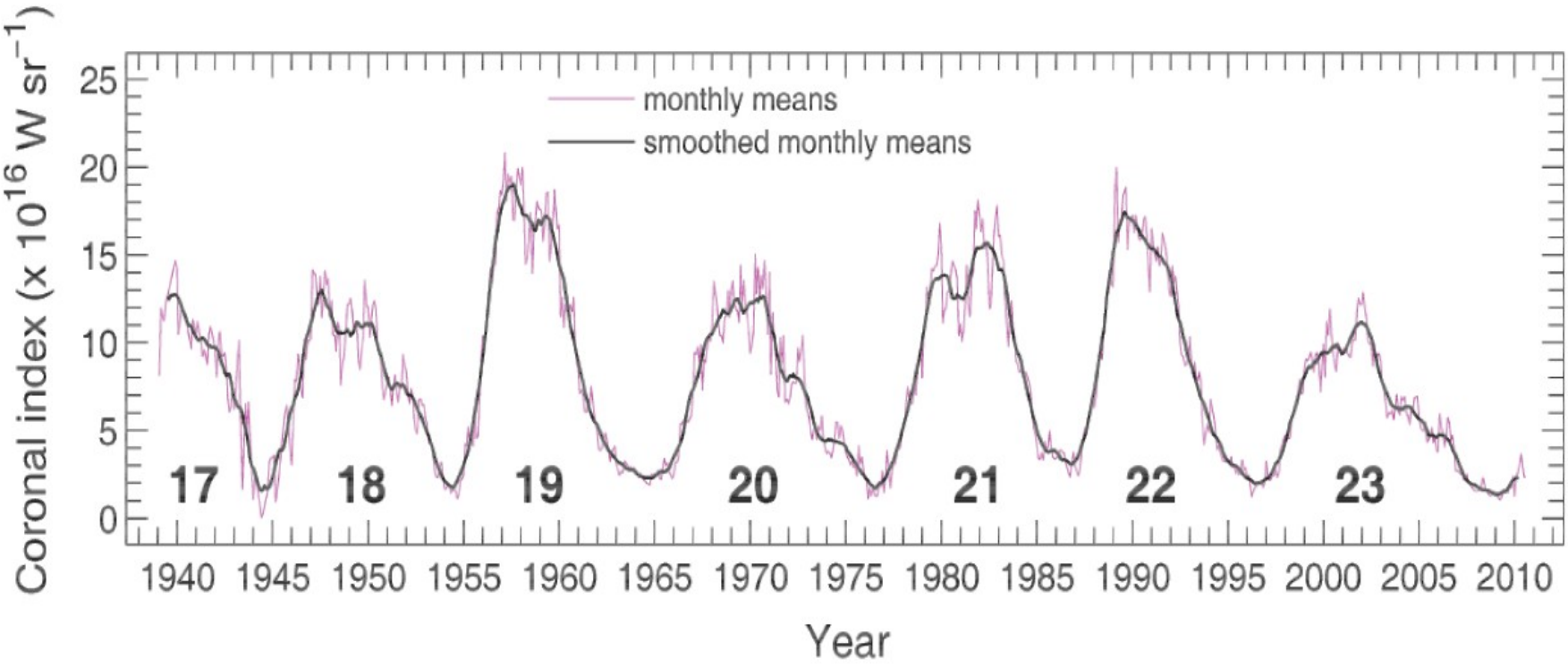
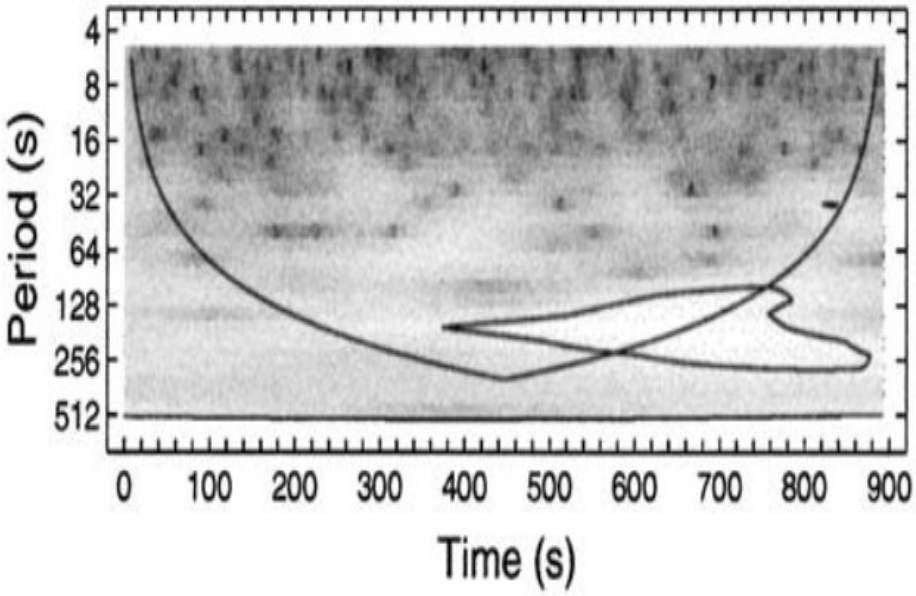
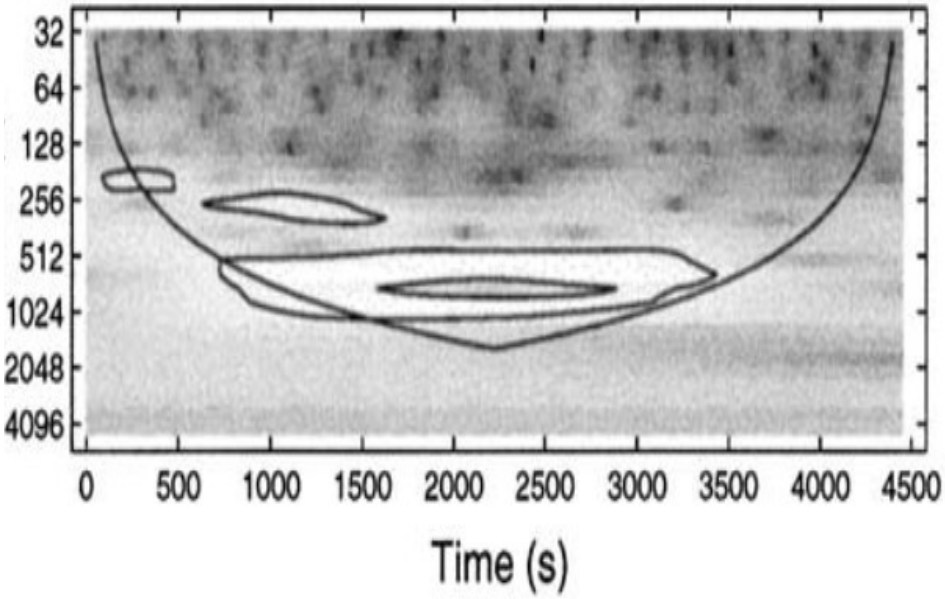


Rybanský, M., 1975, BAC ***26,*** *367*
Minarovjech, M., 2011, CAOSP ***41****, 137*

LSO past science

- Special measurements → 5-min oscillations in the solar green line





Minarovjech et al., 2003, Solar Phys ***213****, 269*

What's next, LSO ?

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- Recent decades (1960 – ~2005):
  - prominences and solar corona ground-based coronagraphs: a decline but also progress at the same time
  - eclipses: limited in many ways, e.g. too short ...
  - space-born instruments: UV, X-rays, great progress...
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- Review of plans of institutes and space agencies:
  - Pic-du-Midi, Norikura, SacPeak, ATST, Maona Loa, Haleakala,...
  - satellites in operation and Solar Orbiter, Solar-C, Proba-3, Aditya-1,...
  - space: imagers (UV, X-ray), spectrometers (UV)
  - spectro-polarimeters: ASPIICS/Proba-3, SUVIT/Solar-C, METIS/SO
  - ground: spectro-polarimeters: only CoMP@Maona Loa (COSMO ?)

What's next, LSO ?

- What's next? A simple but quite difficult question...
- When all our limitations of different types are taken into account:

2D spectro-polarimetry using
VIS and near IR emission lines:

coronagraphic measurements of
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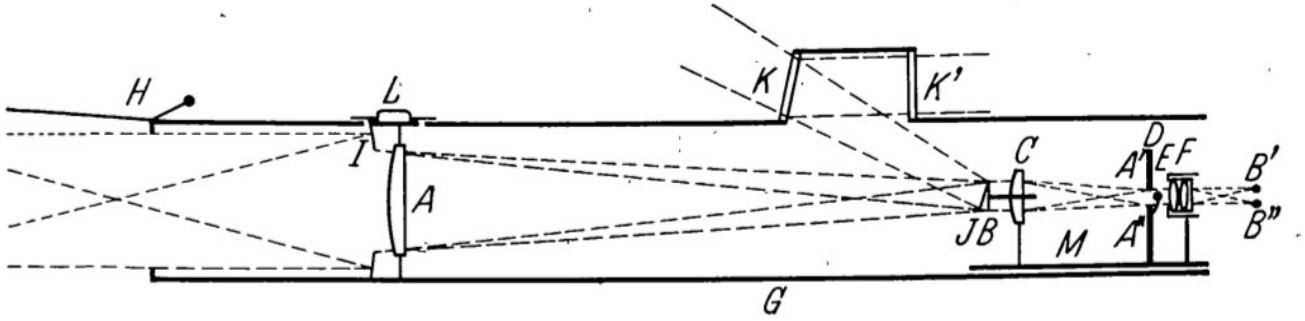
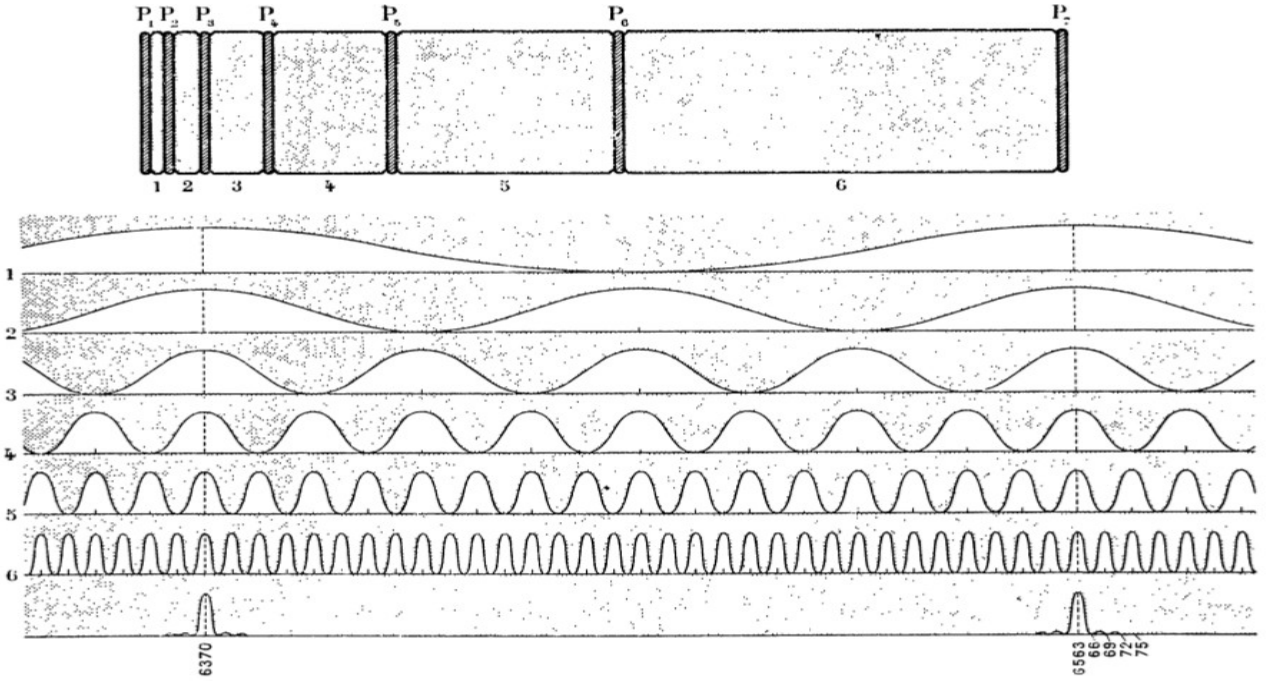
- But a budget needed is above all means...
- Miracle of the EU structural funds for science in less-developed regions of Slovakia

What's next, LSO ?

- A short historical note: the LSO is a tribute to B. Lyot...



*Lyot, B., Zeitschrift für Astrophysik **5**, 73 (1932)*



*Lyot, B., Annales d'Astrophysique, **7**, 31 (1944)*

LSO instrumentation

LSO instrumentation

CoMP-S with PDSS
pointer R
CorMag
pointer H
SCD
H alpha full disk+aureola

LSO instrumentation

CoMP-S with PDSS
pointer R
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LSO: CoMP-S

- **The Coronal Multi-channel Polarimeter for Slovakia – CoMP-S**

- **Main feature:** wavelength range: **500 – 1100 nm** allowing spectropolarimetric measurements of several VIS + near-IR emission chromospheric and coronal emission lines (CoMP only 1070-1090nm)

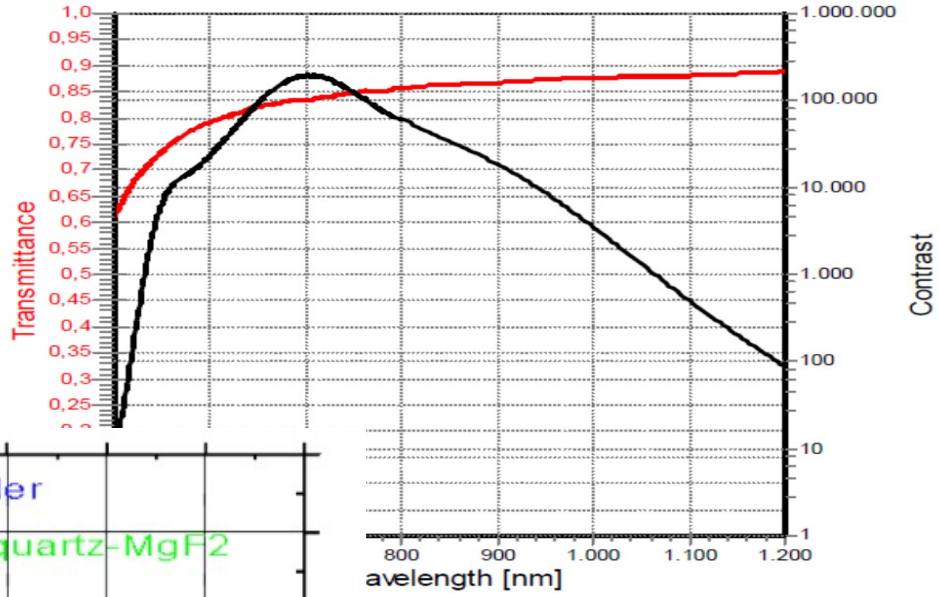
- **Other specifications:** not a full-disk FoV, simultaneous imaging of a 2D area, sequential data acquisition in wavelength and polarization, a refocusing needed when the spectral line is changed

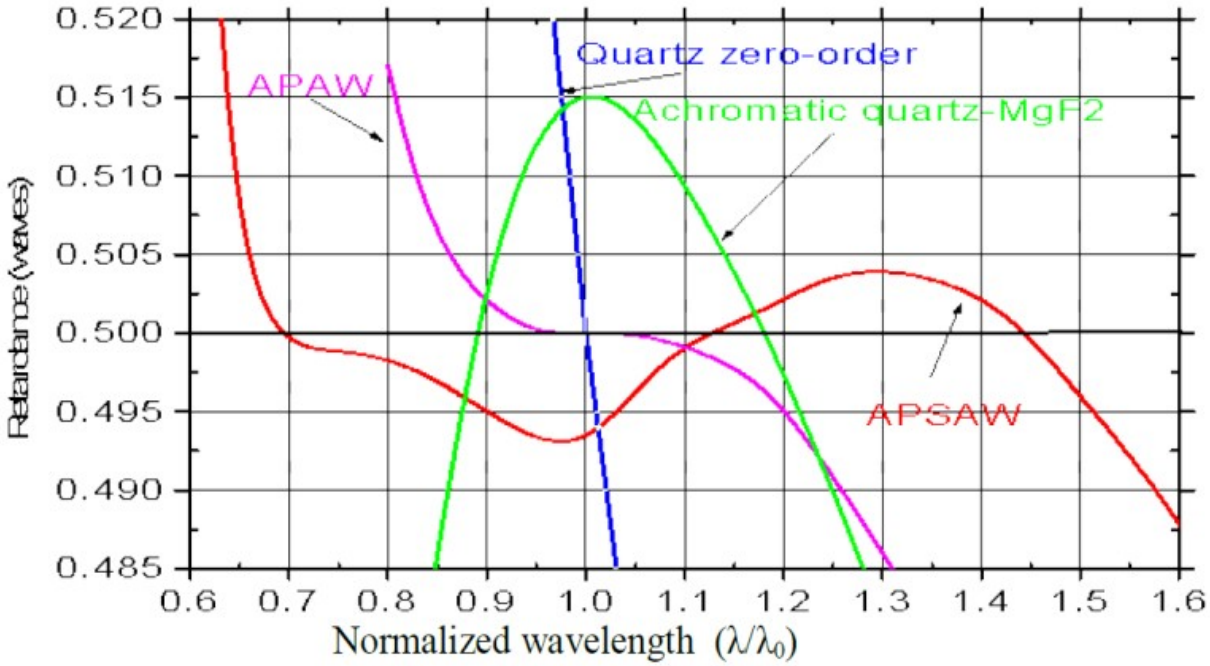
LSO: CoMP-S

- How this can be achieved? Advances in broadband polarizers and super-achromatic waveplates optics...

  - polarizer material:
    VIS700BC4 by CODIXX
    more than ~70% transmission

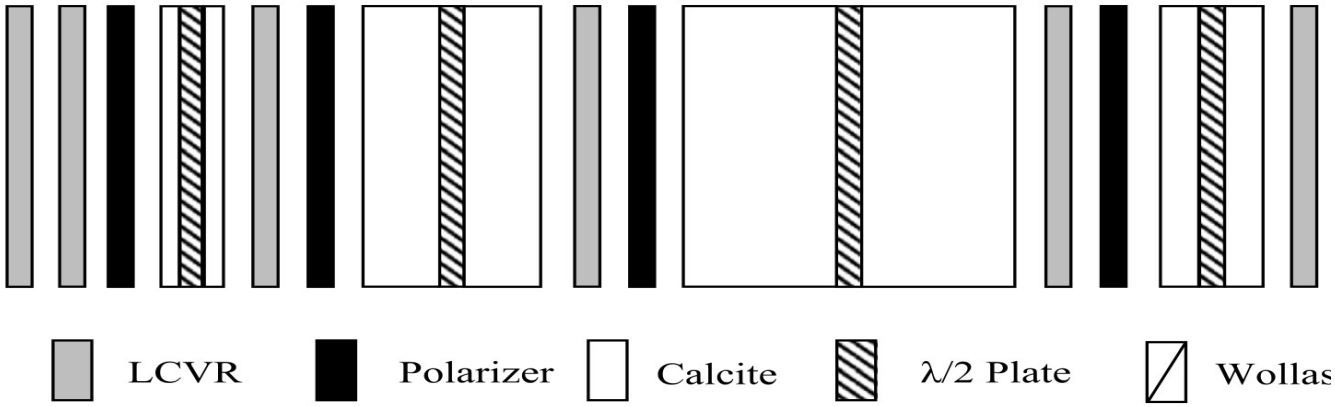
  - super-achromatic λ/2 plates:
    APSAW by ASTROPRIBOR
    range: 0.7- 1.5 $\lambda_{nominal}$

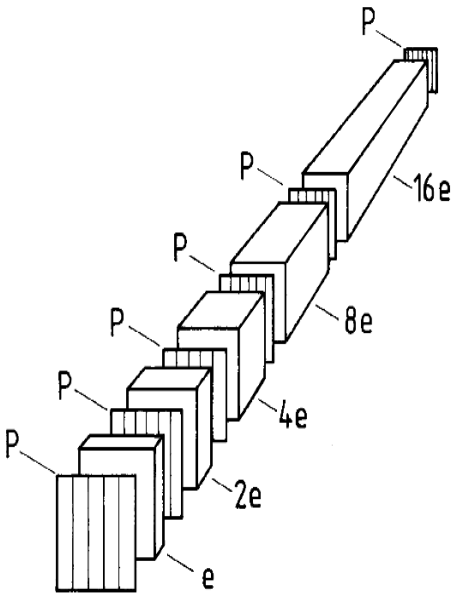


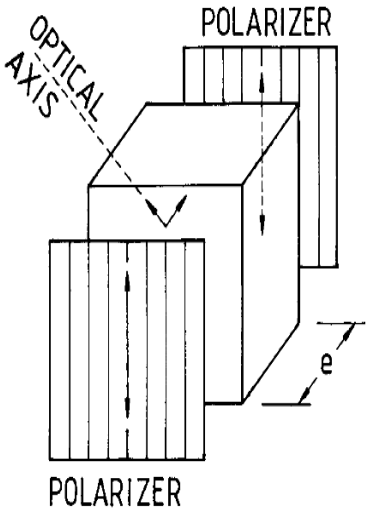


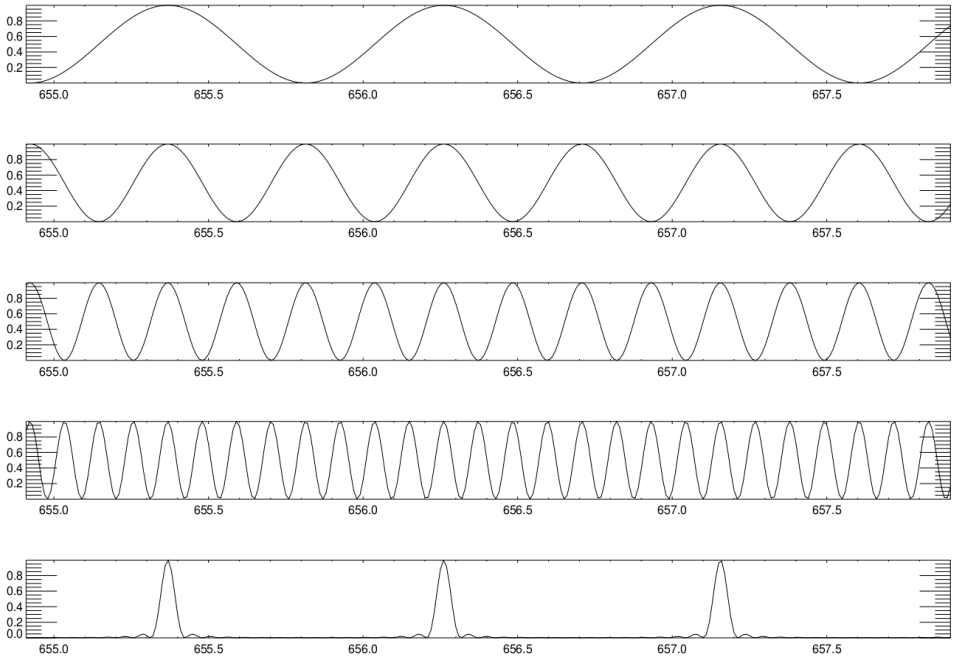
LSO: CoMP-S

- How this can be achieved?



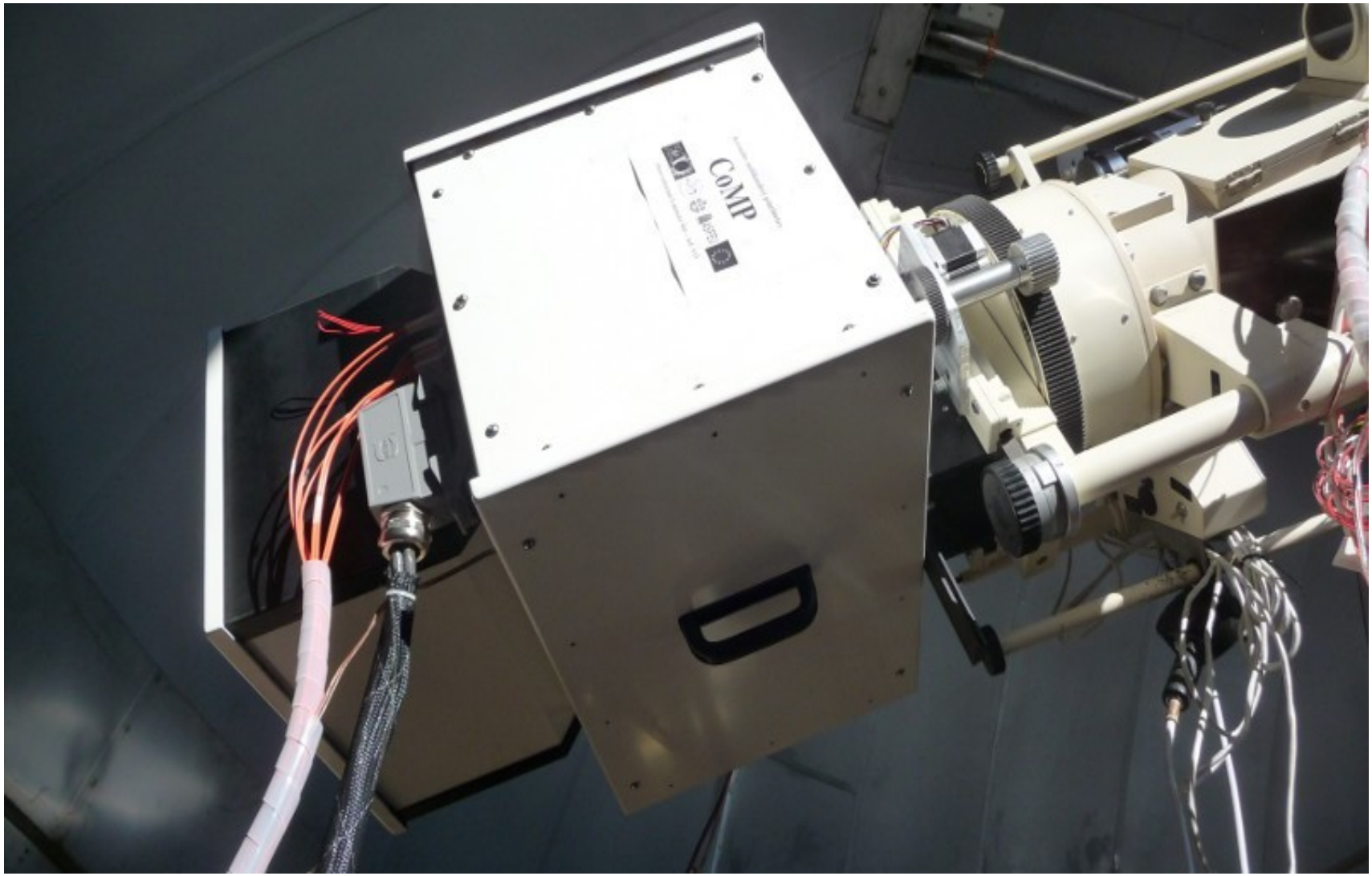






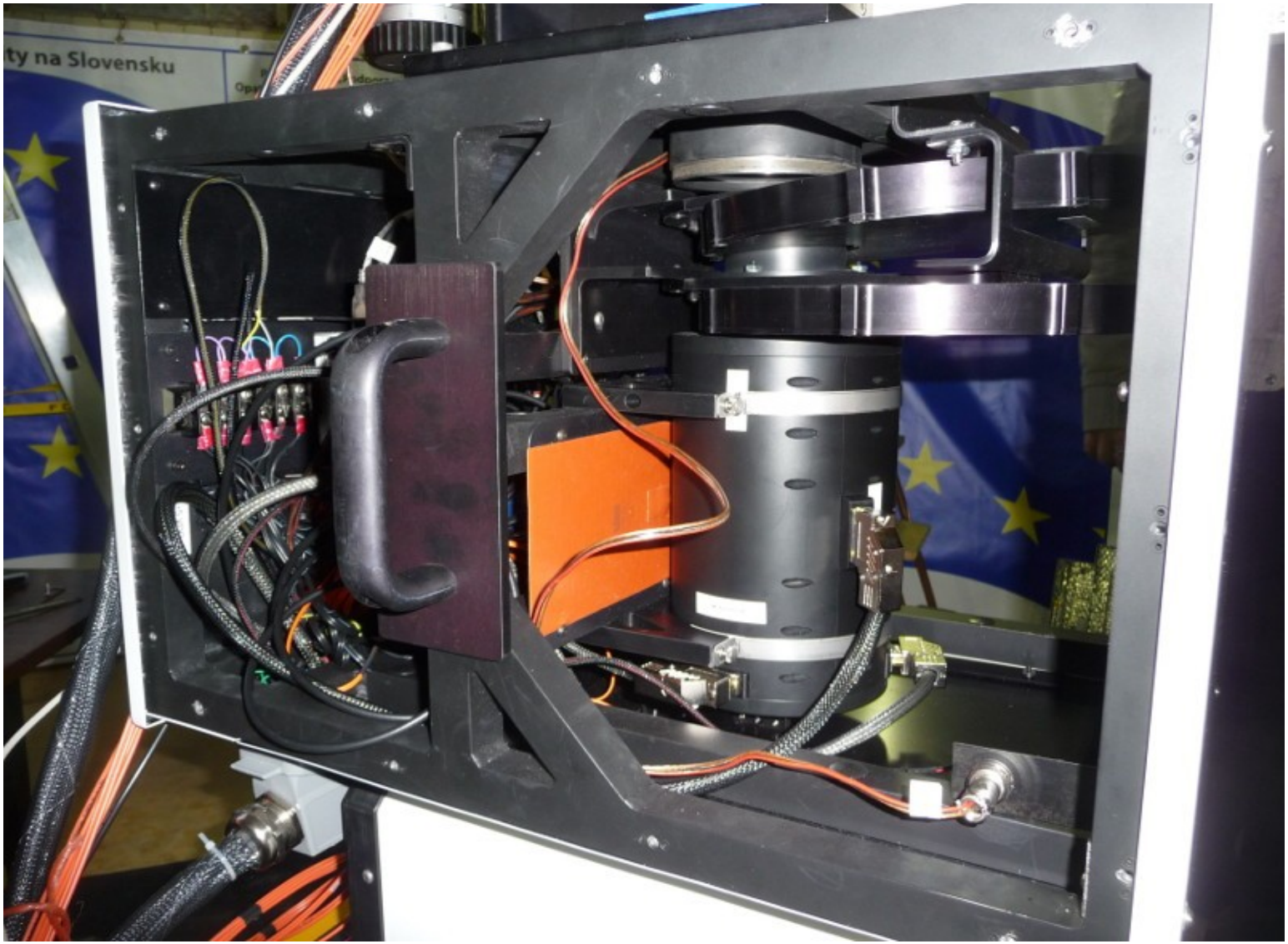
LSO: CoMP-S

Main modules: mechanical interface, filter module, camera module, …



LSO: CoMP-S

Main modules: filter module

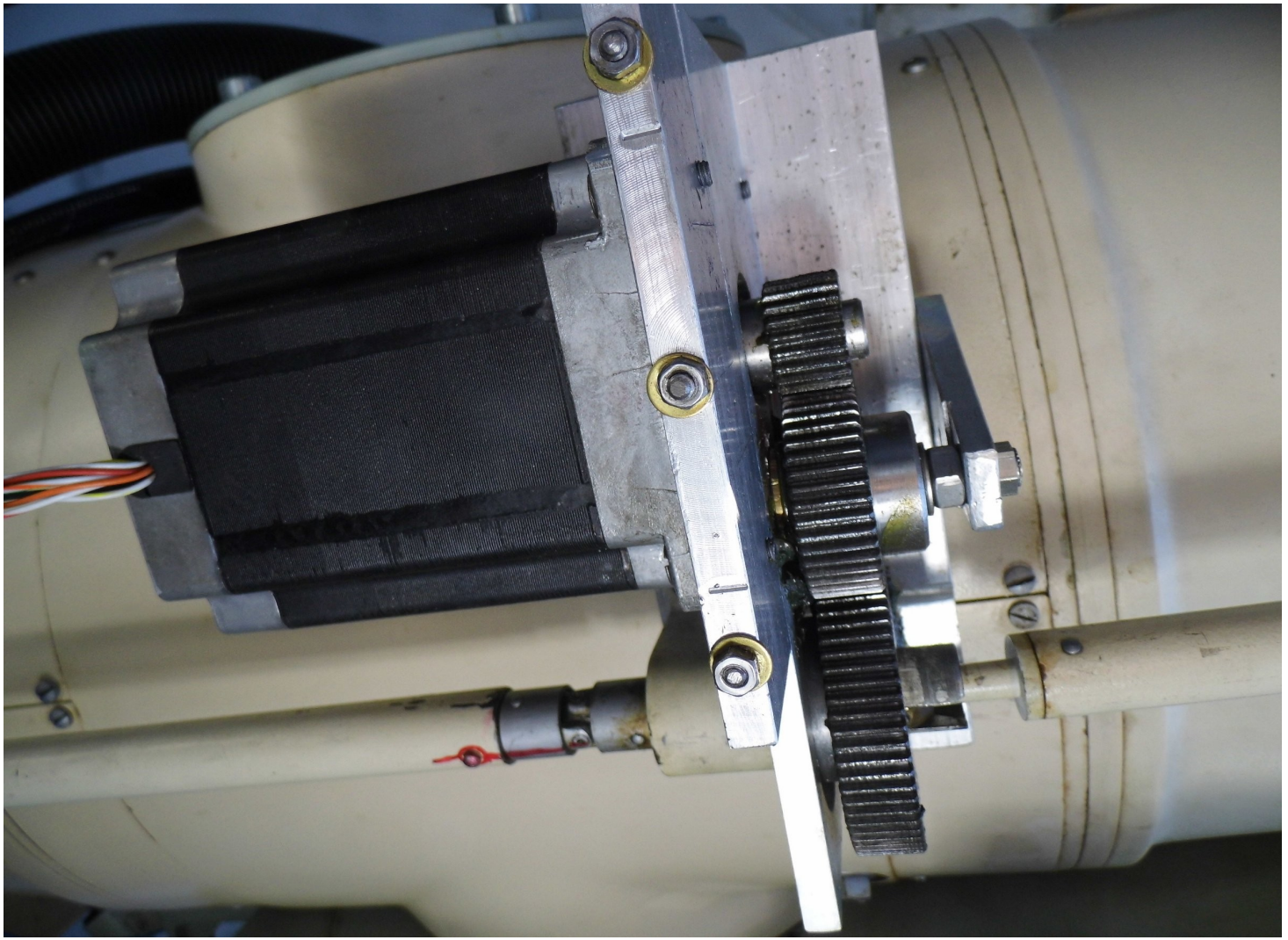


LSO: CoMP-S

Main modules: camera module

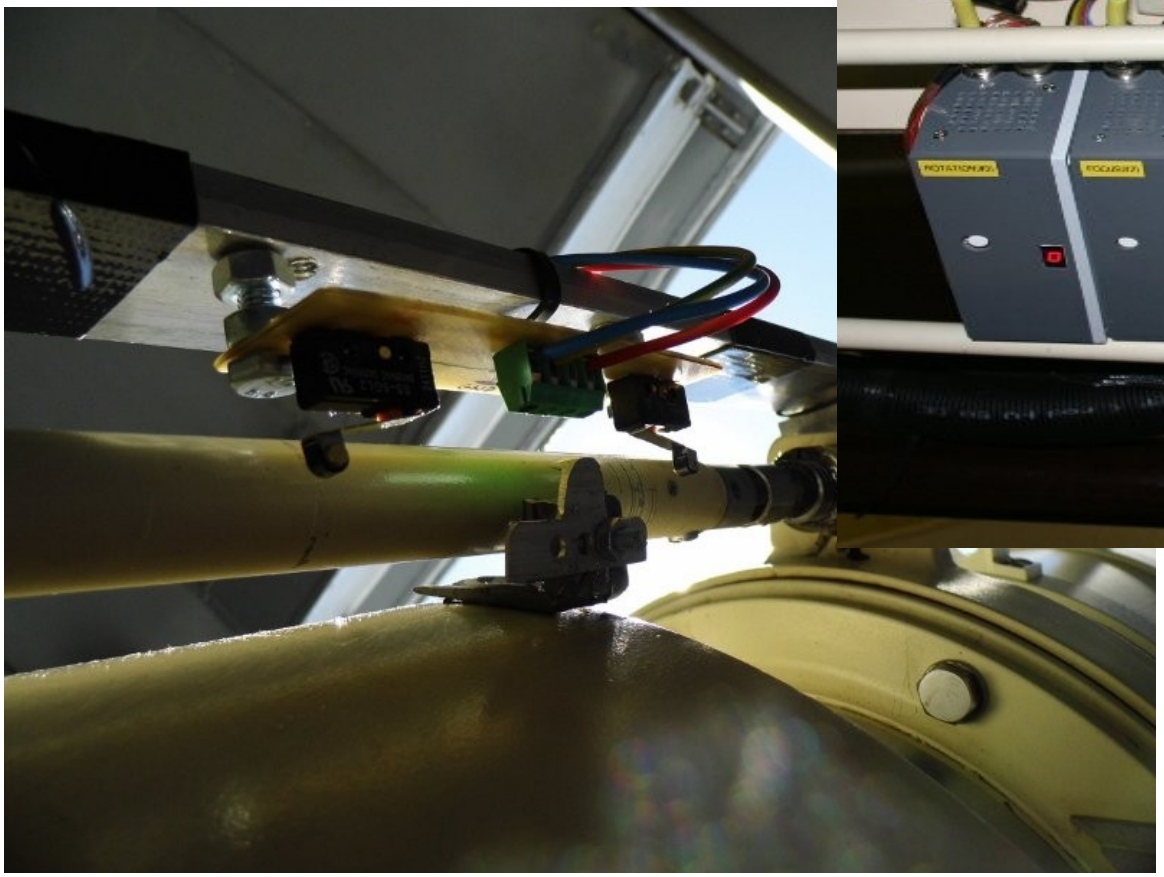
LSO: CoMP-S

Focusing the objective lens: stepper motor Powerpac SM32-5008S



LSO: CoMP-S

Motor electronics for computer operation of the rotation, diffuser, and focusing including end switches



LSO: CoMP-S

CoMP-S briefly:

- installed in March 2011
- regular observations since May 2013

- 4 stage wide-field tunable Lyot filter, FLC polarimeter
- strategy: 2 orthogonal pol. states in shifted bandpasses simultaneously
- selected emission lines:
  corona: Fe XIV 530.3nm, Ca XV 569.5nm, Fe X 637.5nm,
  Fe XI 789.2nm, *Fe XIII 1074.7nm, 1079.8nm*
  prominences: He I 587.6nm, H I 656.3nm, Ca II 854.2nm,
  He I 1083.0nm

- deliverables: 2D I (A,v,w), *2D full Stokes I, Q, U, V*

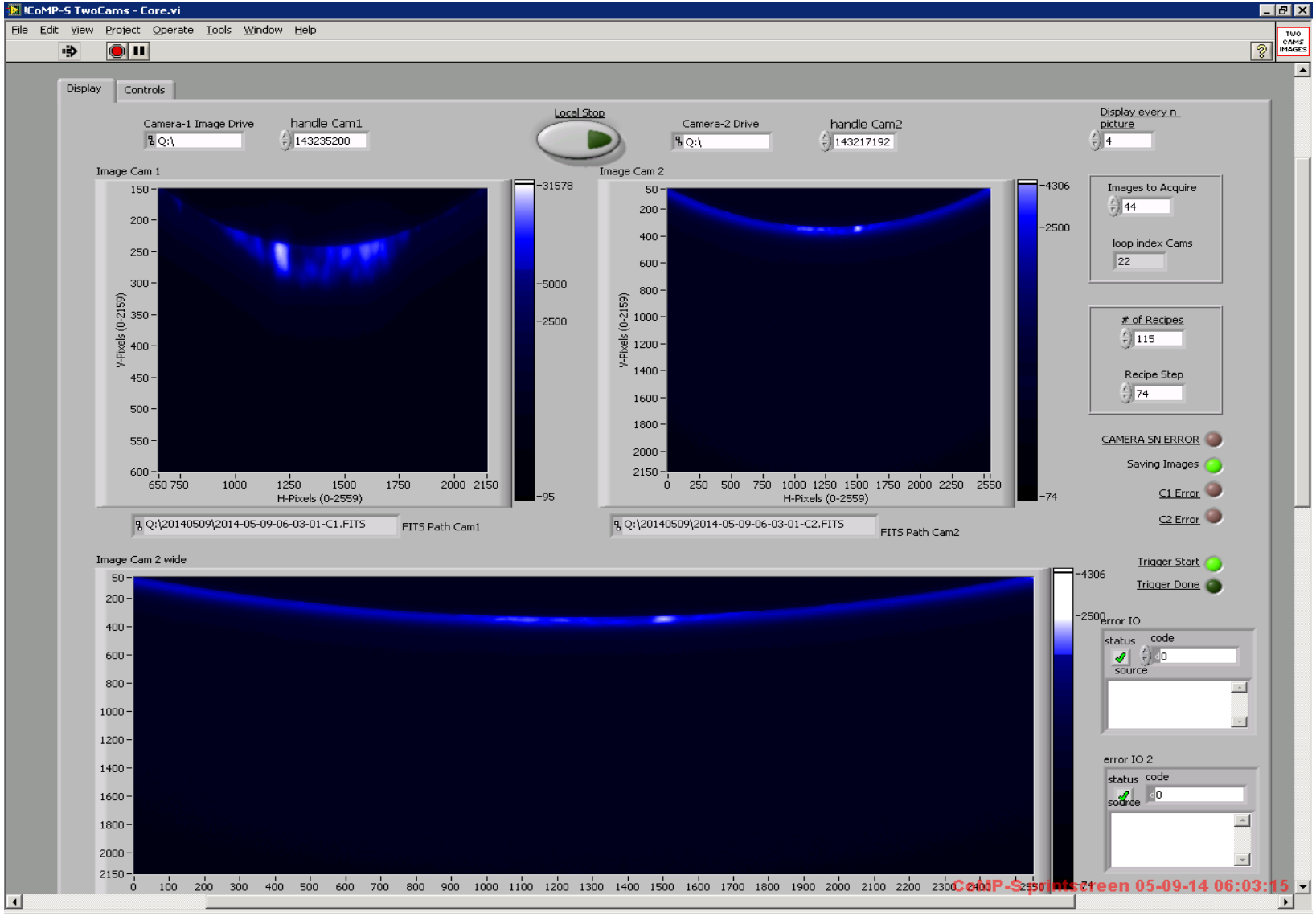
- FoV: ~860” x 680”, diffraction limited (0.33”/pixel @ 656.3nm)

- FWHM: 0.028 - 0.13 nm (530 – 1083nm)

- typical exposure times: ~100 ms – prominence lines
  ~1 s – coronal lines
- wavelength tuning time : ~0.2 s
- polarization change time: ~30 ms

LSO: CoMP-S

Example of the Labview control program GUI – 9/5/2014:



LSO: CoMP-S

Hα quiescent prominence – Oct 20, 2012, 07:09 UT:

- HOP 186 „Mass loading of quiescent prominences from multi-wavelength observations“
- Hα line profile: 11 wavelength settings, only Stokes I parameter presented
- Exposure time: 50 ms, total scan time: 20.75 s, wavelength steps: core: 0.1 Å, wings: 0.2 Å
- post-facto 4 x 4 pixel binning to final sampling: 1.3 arcsec/px
- Gaussian fitting of 11 samples of the H alpha profiles: **amplitude**

LSO: CoMP-S

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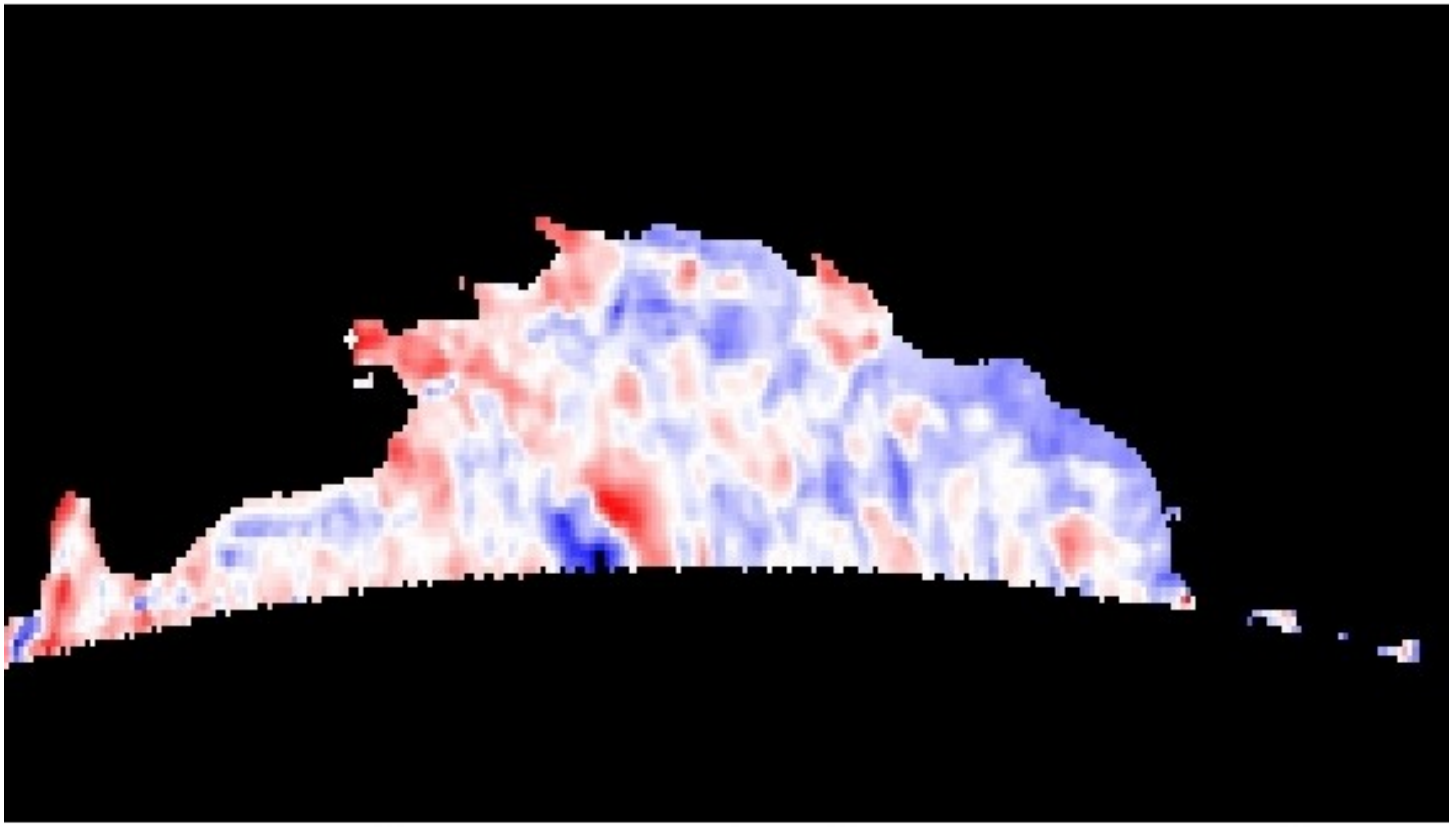
- post-facto 4 x 4 pixel binning to final sampling: 1.3 arcsec/px
- Gaussian fitting of 11 samples of the H alpha profiles: **dopplershifts [+/-12 km/s]**



LSO: CoMP-S

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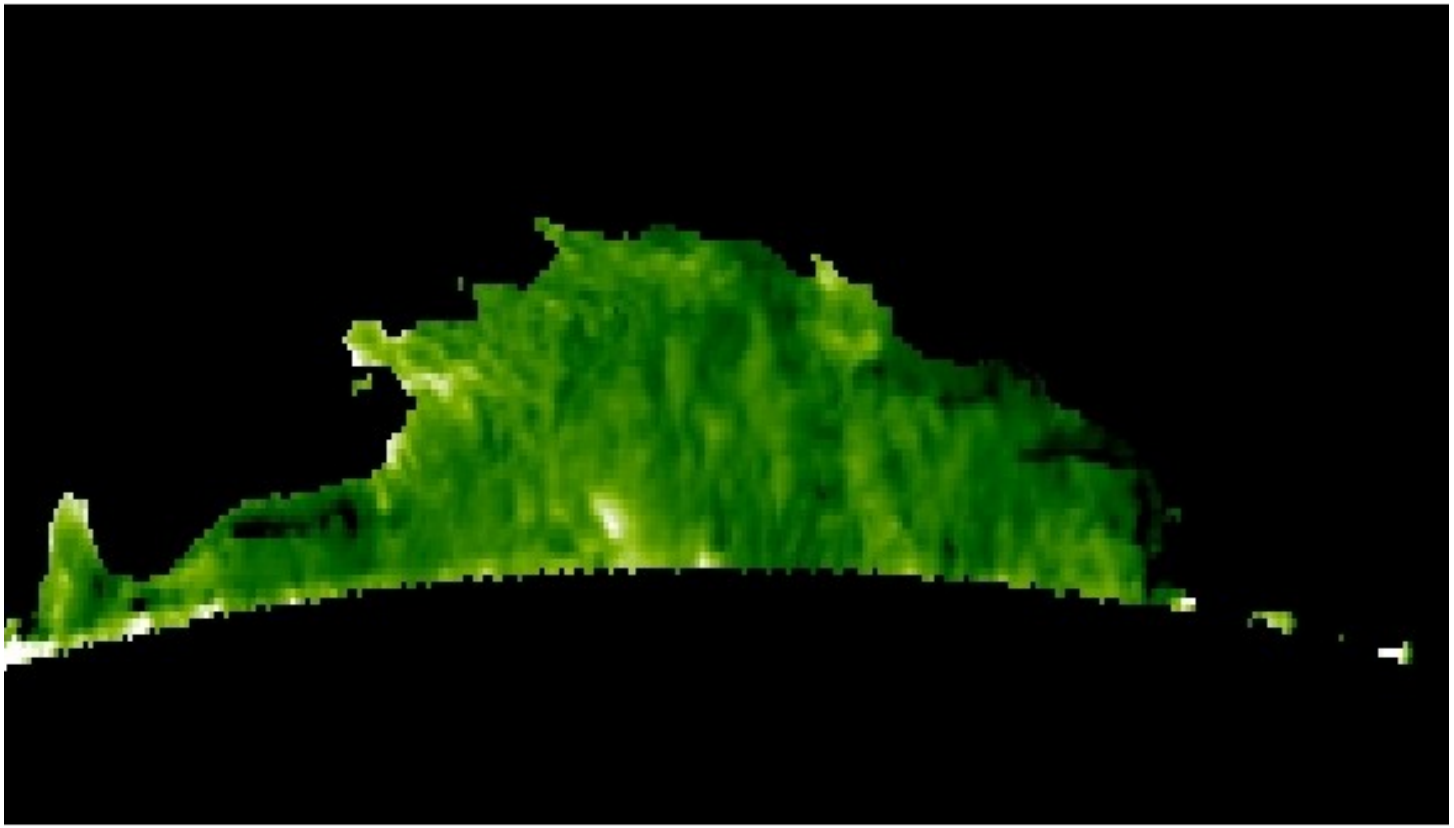
- post-facto 4 x 4 pixel binning to final sampling: 1.3 arcsec/px
- Gaussian fitting of 11 samples of the H alpha profiles: **Gaussian width [0.020-0.045 nm]**



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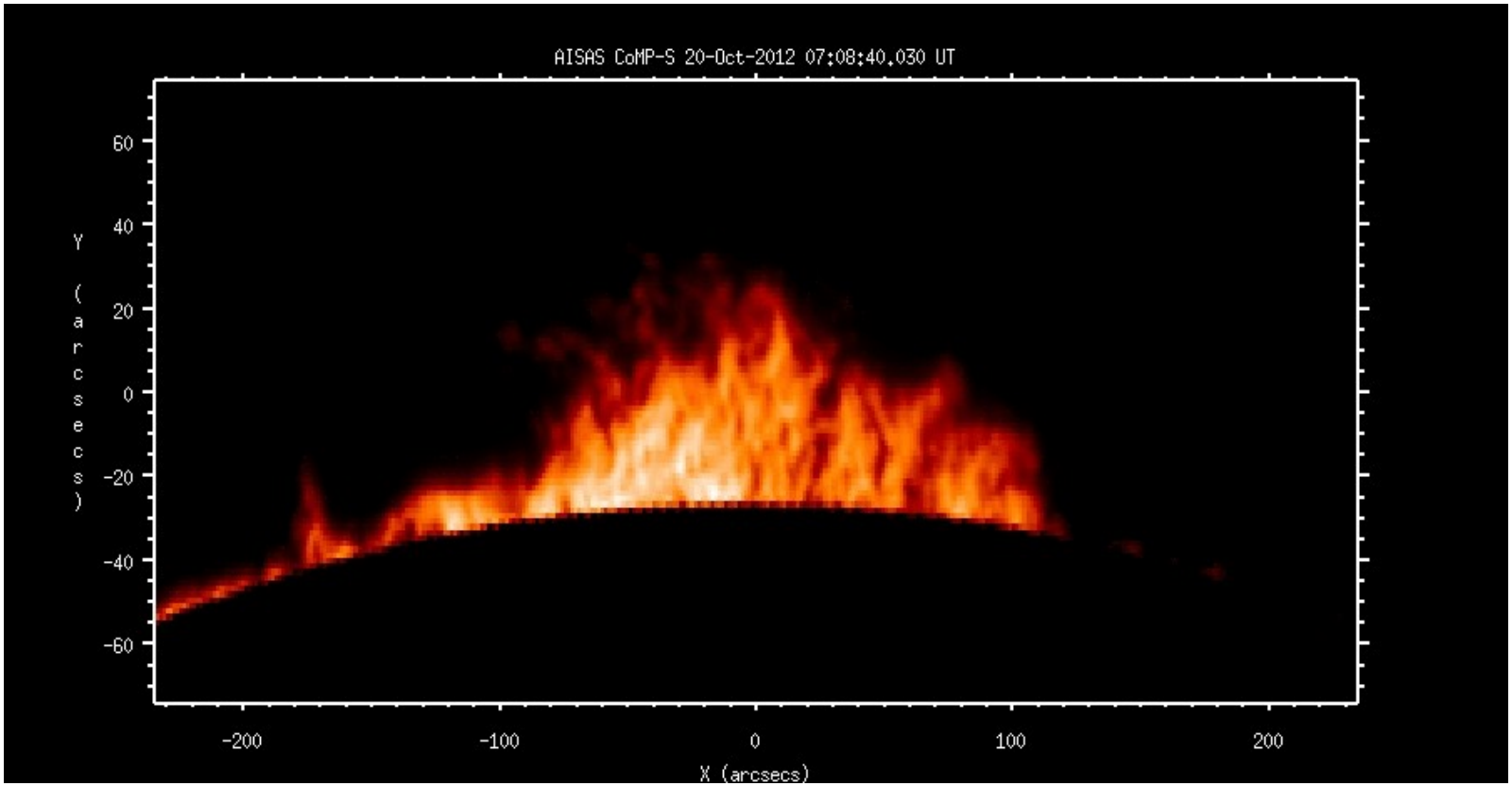
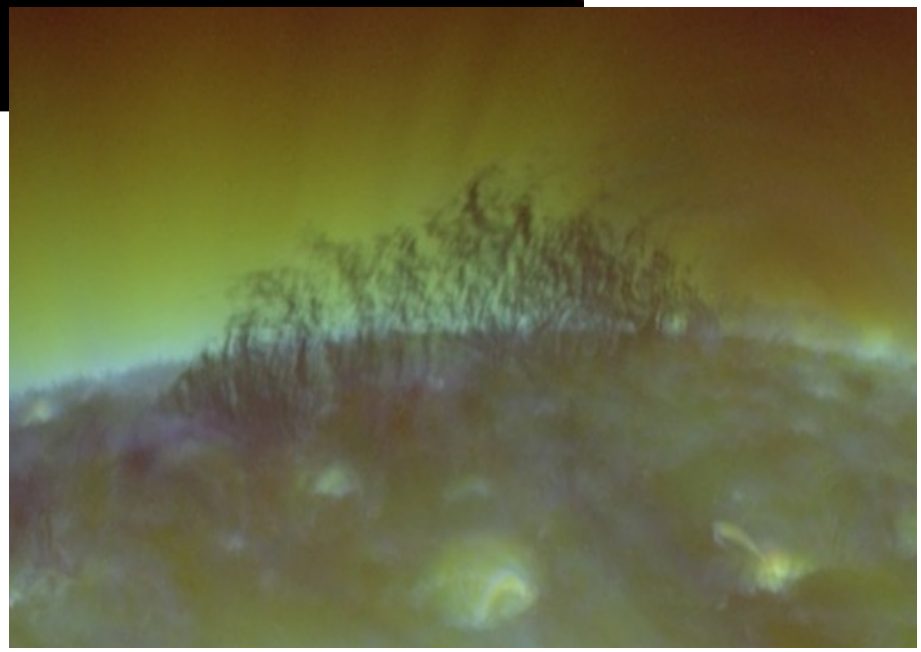
- Hα line profile: 11 wavelength settings, only Stokes I parameter presented
- Exposure time: 50 ms, total scan time: 20.75 s, wavelength steps: core: 0.1 Å, wings: 0.2 Å
- post-facto 4 x 4 pixel binning to final sampling: 1.3 arcsec/px
- Gaussian fitting: **amplitude ~ dopplershift ~ width**



LSO: CoMP-S

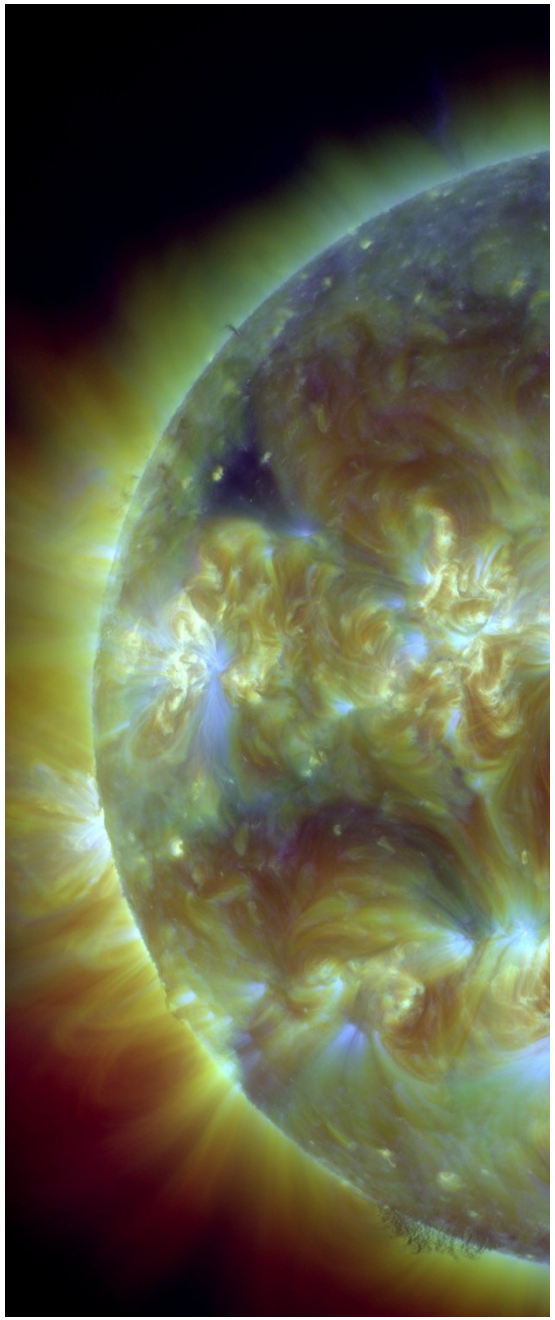
Hα quiescent prominence – Oct 20, 2012:

CoMP-S: 07:09 UT,
H I 656.3 nm



Help of J. Koza

AIA/SDO: 07:11 UT,
21.1+19.3+17.1nm



LSO: CoMP-S

Actual CoMP-S status:

- focusing and rotation motor dismounted
- adaptations of their motor electronics due to too frequent problems
- observations continue just in one spectral line, namely:
  OBS_PROG_002: “Prominences ~ tornadoes“

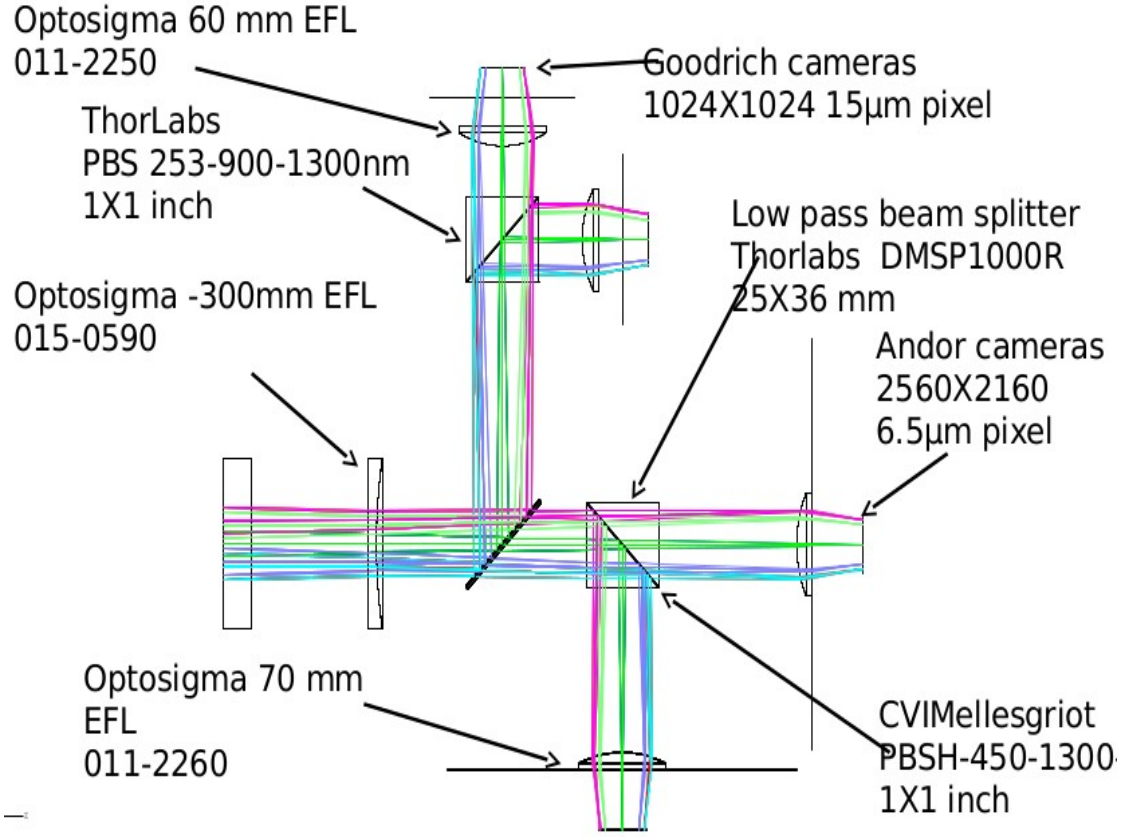
- data reduction pipeline development
- preparations for the disk/aureola observations
- preparations for the direct Lyot filter passband measurements
- improvements of the temperature control

- problems with the mechanical stability of the camera module
- problems with the polarizing cube beam splitter for 530 nm
- requirement to add IR detectors to the camera module

LSO: CoMP-S + PDSS

The Post-focus Detectors for Solar Spectrometer – PDSS: an upgrade of the original CoMP-S camera module

Main feature: new detectors for VIS + near-IR spectral ranges: VIS - ANDOR Neo, near IR – Goodrich GJ 1280, better mechanics for stability, focusing, a new computer, a little more optics and electronics



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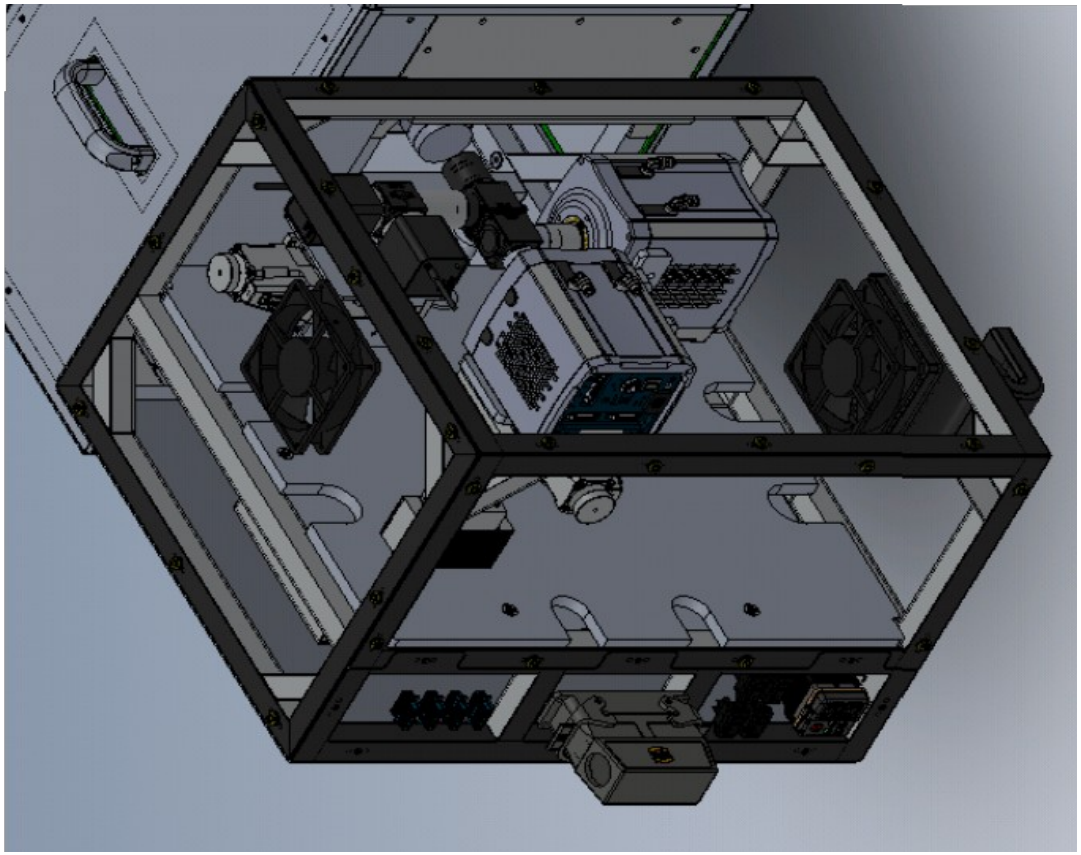
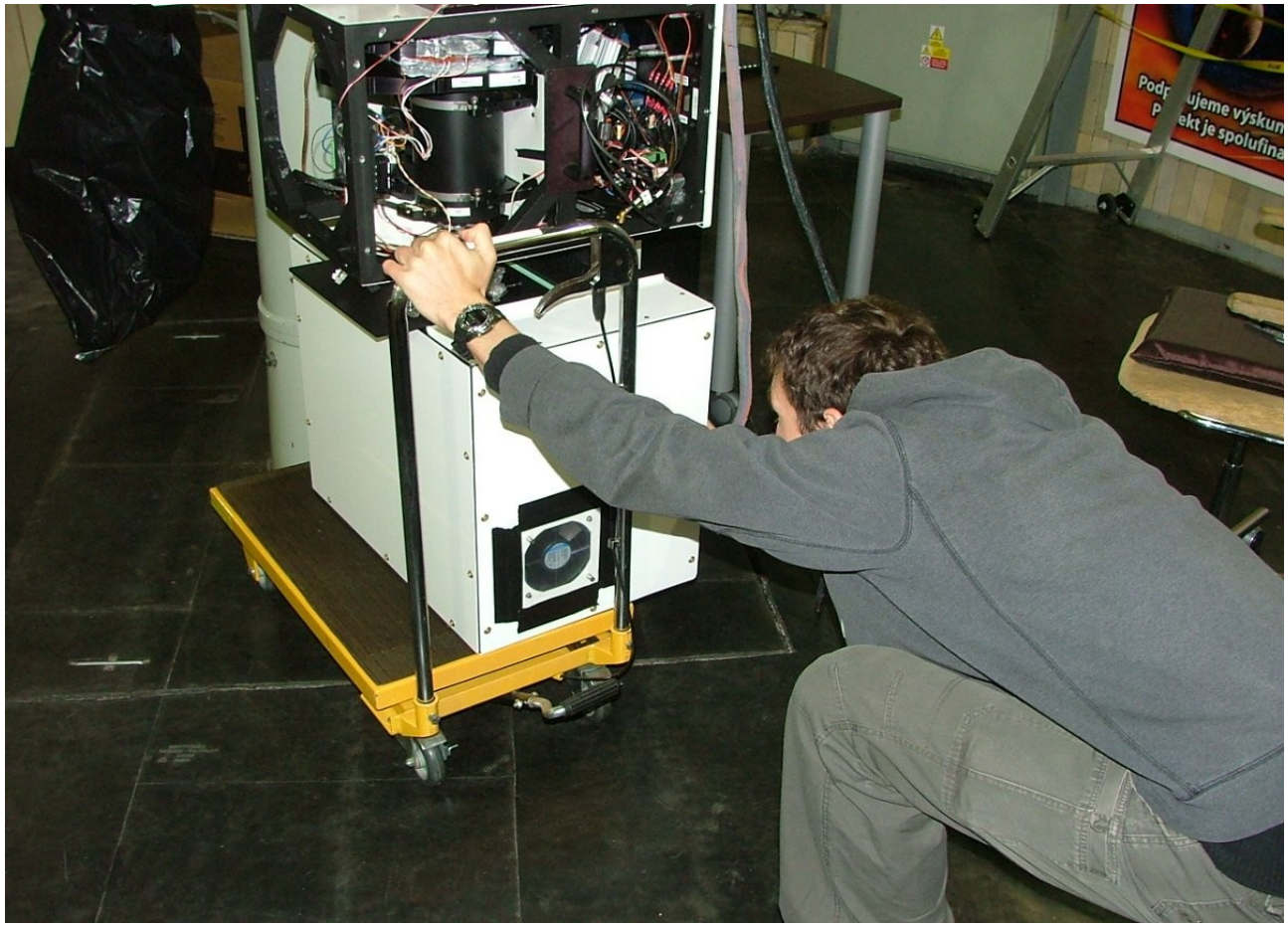


LSO: CoMP-S + PDSS

The PDSS actual status: the instrument has been delivered to AISAS, the first mechanical and electrical tests have started recently



Matúš Kozák moving the PDSS under the CoMP-S for the first time (13/05/2014)

LSO: CoMP-S + PDSS

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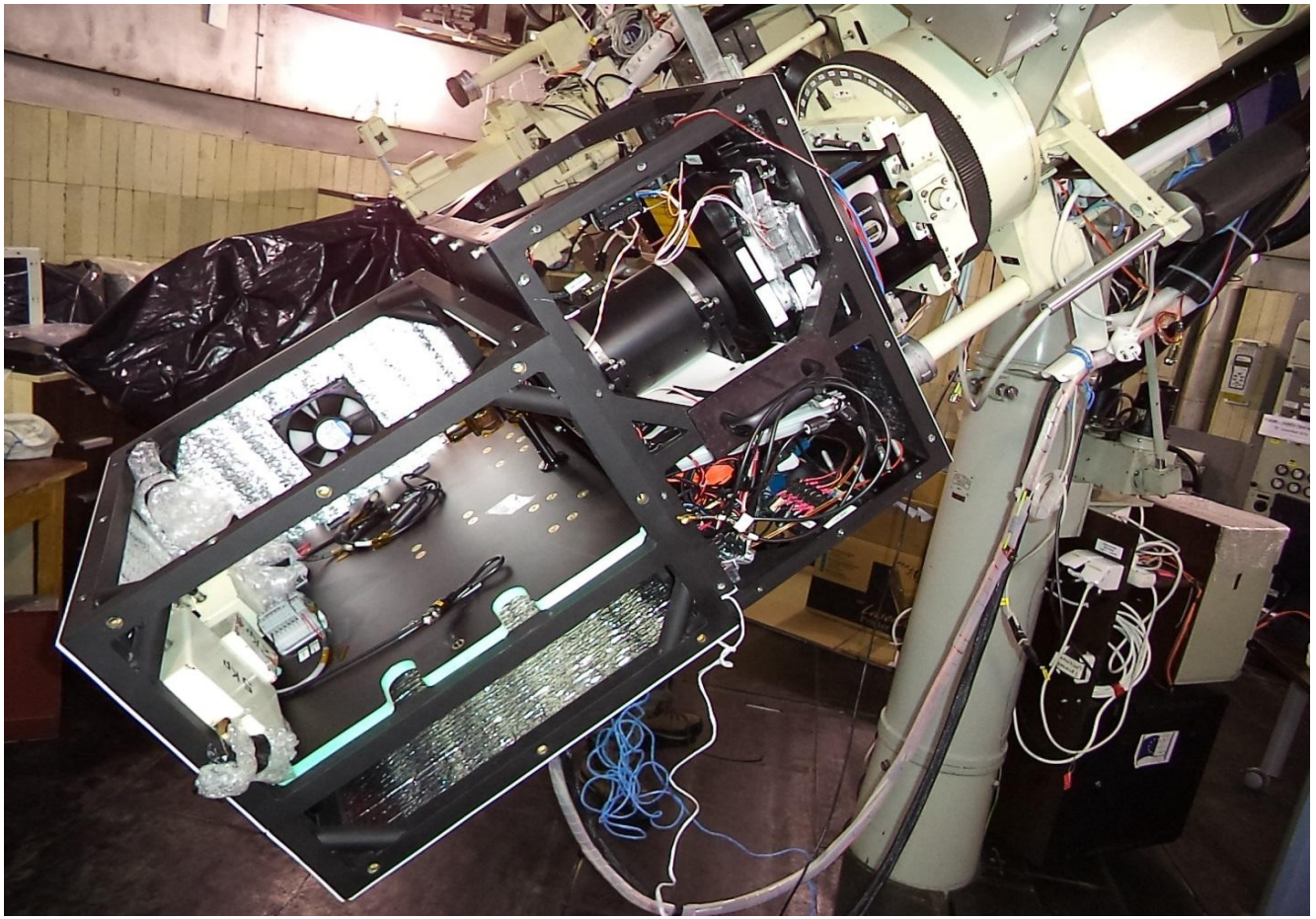
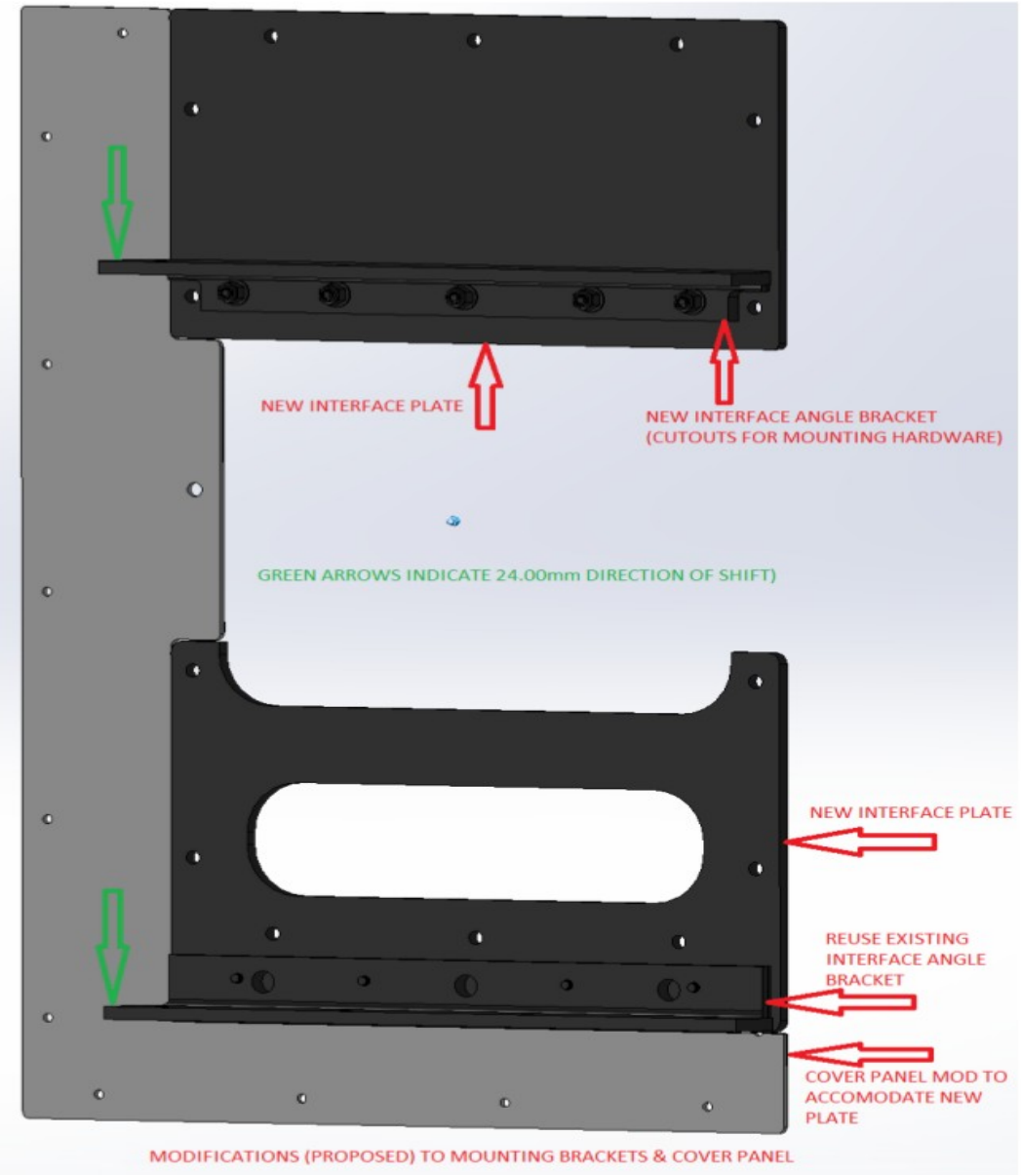


A test of the mechanical stability
(13/05/2014)

LSO: CoMP-S + PDSS

The PDSS actual status:

- last teleconf: 2014/05/27, Matus Kozak with HAO staff
- discussion on modifications of the PDSS interface



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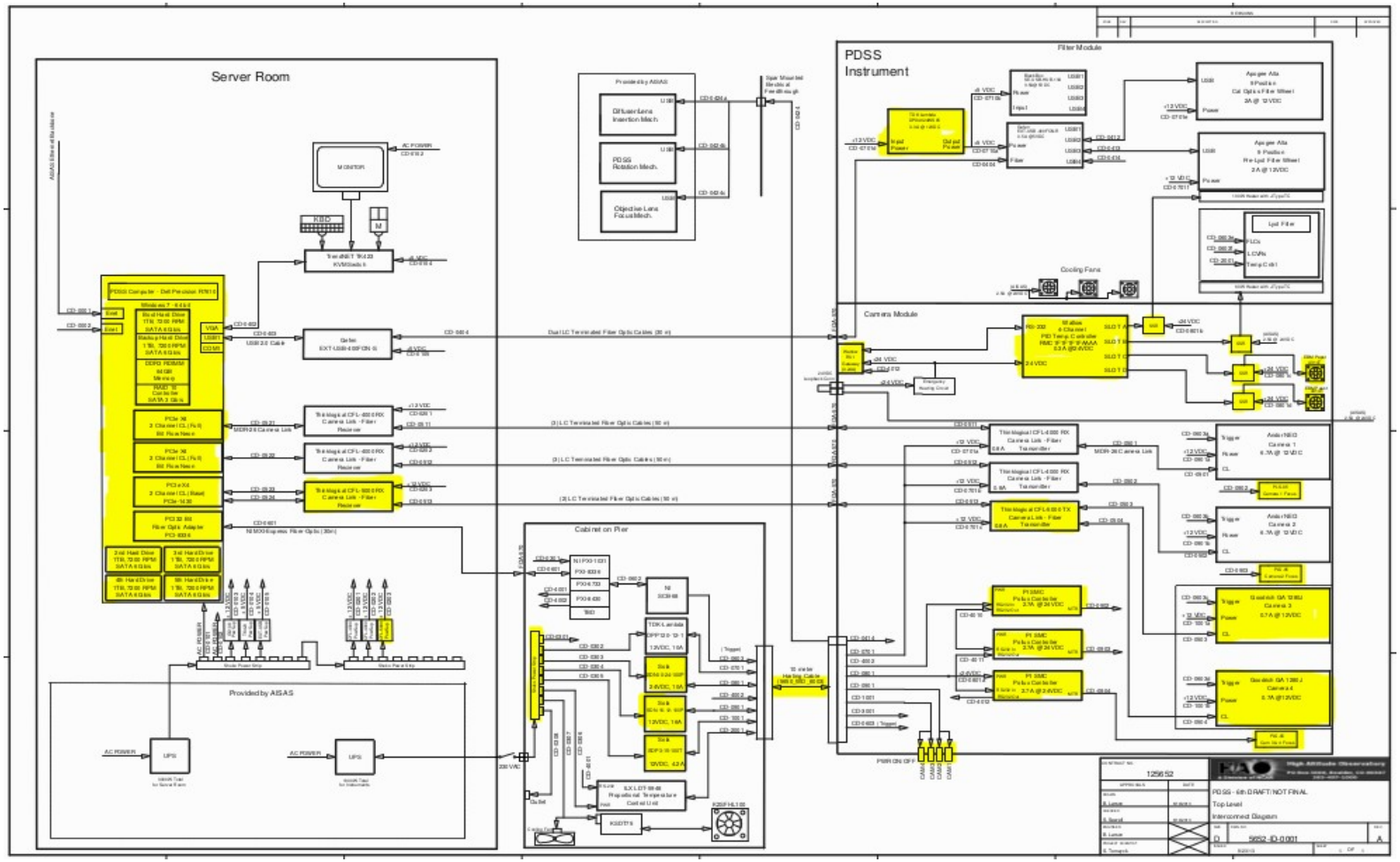


A general interconnect diagram of the CoMP-S + PDSS (yellow)

LSO instrumentation

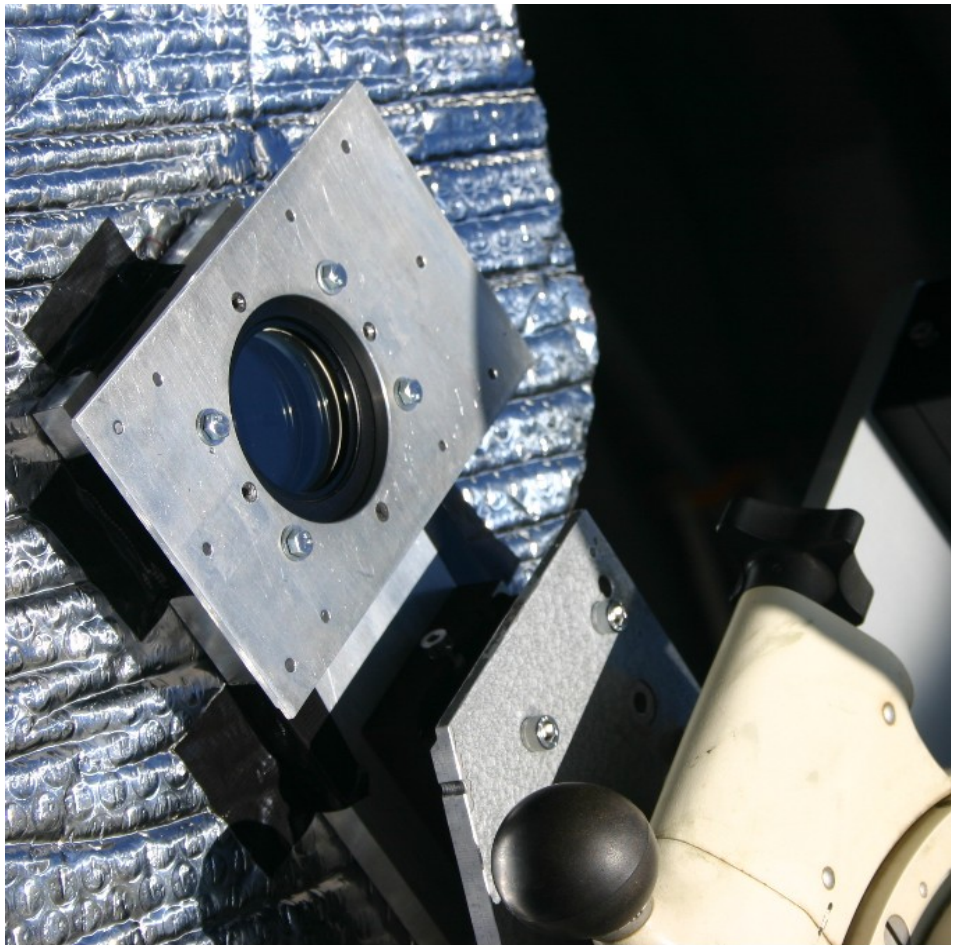
CoMP-S with PDSS
pointer R
CorMag
pointer H
SCD
H alpha full disk+aureola

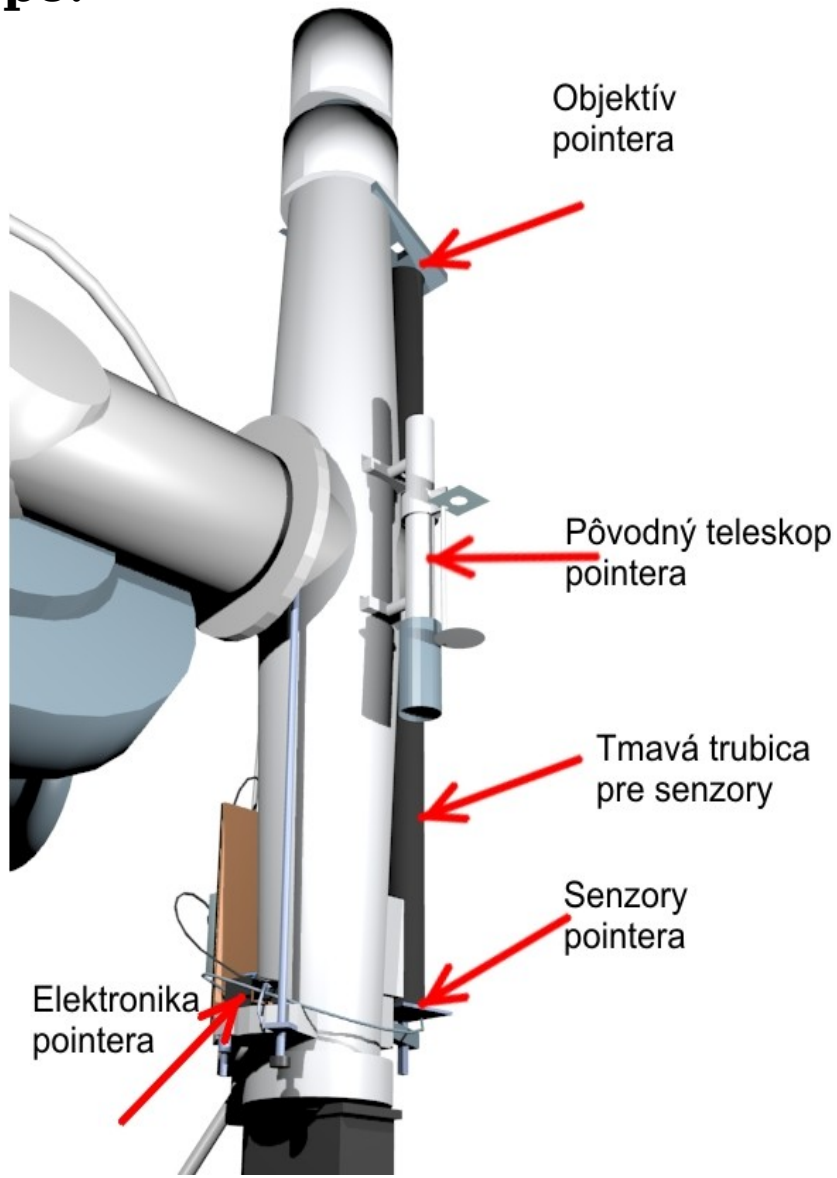
LSO: pointer R

Photoelectric digital pointing telescope: “uhrgang” is not enough due to changing declination of the Sun and a residual bending of the tube

LSO: pointer R

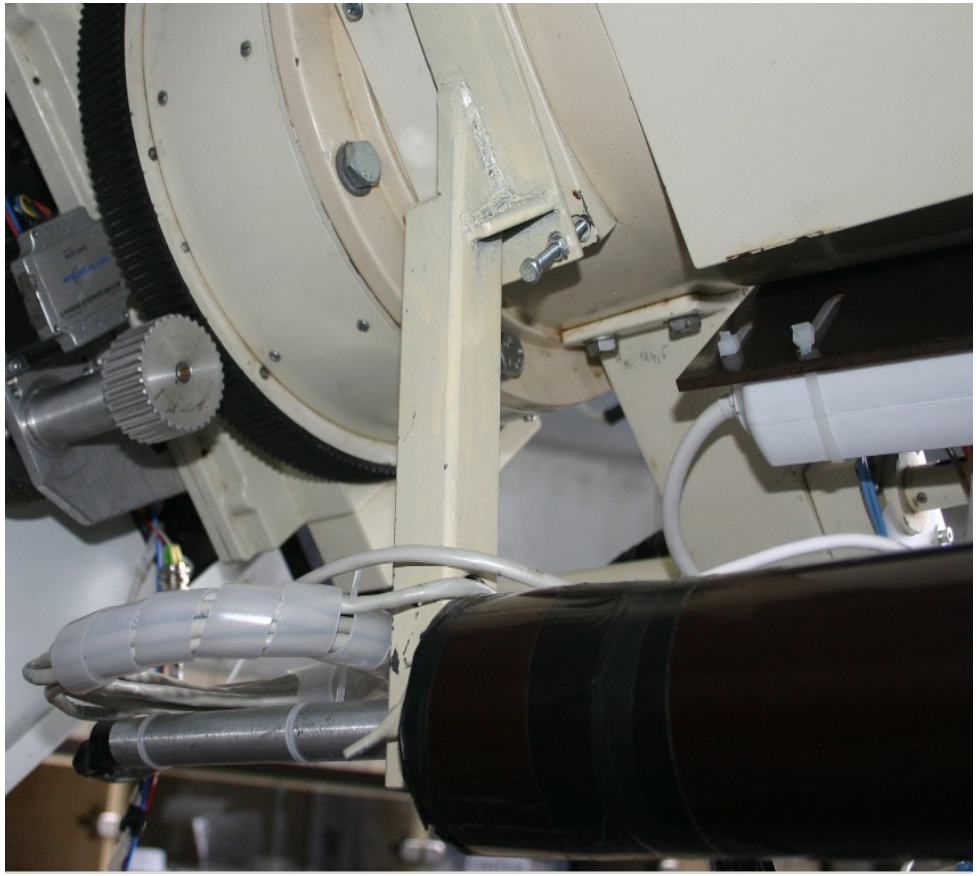
Photoelectric digital pointing telescope:

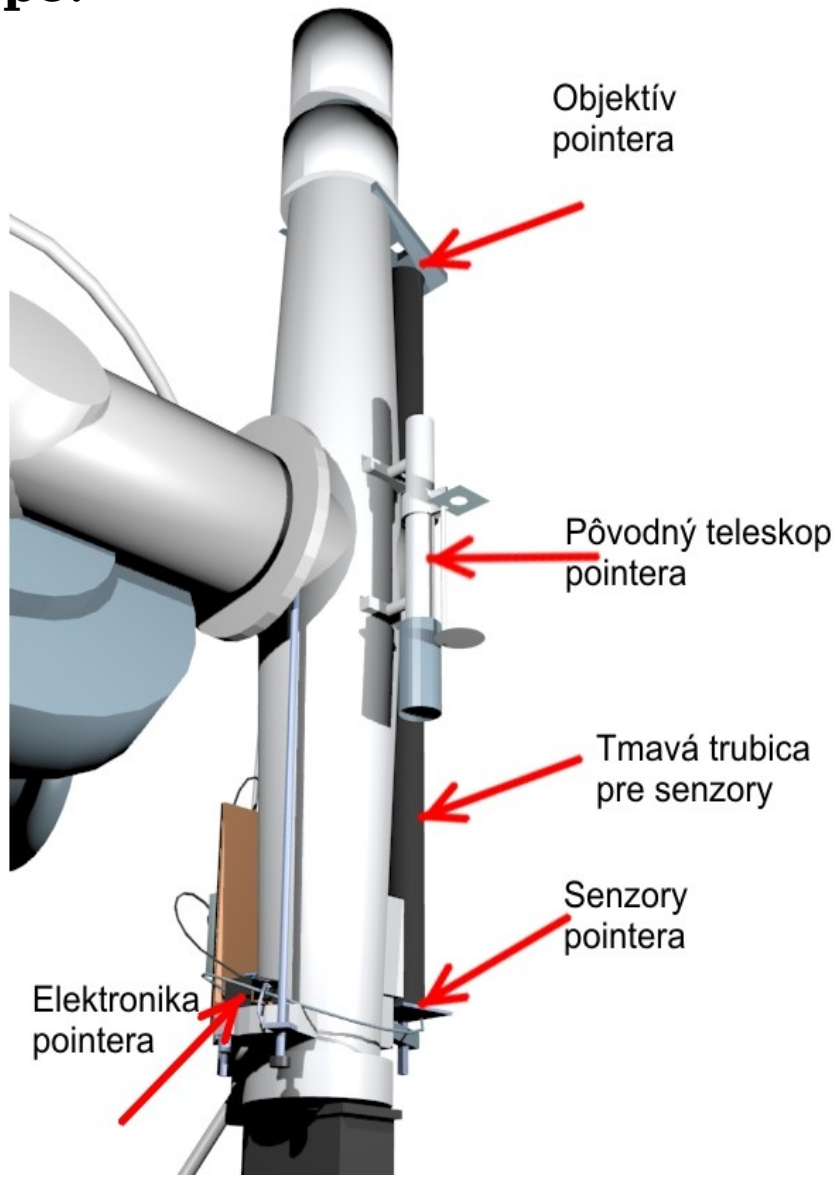




LSO: pointer R

Photoelectric digital pointing telescope:

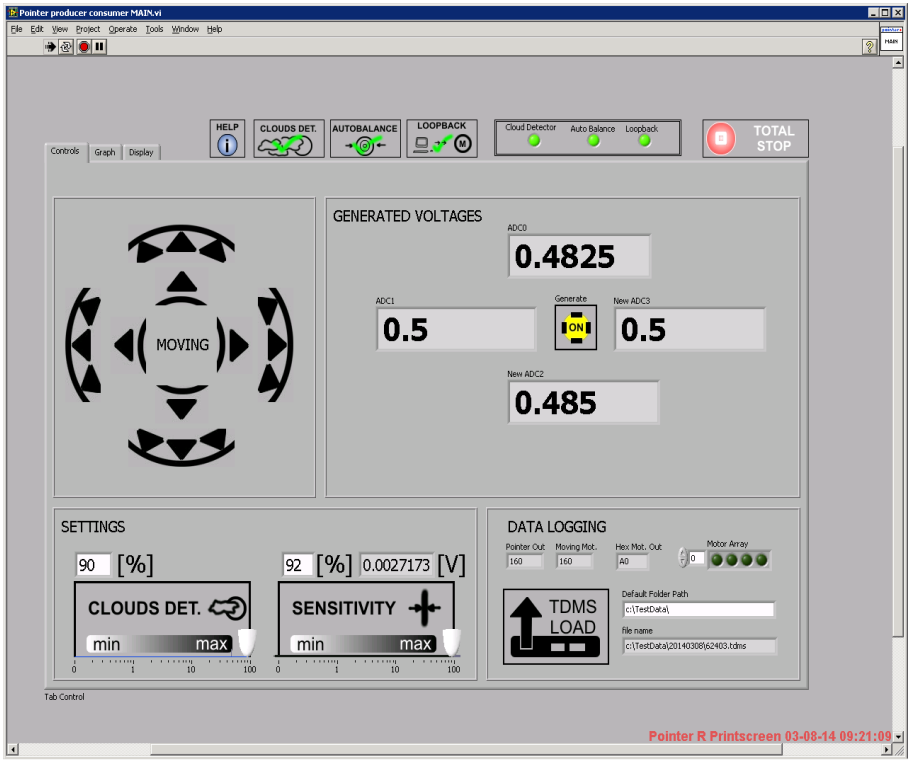


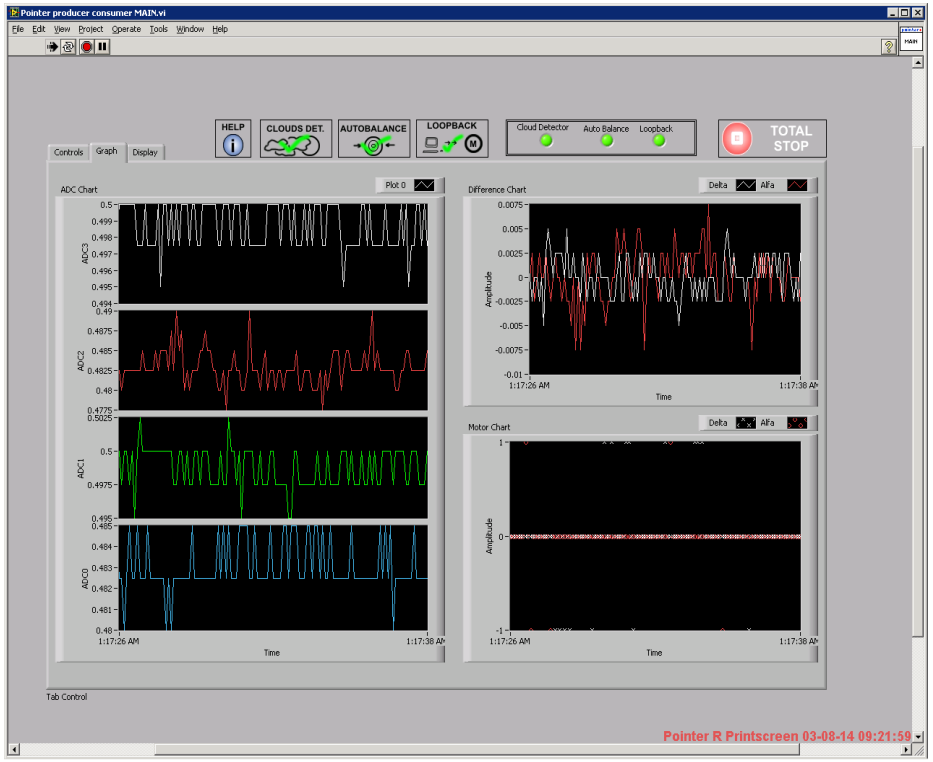


LSO: pointer R

Photoelectric digital pointing telescope:

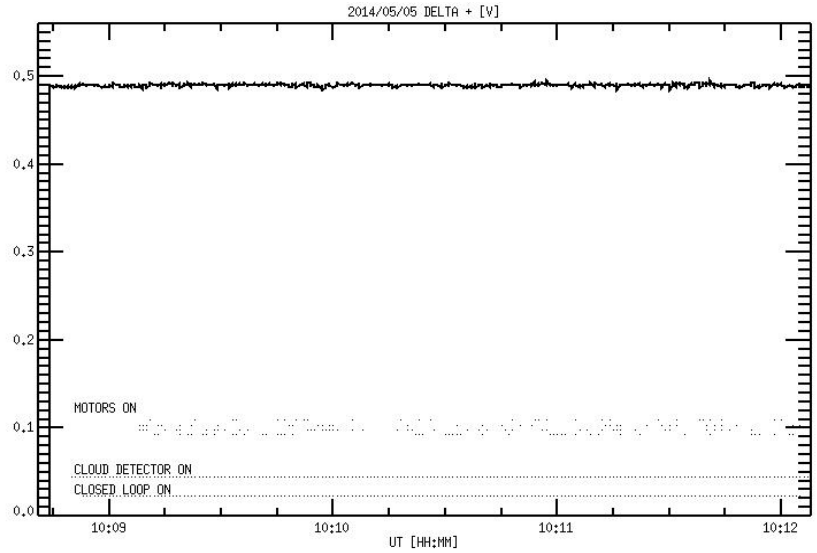
- work of Matúš Kozák
- electronics + LabView code
- ~3” pointing precision
- detector of clouds
- correction for an starting off-pointing
- logging

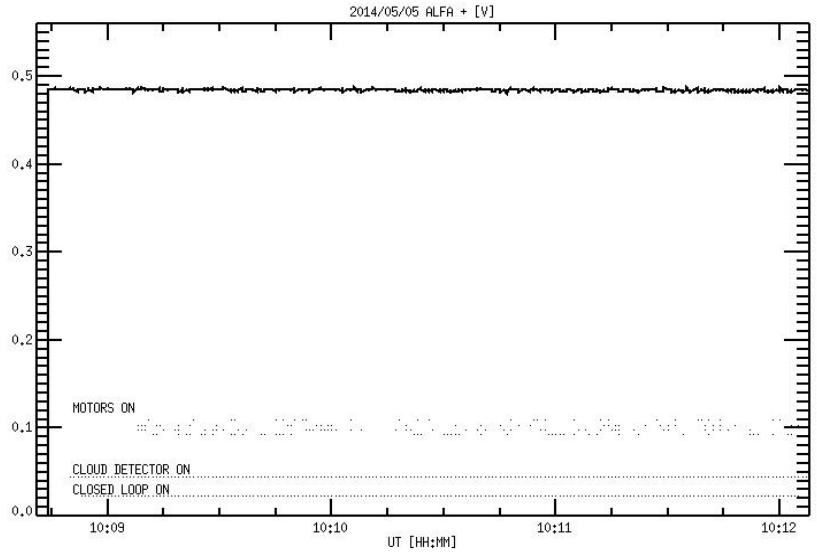


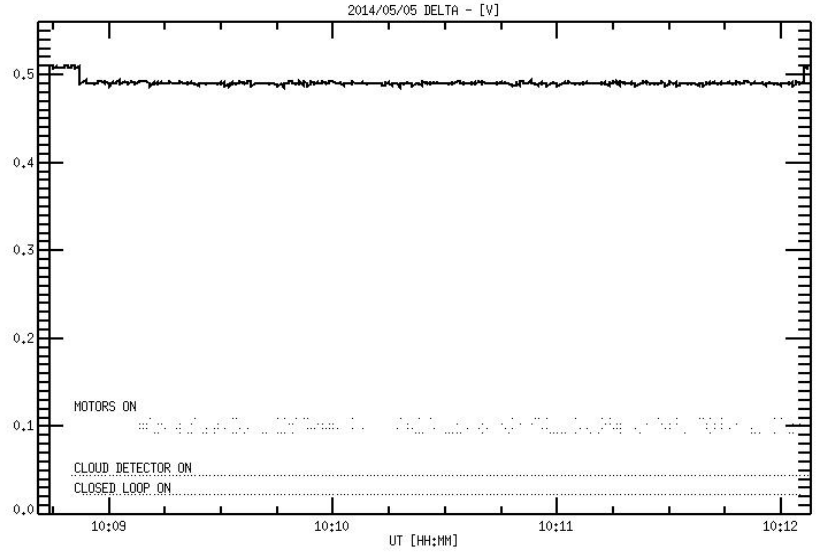


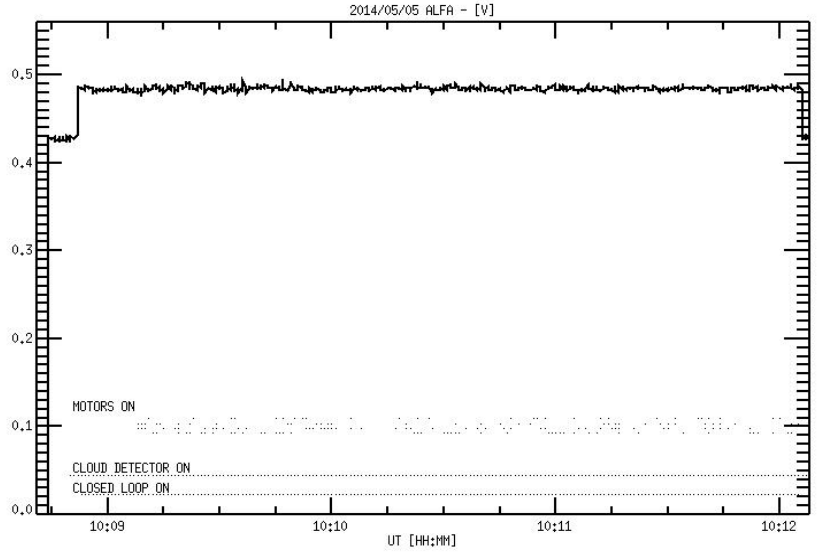
LSO: pointer R

Photoelectric digital pointing telescope: 4 photodiode voltages









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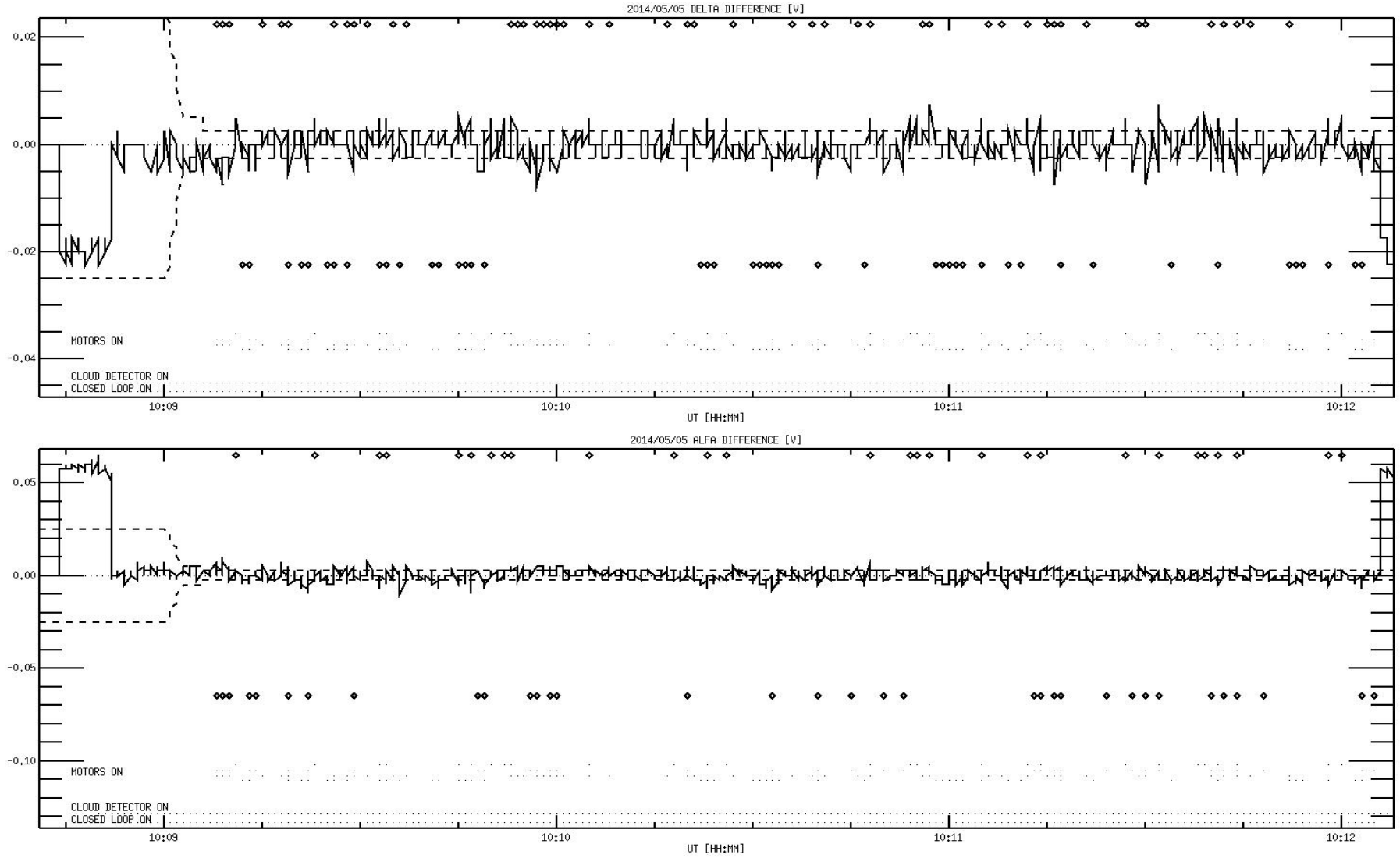


LSO instrumentation

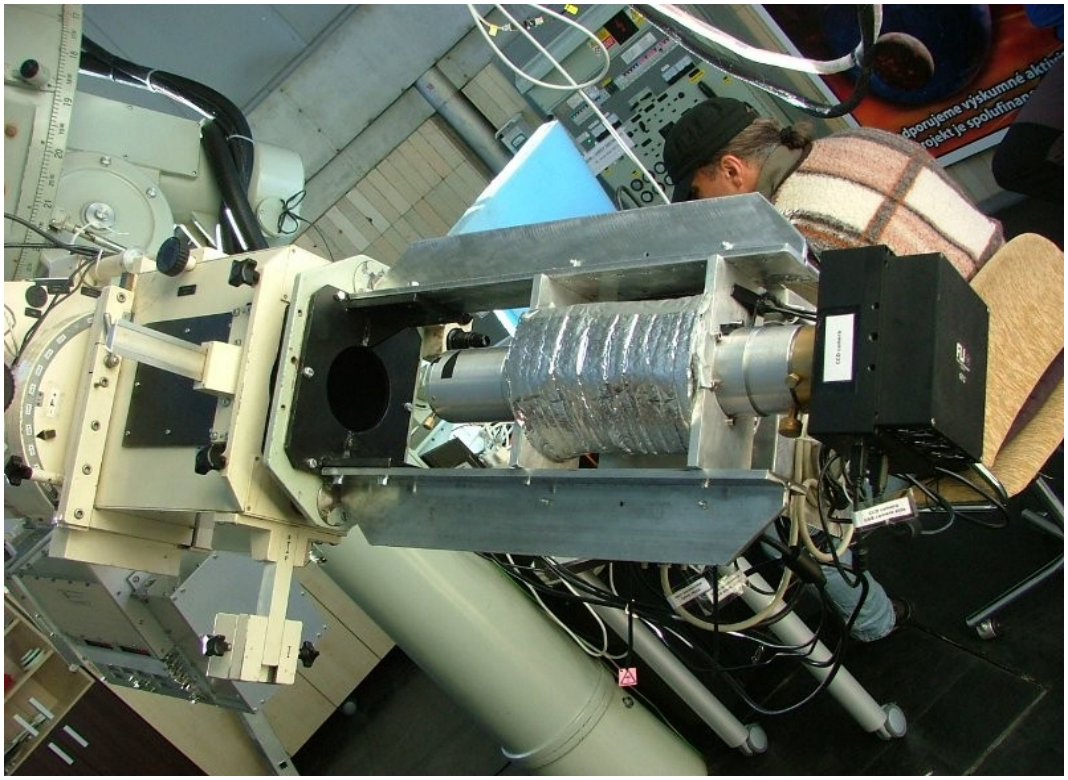
CoMP-S with PDSS
pointer R
CorMag
pointer H
SCD
H alpha full disk+aureola

LSO: CorMag

The Coronal Magnetometer (Cormag) at LSO since April 2014

Main feature: wavelength range: only **~530 nm** allowing spectro-polarimetric measurements of only one emission coronal emission line (CoMP-S can observe this line as well)

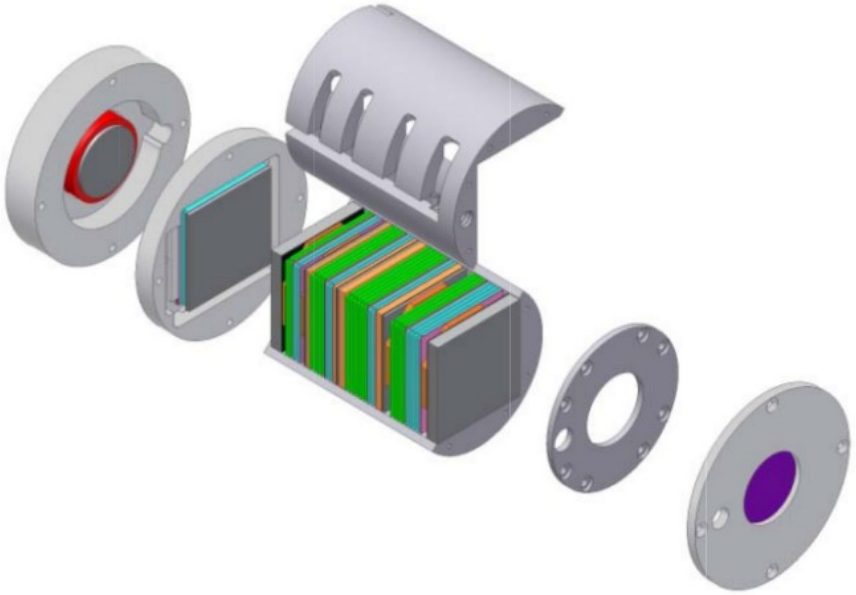
Other specifications: not a full-disk FoV, simultaneous imaging of a 2D area, sequential data acquisition in wavelength and polarization



LSO: CorMag

The Coronal Magnetometer (Cormag) at LSO since April 2014

- team of prof. S. Fineschi (Osservatorio Astronomico di Torino)
- originally part of ASPIICS - a solar coronagraph to be flown on PROBA 3
- a liquid crystal Lyot tunable-filter and polarimeter (LCTP)
- nematic liquid crystal variable retarders (LCVRs)
- a four stage Lyot filter with all four stages wide-fielded
- bandpass FWHM 0.15 nm, FSR 2.7 nm (at 530.3 nm)
- tunable in 0.01 nm steps



*Fineschi et al., Proc. of SPIE **8148,** 814808-1, 2011*

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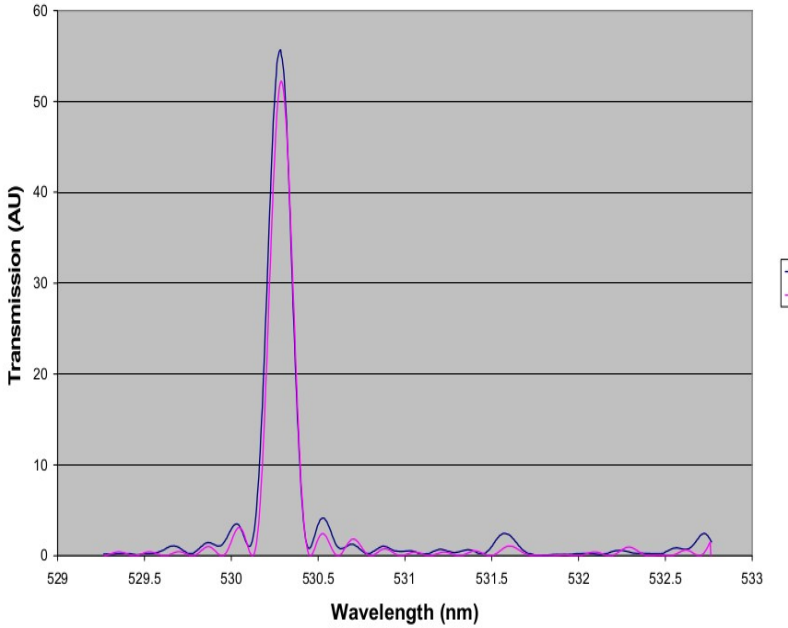

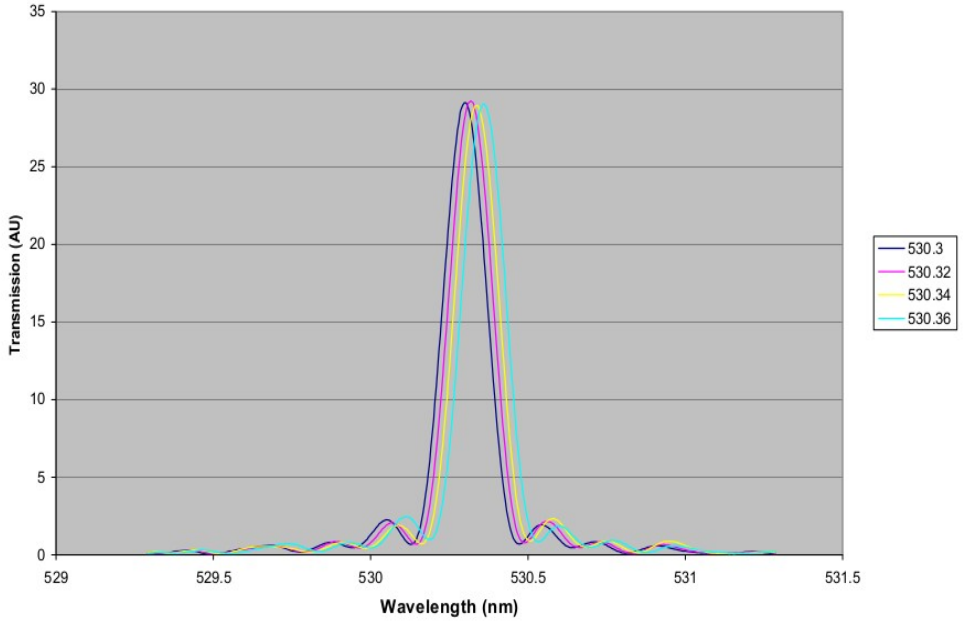

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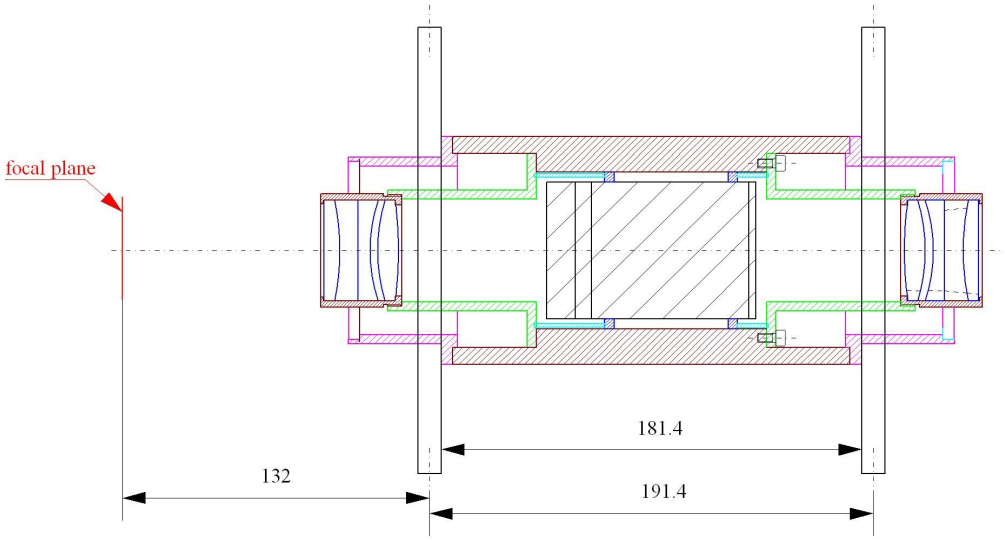
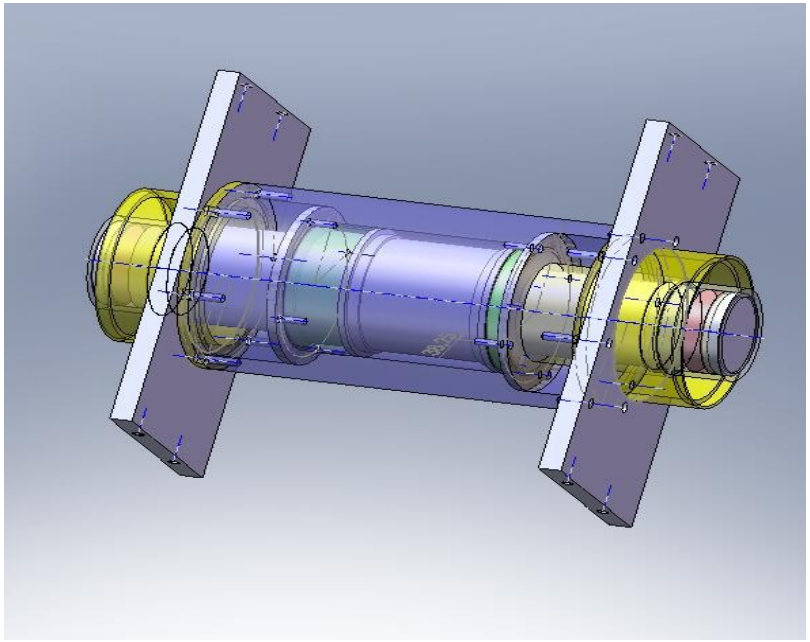




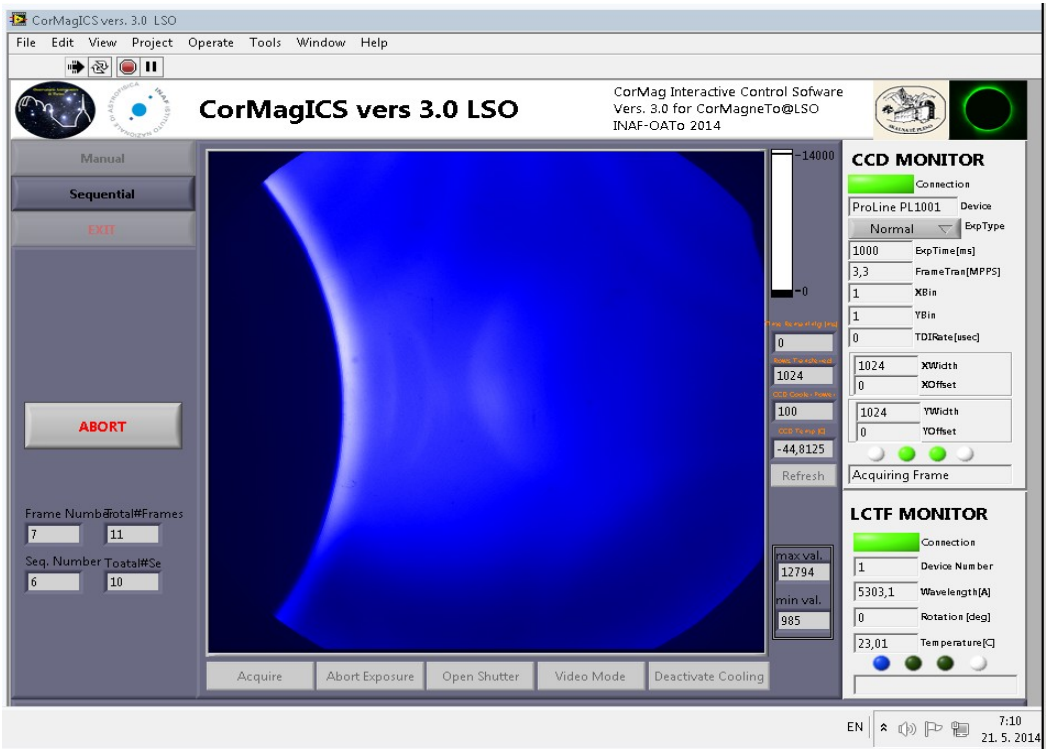
*Fineschi et al., Proc. of SPIE **8148,** 814808-1, 2011*

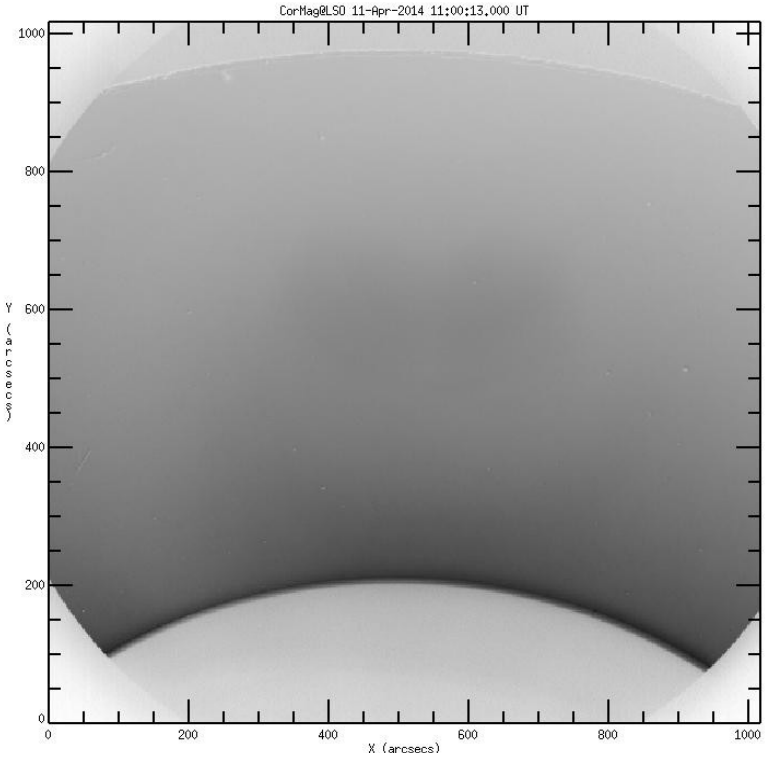
LSO: CorMag

The Coronal Magnetometer (Cormag) at LSO since April 2014

- tests/observations perfomed at LSO in April/May 2014
- Main result – most of the FoV (**but not whole**) with ghosts !!!
- More tests, calibrations, or even change of the optics could be needed

- Excellent plans in our minds: green-green, green-H alpha,...





LSO instrumentation

CoMP-S with PDSS
pointer R
CorMag
pointer H
SCD
H alpha full disk+aureola

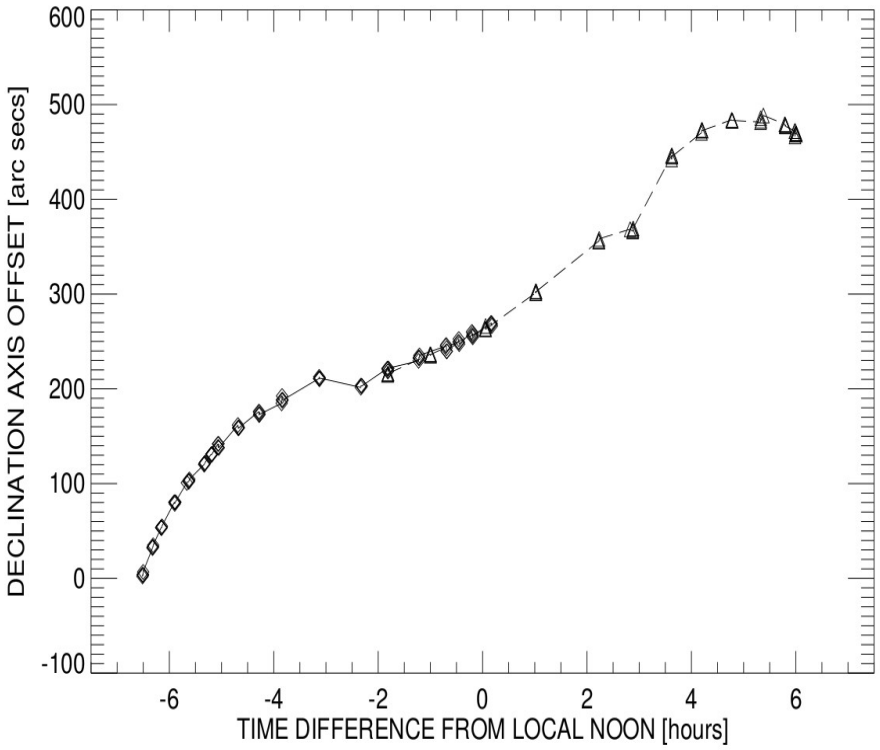
LSO: pointer H

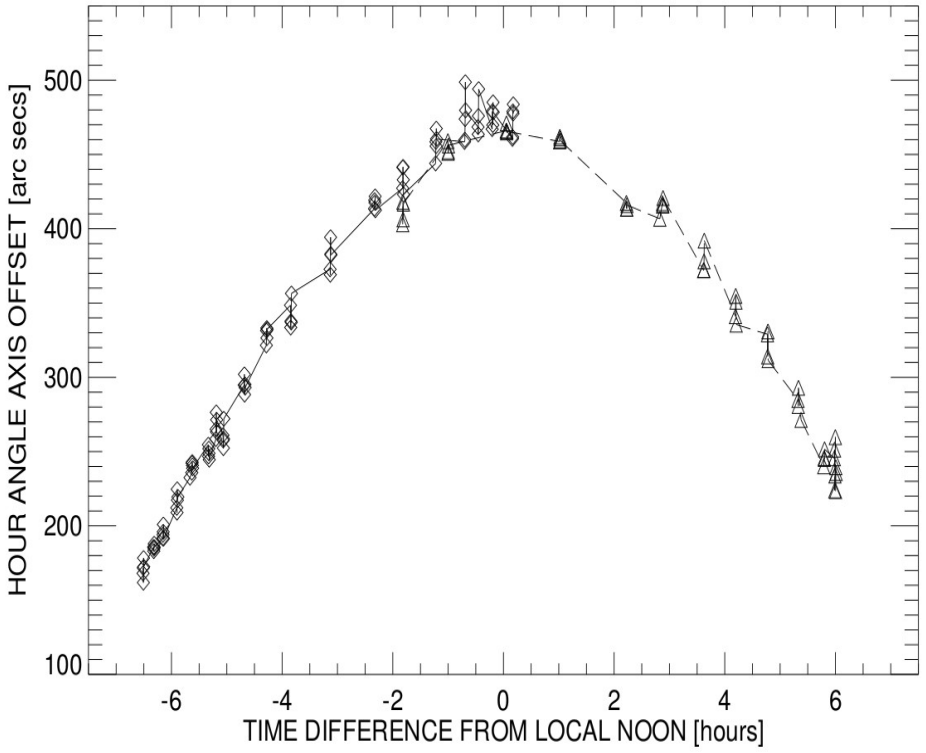
Pointer of the company HANKOM (pointer H)

Why another device is needed?

Reasons:

1/ two coronagraphs are offset now for hundreds of arc seconds
2/ individual tube is bending during the day (max. change of 8“/h)
3/ general offsets in declination and hour angle are variable





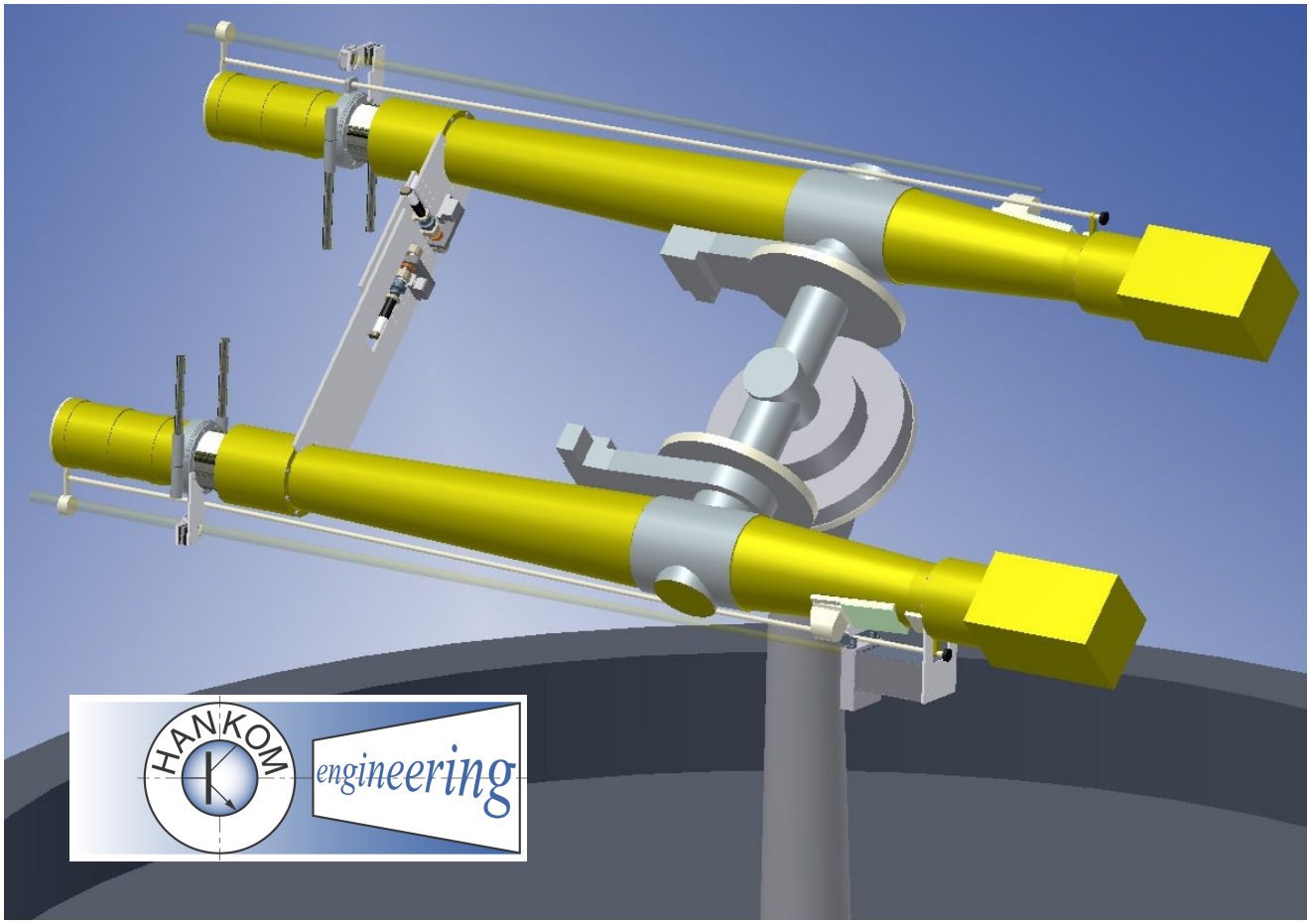
LSO: pointer H

How to correct these mechanical problems?

LSO: pointer H

How to correct these mechanical problems?

Objective lens shift with an on-line correction of the tube directions by pulling/pushing their hour angle distance and variating their declination difference. Easy to write but a little harder to do! HANKOM company...



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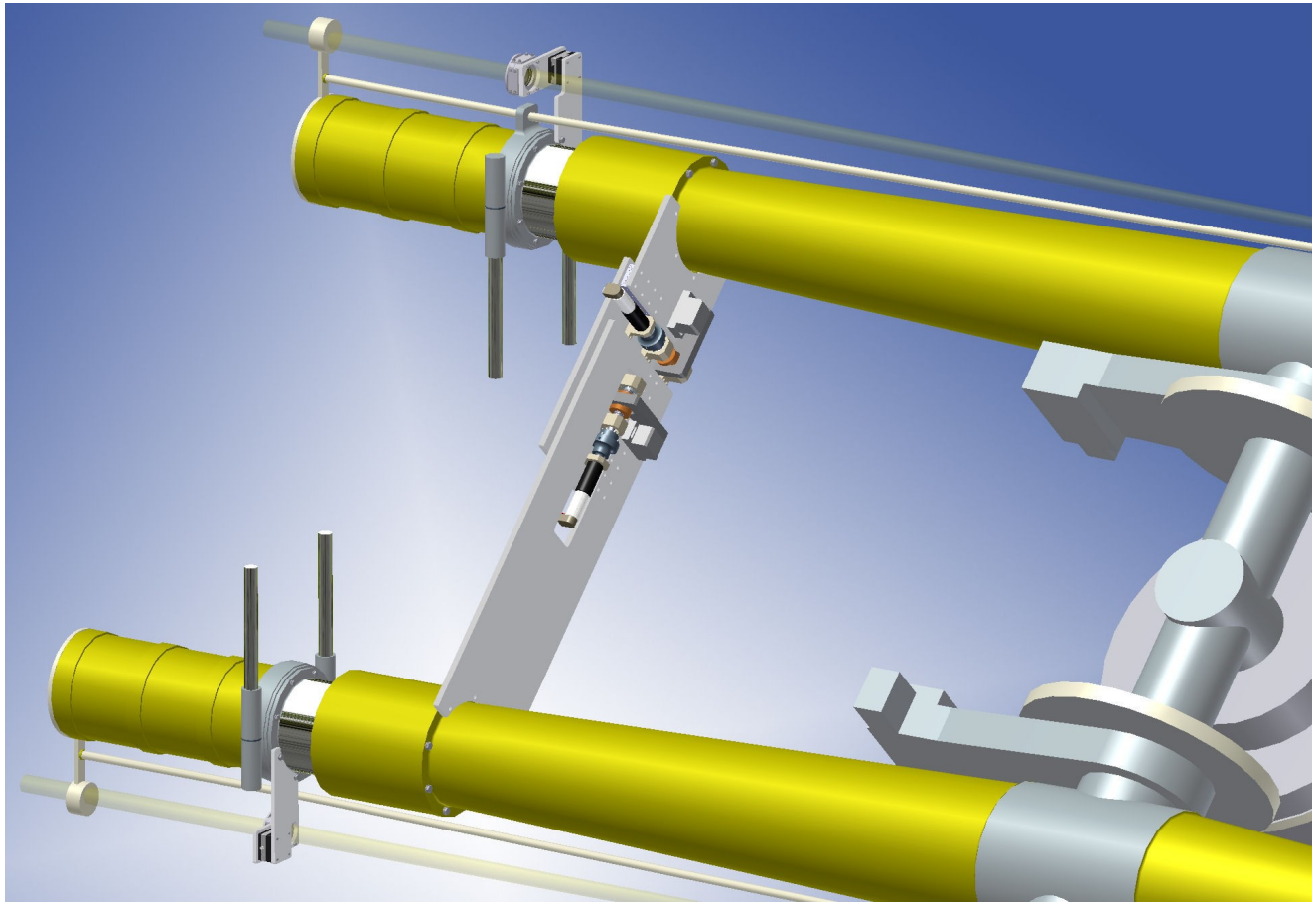

An alignment unit - sketch

LSO: pointer H

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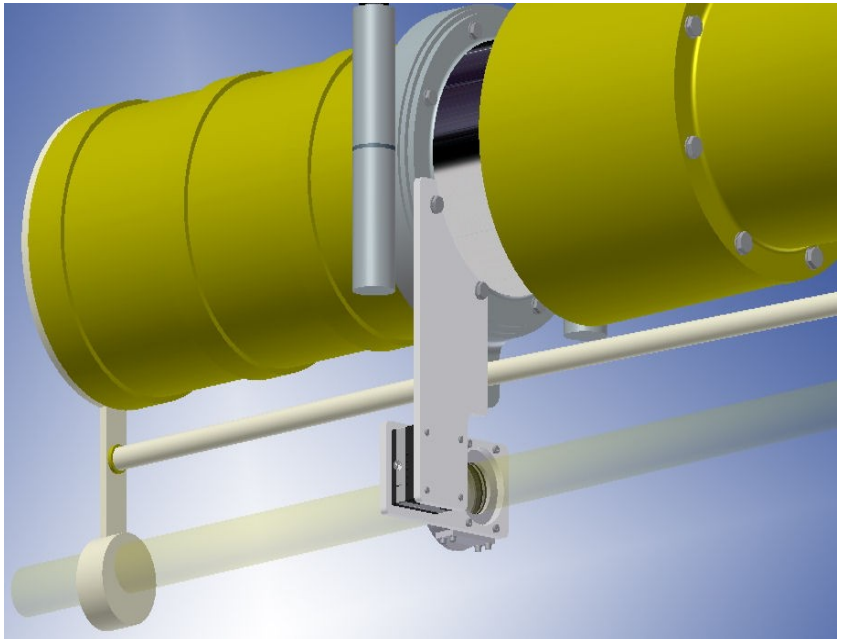
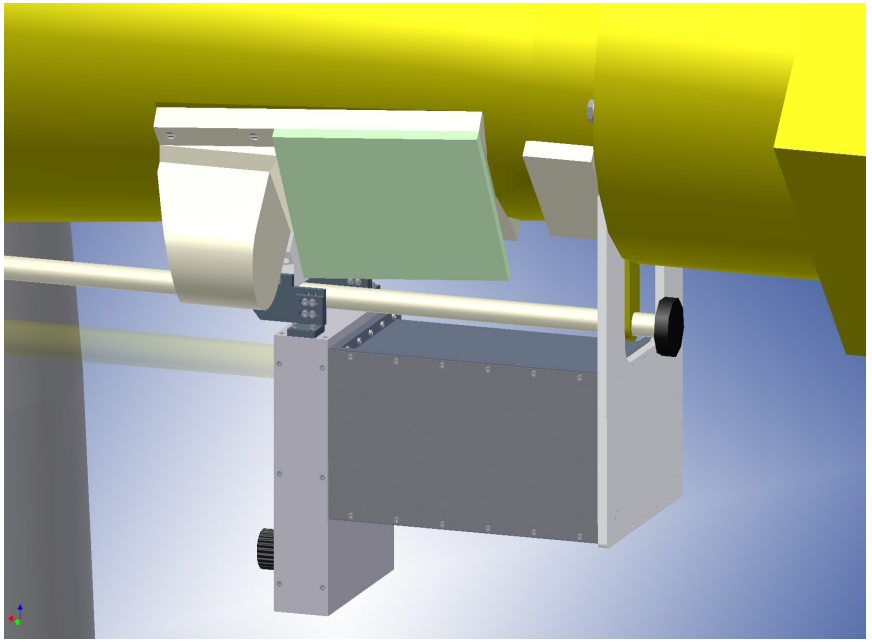


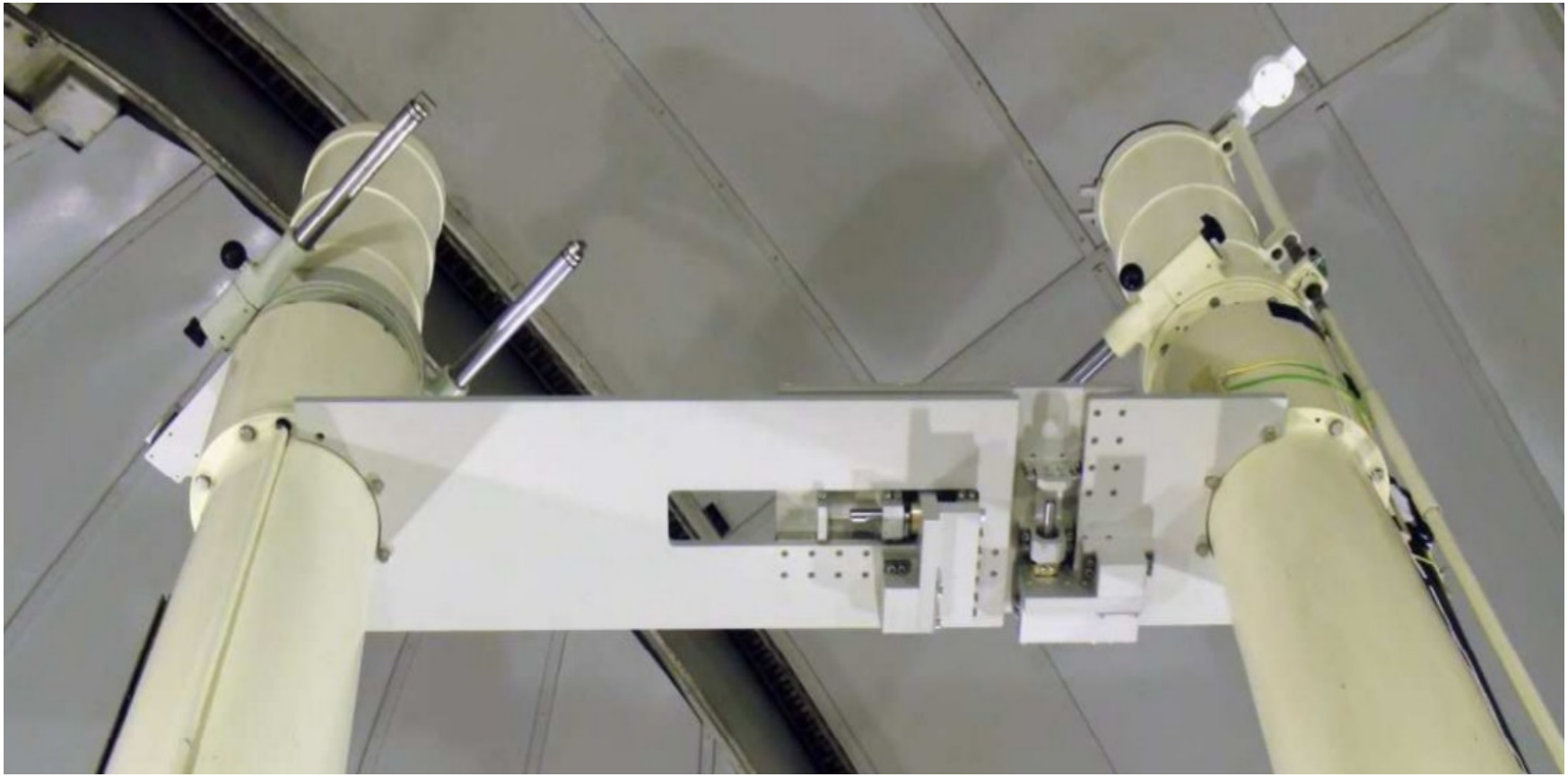
A lens unit - sketch



A detector unit - sketch

LSO: pointer H

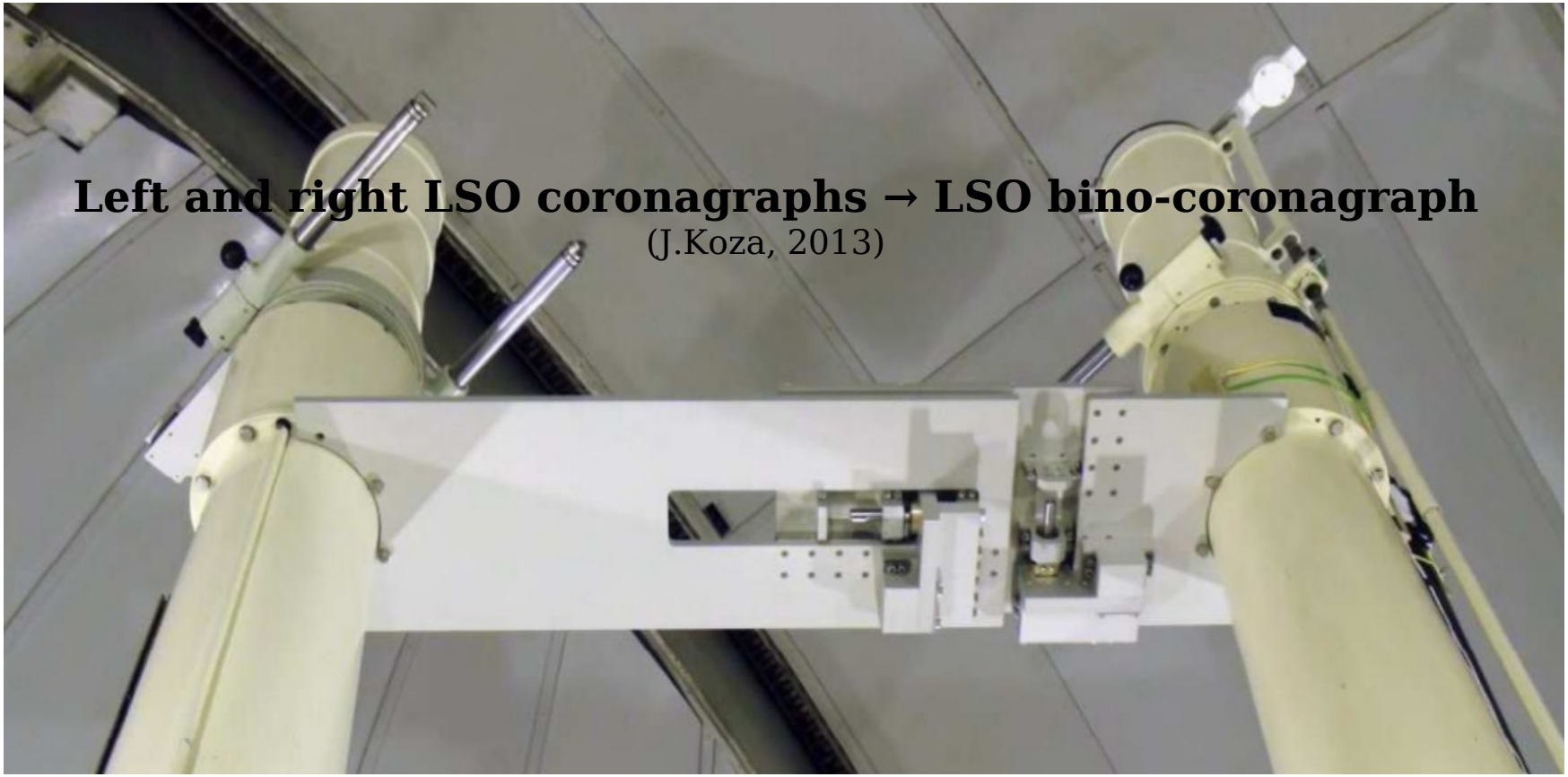
Realization: HANKOM company



The alignment - reality

LSO: pointer H

Realization: HANKOM compan

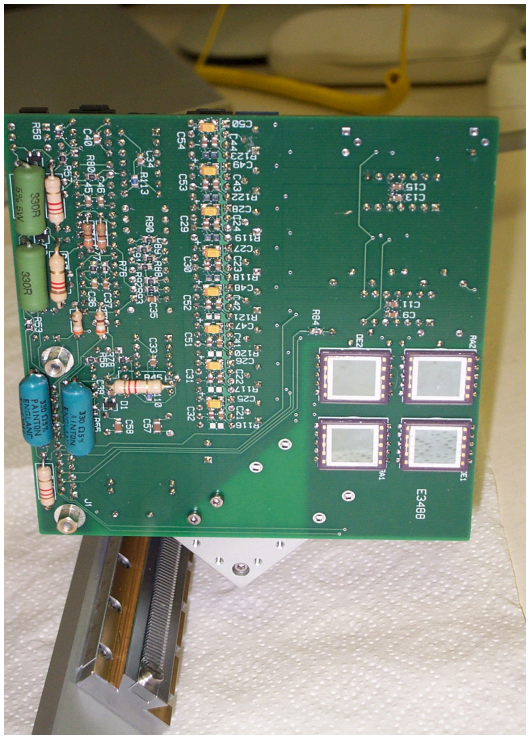


The alignment - reality

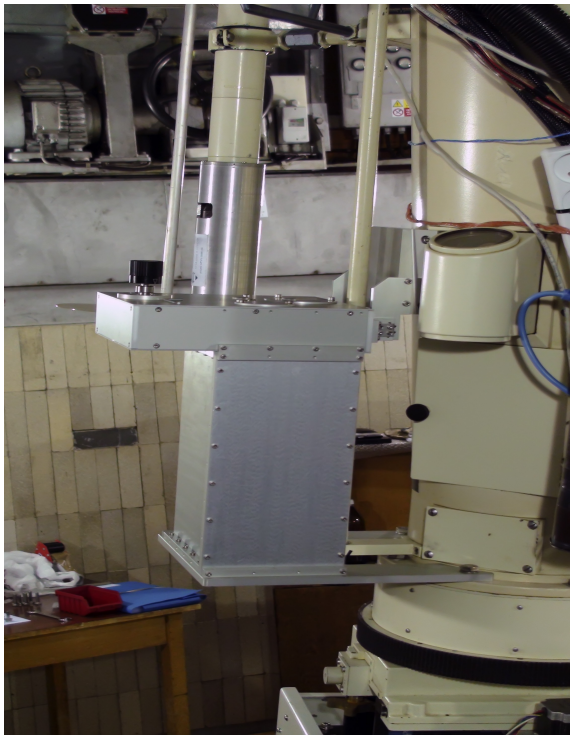
LSO: pointer H

Realization: HANKOM company

The lens unit - reality



Electronics - reality



The detector unit - reality

LSO: pointer H

Small celebration: two Zeiss coronagraphs pointed properly to the solar disk center for **simultaneous** coronagraphic scientific measurements for the first time on **21/05/2014** (for an hour in frame of the coordinated observing campaign with Hinode/EIS+XRT+SOT + IRIS)

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LSO: pointer H

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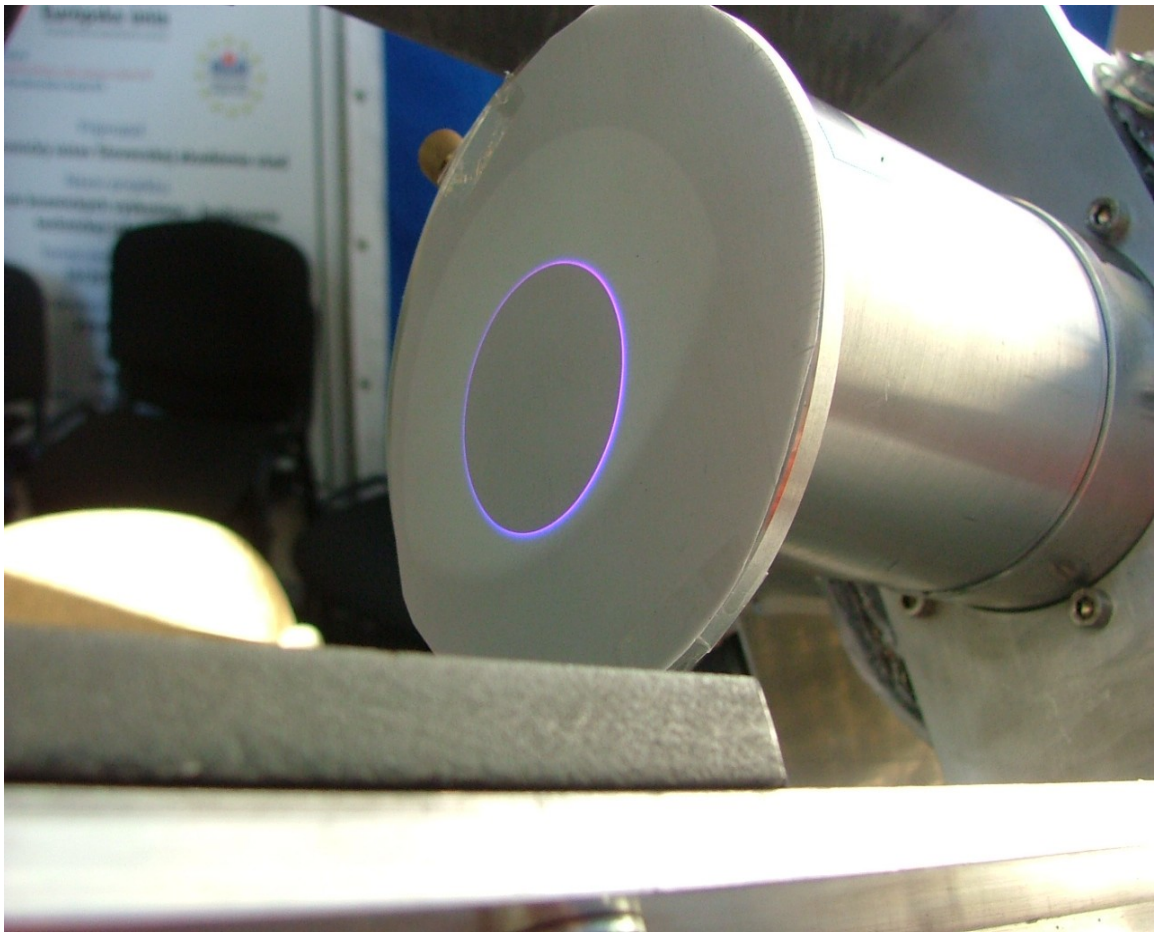
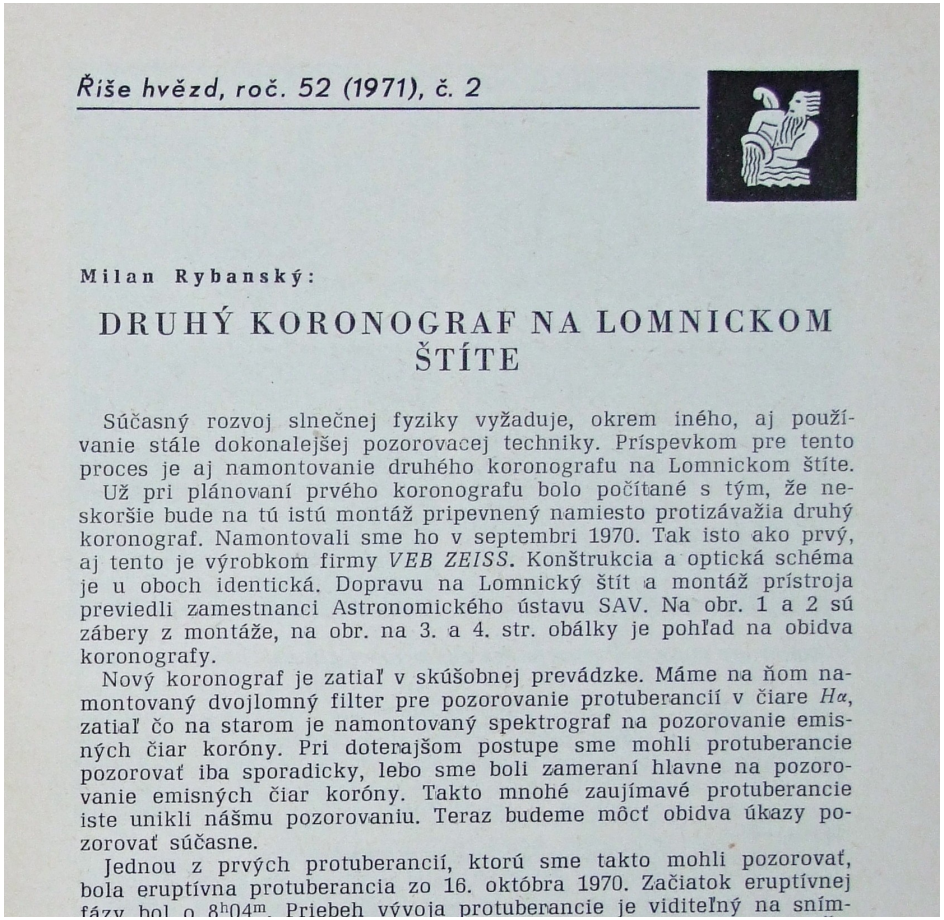


LSO: pointer H

- A short historical note: a pioneering work of our colleagues



Říše hvězd, roč. 52 (1971), č. 2

Milan Rybanský:

DRUHÝ KORONOGRAF NA LOMNICKOM ŠTÍTE

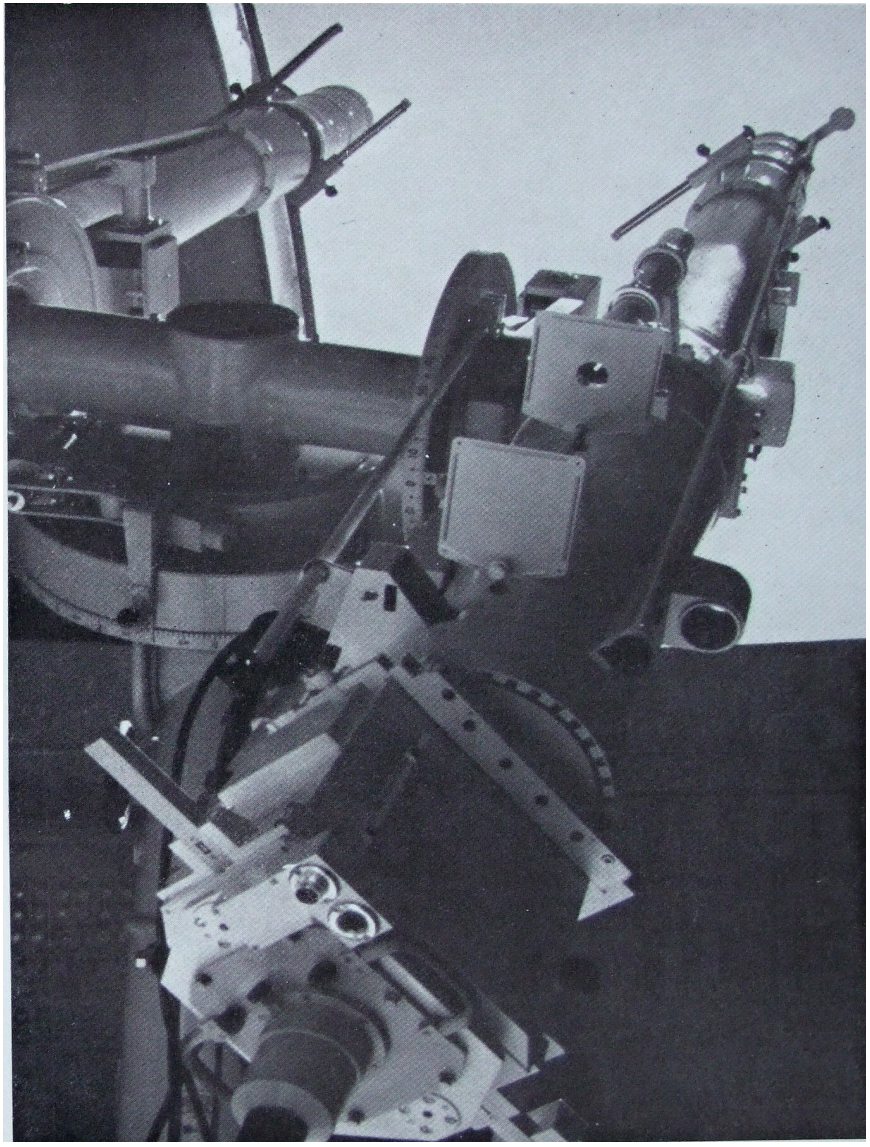
Súčasný rozvoj slnečnej fyziky vyžaduje, okrem iného, aj používanie stále dokonalejšej pozorovacej techniky. Príspevkom pre tento proces je aj namontovanie druhého koronografu na Lomnickom štíte.

Už pri plánovaní prvého koronografu bolo počítané s tým, že neskoršie bude na tú istú montáž pripevnený namiesto protizávažia druhý koronograf. Namontovali sme ho v septembri 1970. Tak isto ako prvý, aj tento je výrobkom firmy *VEB ZEISS*. Konštrukcia a optická schéma je u oboch identická. Dopravu na Lomnický štít a montáž prístroja previedli zamestnanci Astronomického ústavu SAV. Na obr. 1 a 2 sú zábery z montáže, na obr. na 3. a 4. str. obálky je pohľad na obidva koronografy.

Nový koronograf je zatiaľ v skúšobnej prevádzke. Máme na ňom namontovaný dvojlomný filter pre pozorovanie protuberancií v čiare $H\alpha$, zatiaľ čo na starom je namontovaný spektrograf na pozorovanie emisných čiar koróny. Pri doterajšom postupe sme mohli protuberancie pozorovať iba sporadicky, lebo sme boli zameraní hlavne na pozorovanie emisných čiar koróny. Takto mnohé zaujímavé protuberancie iste unikli nášmu pozorovaniu. Teraz budeme môcť obidva úkazy pozorovať súčasne.

Jednou z prvých protuberancií, ktorú sme takto mohli pozorovať, bola eruptívna protuberancia zo 16. októbra 1970. Začiatok eruptívnej fázy bol o 8^h04^m. Priebeh vývoja protuberancie je viditeľný na sním-

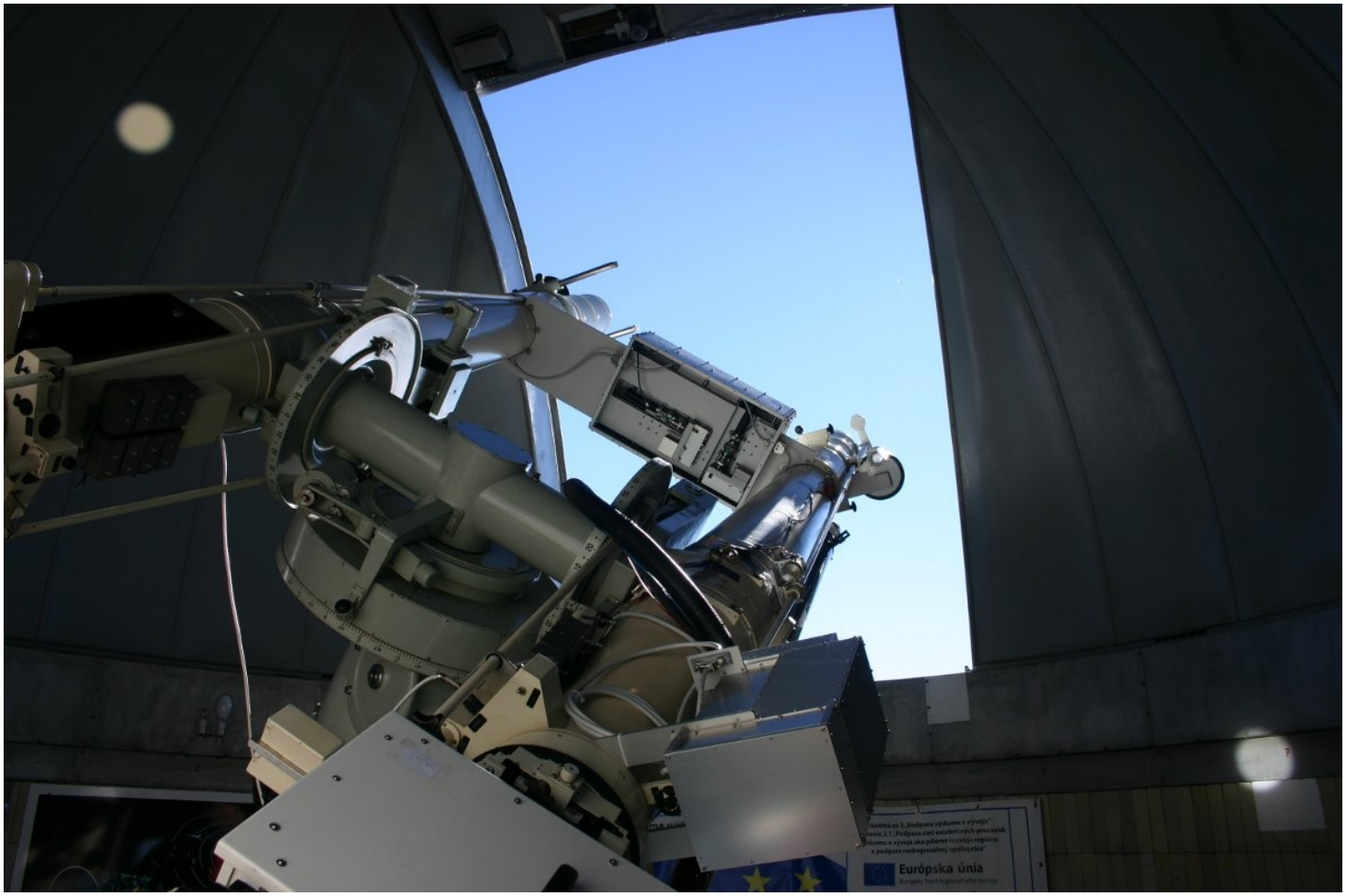
Rybanský, M., Říše hvězd ***52****, 25 (1971)*



LSO: pointer H

Small celebration: two Zeiss coronagraphs pointed properly to the solar disk center for **simultaneous** coronagraphic scientific measurements:

24-26/09/1970 → 21/05/2014

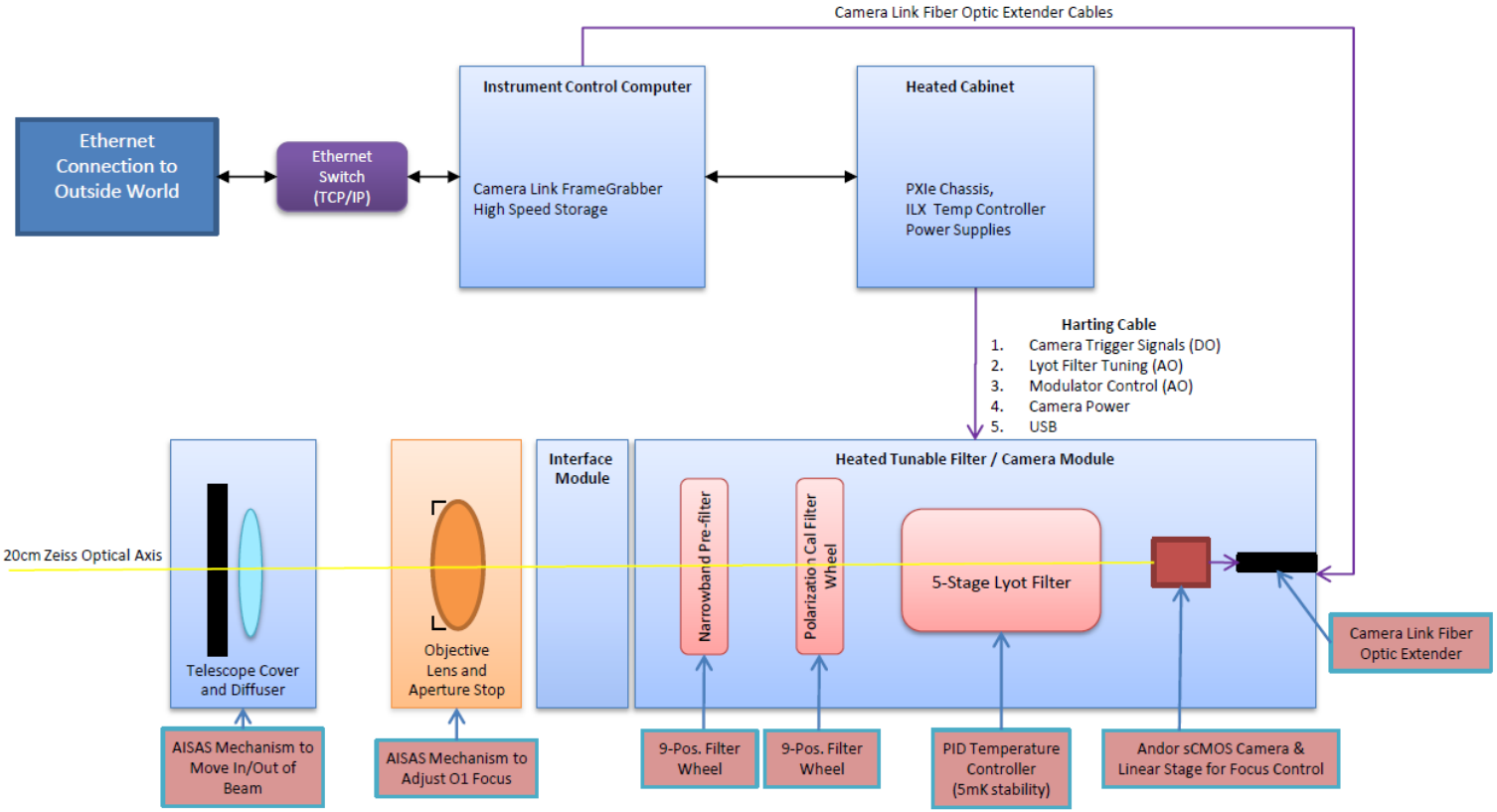


LSO instrumentation

CoMP-S with PDSS
pointer R
CorMag
Pointer H
SCD
H alpha full disk+aureola

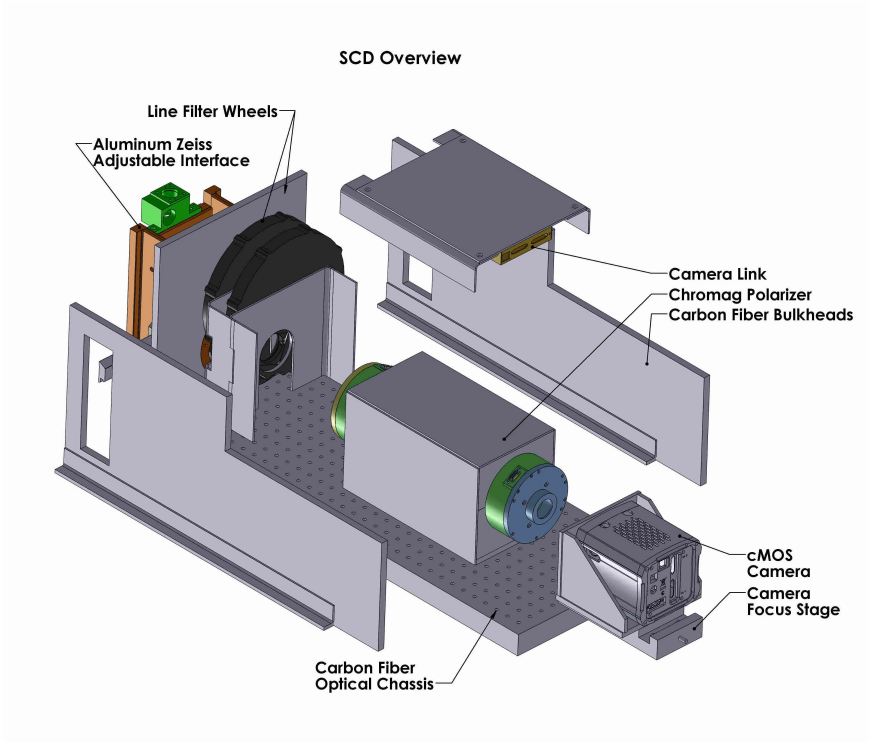
LSO: Solar Chromospheric Detector (SCD)

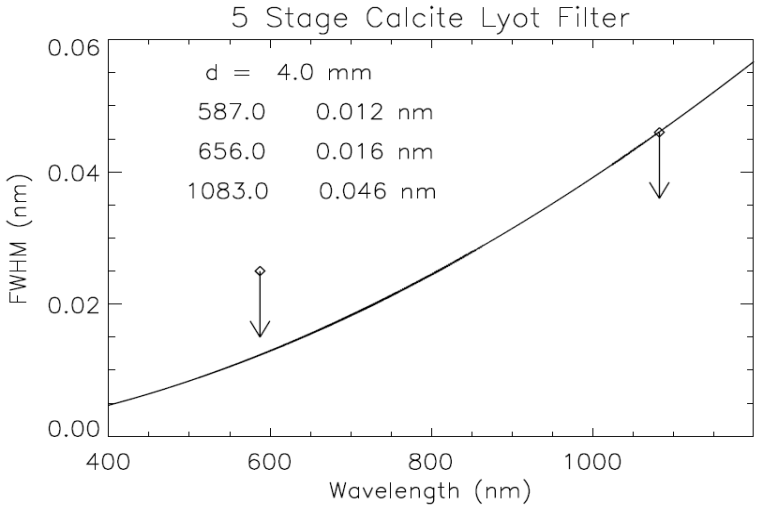
- a contract with HAO/NCAR – “CHROMAG for Slovakia“
- 5-stage Lyot filter + polarimeter
- wavelength range: 500-1100 nm
- chromospheric lines: He I 587.6 nm, Na I 589.6 nm, H I 656.3 nm,
  CaII IR triplet and HeI 1083.0 nm
  photospheric lines: Fe I 557.6 nm, Fe I 630.25 nm
- Andor sCMOS NEO camera: 2560 x 2160 pixels of 6.5 micron size

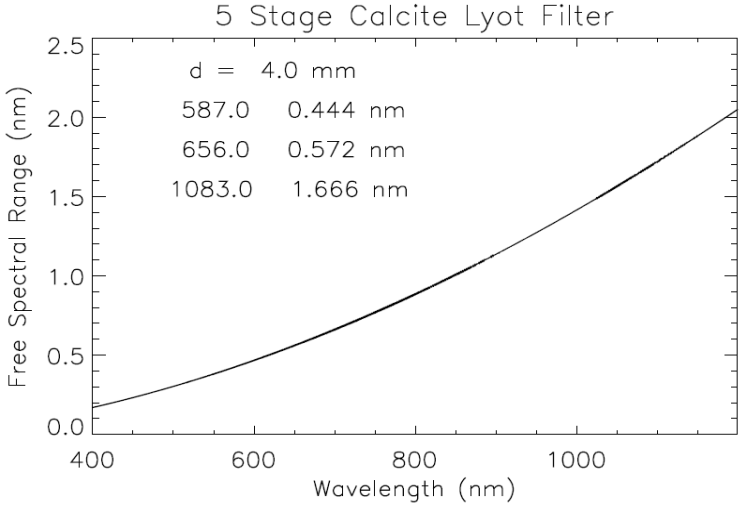


LSO: Solar Chromospheric Detector (SCD)

- a contract with HAO/NCAR – “CHROMAG for Slovakia“
- 5-stage Lyot filter + polarimeter
- FWHM: 0.012nm@587nm →
  0.046nm@1083nm







LSO instruments
~
LSO infrastructure

LSO infrastructure

Electric cabling & server room
Dome and slit
Baterries
Water
Furniture
Windows
Many 'minor' details

LSO infrastructure

Electric cabling & server room

Dome and slit

Baterries

Water

Furniture

Windows

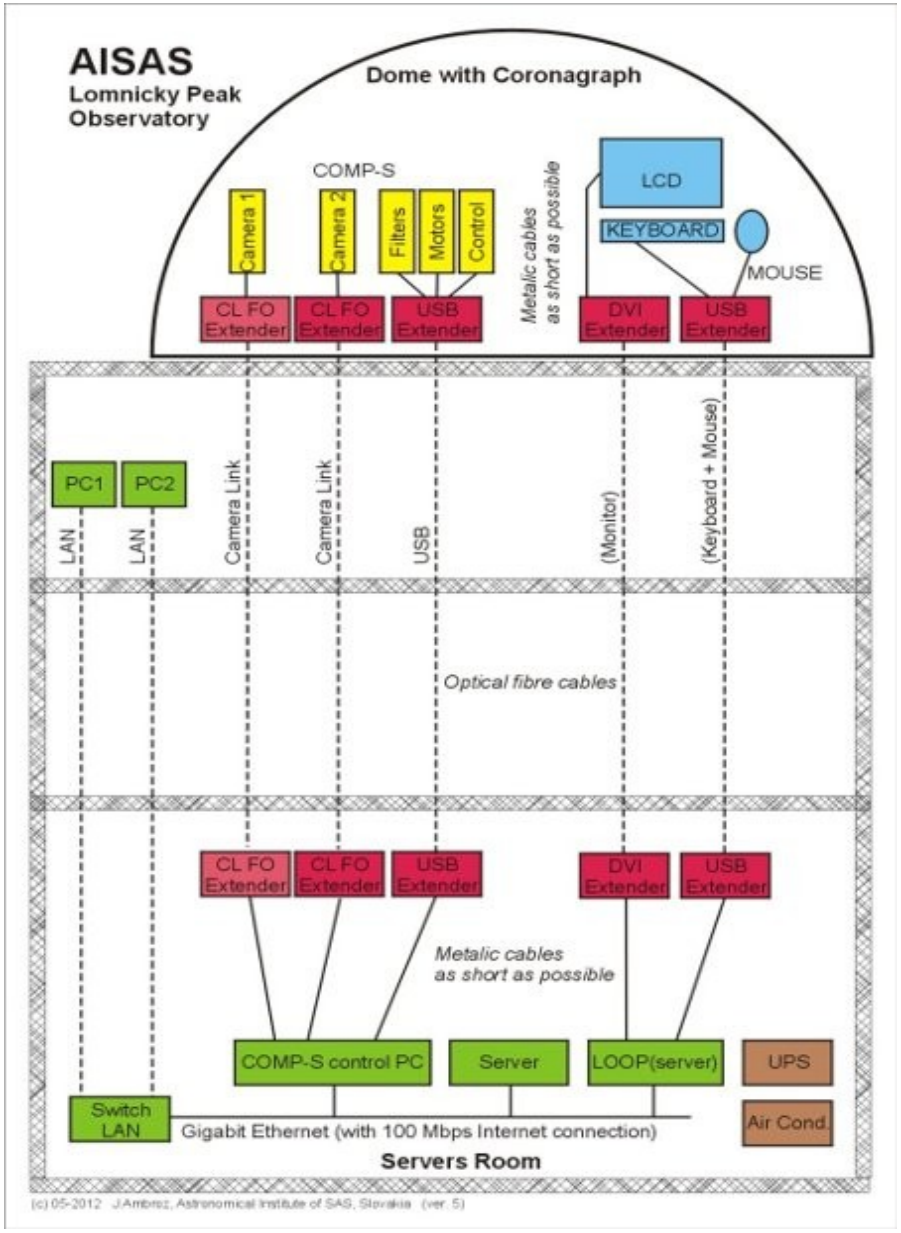
Many 'minor' details

LSO infrastructure

Cabling in the building:

- power supplies
- signal cables via FO
- KVM and USB extension via FO
- data cables via FO
- two electric grounds
- a galvanic insulation

Quite expensive toys...



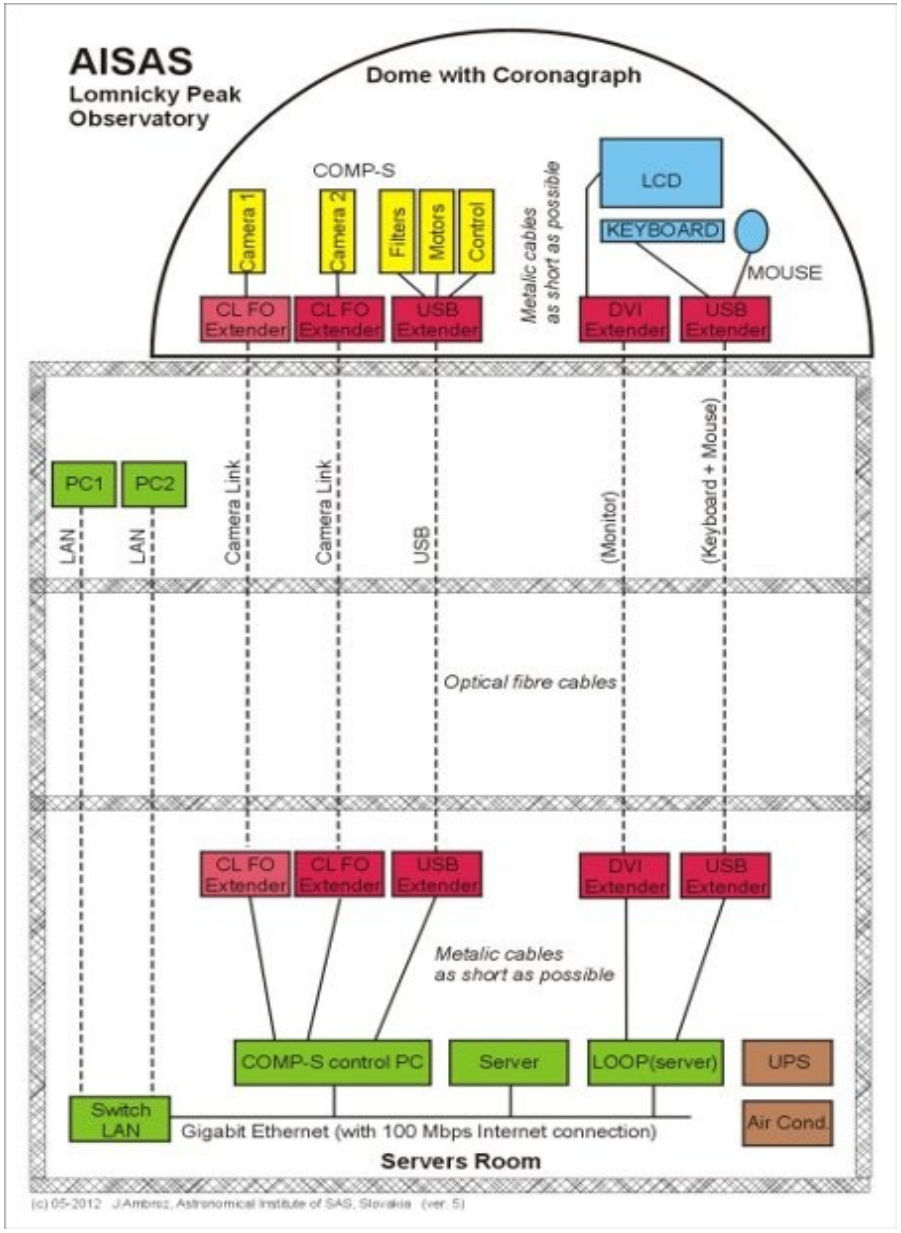
LSO infrastructure

Cabling in the building:

- power supplies
- signal cables via FO
- KVM and USB extension via FO
- data cables via FO
- two electric grounds
- a galvanic insulation

Quite expensive toys...

No telescope present at all!



LSO infrastructure

Cabling in the building:

Peter Habaj, Matúš Kozák, Jaro Ambróz installing a box
with the CoMP-S electronics

LSO infrastructure

Server room:

- 2x2m, double floor, dual cooling system, 19“ rack, ….
- author: Jaro Ambróz

LSO infrastructure

Electric cabling & server room
Dome and slit
Baterries
Water
Furniture
Windows
Many 'minor' details

LSO infrastructure

Dome slit motion (and stop):

- vertical motion
- an unbalanced weight of ~1200 kg
- an electromechanical brake

LSO infrastructure

Dome slit motion (and stop):

- vertical motion
- an unbalanced weight of ~1200 kg
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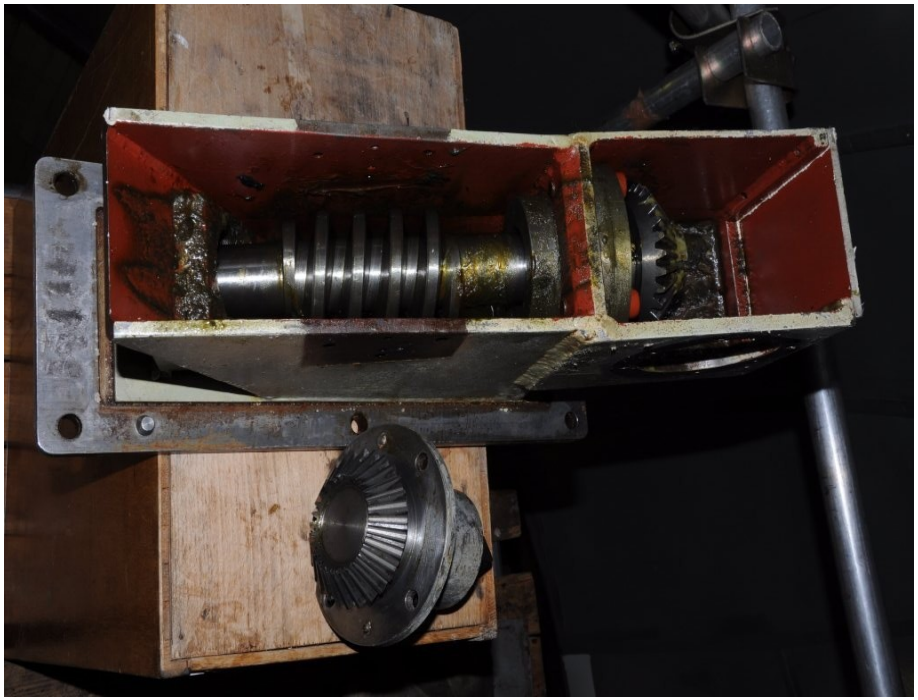
- electro-mechanical end switches

LSO infrastructure

Dome slit motion (and stop):

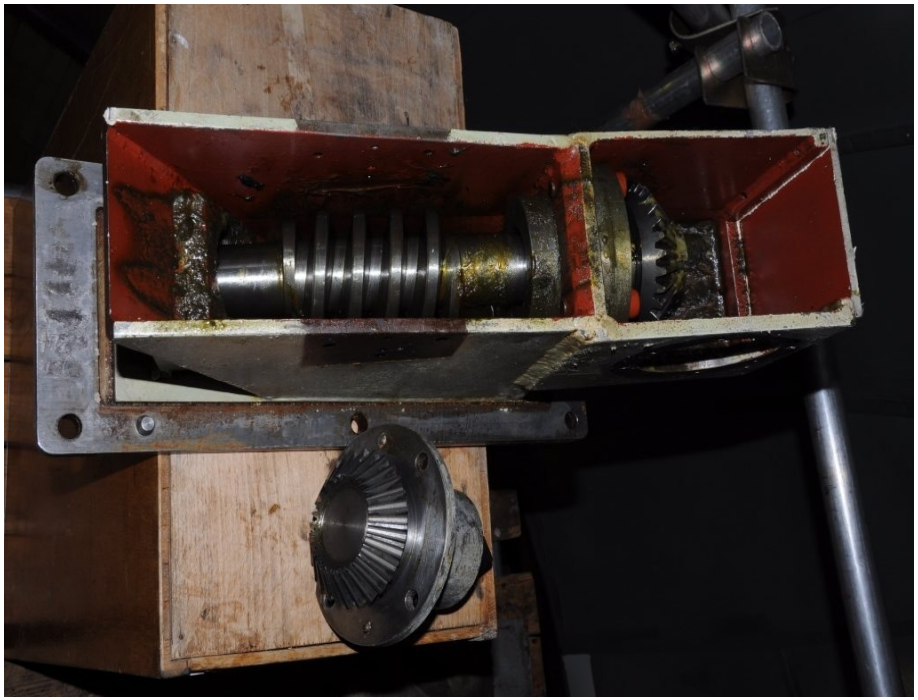
- vertical motion
- an unbalanced weight of ~1200 kg
- an electromechanical brake
- electro-mechanical end switches
- gearboxes



LSO infrastructure

Dome slit motion (and stop):

- vertical motion
- an unbalanced weight of ~1200 kg
- an electromechanical brake
- electro-mechanical end switches
- gearboxes
- **all is needed to open and also to close the dome slit safely!**



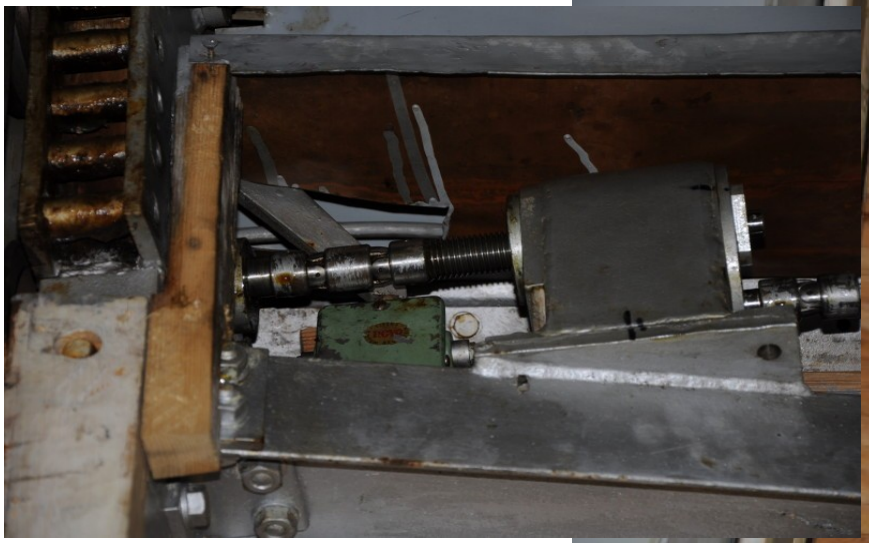
LSO infrastructure

Heating system: heating of moving interfacing parts of the dome/slit/wall

- 27 heaters
- 17.5 kW of power input
- **unused nowadays**

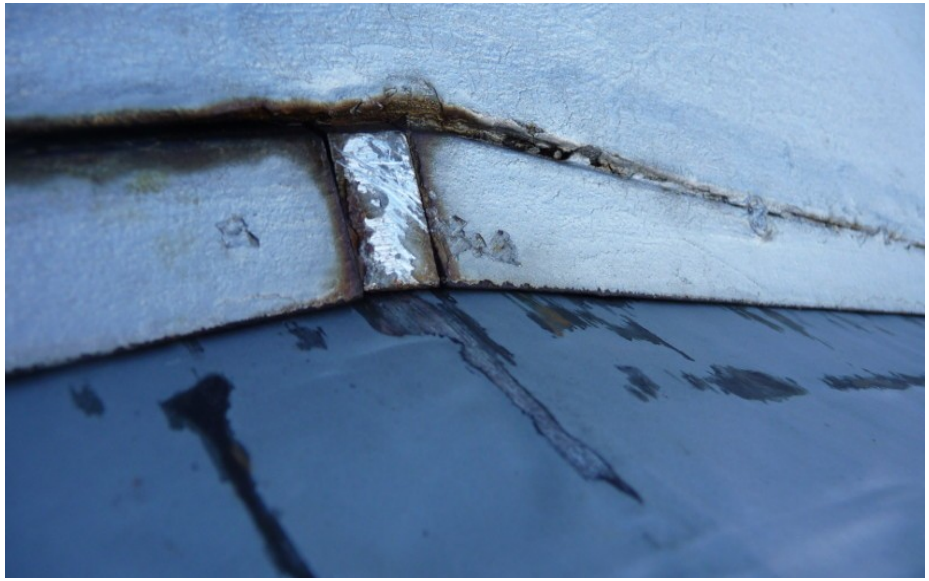
LSO infrastructure

Two-part dome slit: motorized disconnection/reconnection mechanism repaired



LSO infrastructure

Dome outer roof: “copper plates problems” due to too narrow clearance between the moving slit and the roof plates – interruption of observations for almost 4 months



LSO infrastructure

Dome outer roof: “copper plates problems” due to too narrow clearance between the moving slit and the roof plates – interruption of observations for almost 4 months - **a lot of luck!**

LSO infrastructure

Electric cabling & server room
Dome and slit
Baterries
Water
Furniture
Windows
Many 'minor' details

LSO infrastructure

Baterries:

- Ni-Cd ~24 VDC ~250Ah baterries + on-line charger
- for heating of the most critical optical elements and electronics
- author: Peter Habaj

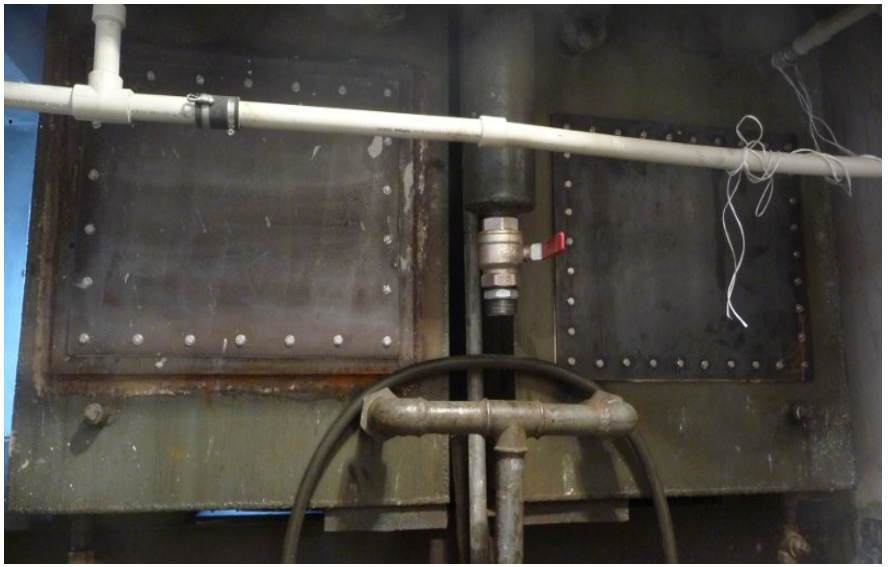
LSO infrastructure

Electric cabling & server room
Dome and slit
Baterries
Water
Furniture
Windows
Many 'minor' details

LSO infrastructure

Water for other purposes: 4 tanks completely filling one room, 11.4 m^3

- summer: roof water
- winter: delivered from Skalnaté Pleso cable car building by the cable car (~25 m^3 yearly)
- cleaning after 50 years...



LSO infrastructure

Potable water: 300 l tank, regular cleaning, two stage Fe/Mg/C filters, (~5m^3 delivered from Skalnaté Pleso cable car building by the cable car yearly) – **your coffee and tea!**

LSO infrastructure

Electric cabling & server room
Dome and slit
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Many 'minor' details

LSO infrastructure

Forniture: gifts of the Trendwood-twd company (Banská Bystrica) - 1/ 4 sleeping rooms, 2/ dome – in total 24 pieces up to now, 3/ offices

Person in charge: Ing. Igor Patráš

LSO infrastructure

Electric cabling & server room
Dome and slit
Baterries
Water
Furniture
Windows
Many 'minor' details

LSO infrastructure

Windows: gift of the company RI-okna, Ltd., Bzenec, ČR (22 high quality windows: system PONZIO PE 68 HI, 3 chambers, 3 layers of glass)

Person in charge: Ing. Martin Ištvánek

LSO infrastructure

Electric cabling & server room
Dome and slit
Baterries
Water
Furniture
Windows
Many 'minor' details

LSO infrastructure

Cleaning of the dome from outside in winter:

- since November to May
- cleaning of just an area where the slit is moved when opened
- water drops away from the light pass to the dome

LSO “details“

Staff
Money
Delays
PRs
Management

LSO “details“

Staff
Money
Delays
PRs
Management

LSO “details”: staff

Presentation on behalf of the LSO/CoMP-S team:

- Peter Habaj, Juraj Kavka, Rastislav Mačura - observers

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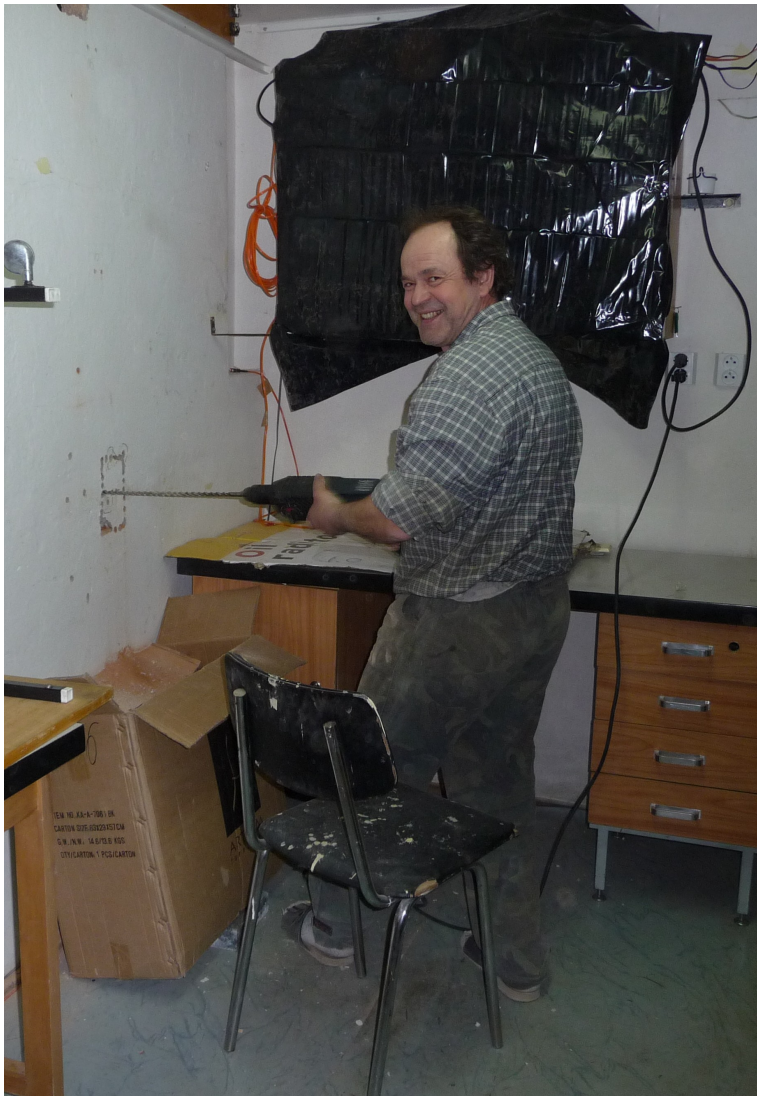

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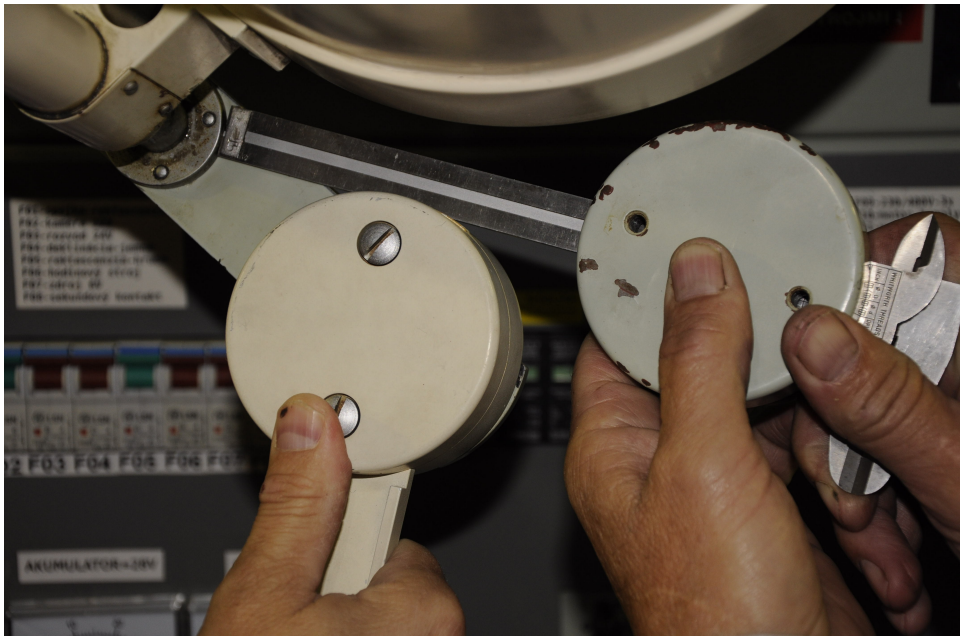

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- Ján Klein (part-time) - workshop

- Pavol Schwartz
- Peter Gömöry
- Július Koza

- Aleš Kučera – our boss

LSO “details“

Staff
Money
Delays
PRs
Management

LSO “details”: money

The LSO as a running observatory eats a lot of money….

LSO “details”: money

The LSO as a running observatory eats a lot of money....

The actual sources of the financial support:

- an institutional budget of the AISAS
- VEGA grant agency project 2/0108/12, “Variabilita časového vývoja magnetických štruktúr v slnečnej atmosfére a ich fyzikálne modely“, PI: Aleš Kučera
- APVV grant agency project APVV-816-11 “Slnečná koróna: výskum fyzikálnych procesov (2013-2015), PI: Ján Rybák, *http://www.astro.sk/~choc/open/apvv_0816-11/*
- project COST Action MP1104 "Polarization as a tool to study the solar system and beyond"
- ŠF EÚ pre vedu v SR – agentúra ASFEU MŠ SR
- indirect support: DAAD-SAV project, SOLARNET EU 7FP project

LSO “details“

Staff
Money
Delays
PRs
Management

LSO “details”: delays

The LSO as a running observatory eats a lot of manpower. We have delays in all instrumental projects of the LSO.

LSO “details”: delays

The LSO as a running observatory eats a lot of manpower. We have delays in all instrumental projects of the LSO.

Reasons of the delays:

- a really isolated observatory – transportation completely depends on weather and the cable car
- some old problems were really needed to be solved (dome, slit,...)
- an astroclimate – our magical 1/3, 1/5, 1/7 for fractions of the observational days in total, 'coronal' days, and long 'coronal' days to 365 days
- the LSO dome is really not a lab environment...
- our staff is limited

LSO “details”: delays

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- the LSO dome is really not a lab environment...
- our staff is limited
- sometimes there might be moments we are tired...

LSO “details“

Staff
Money
Delays
PRs
Management

LSO “details”: PRs

Only limited activities at the LSO:

- “Door open days” – each year four Saturdays during summer
- information monitor in the “DEDO” caffe at the Lomnicky Peak
- summer practicum for university students

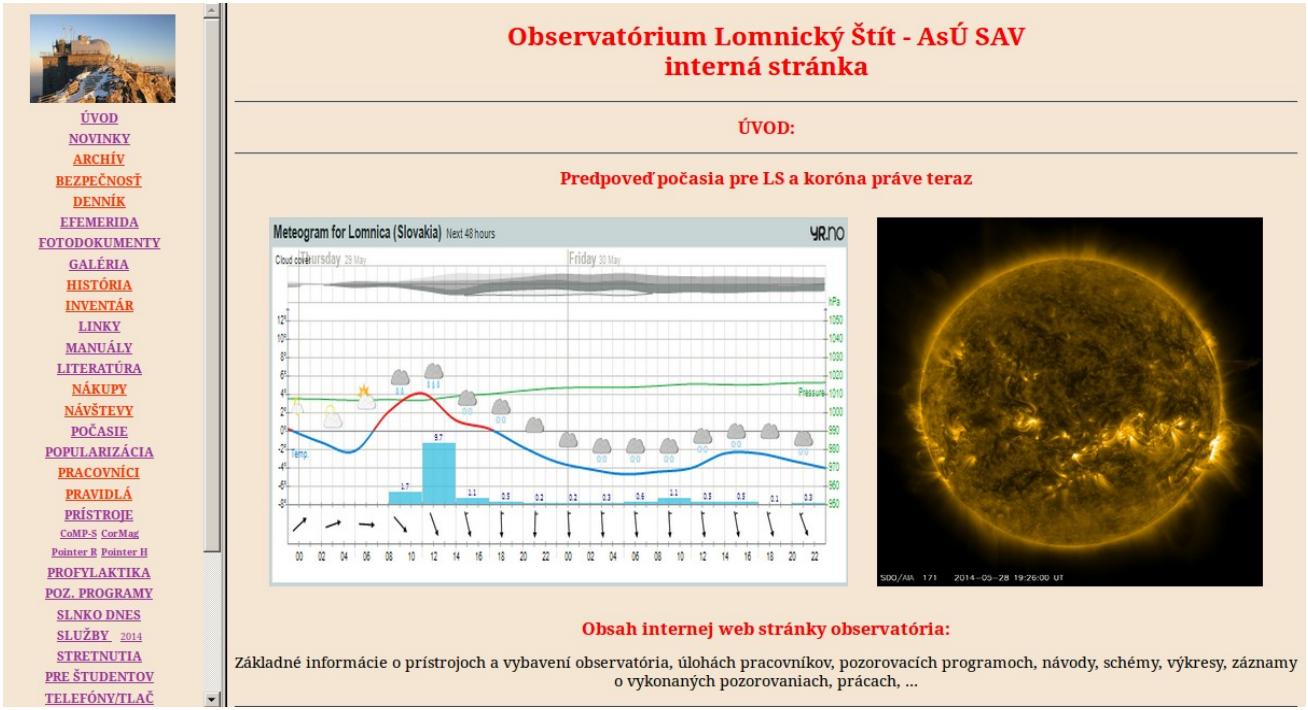
LSO “details“

Staff
Money
Delays
PRs
Management

LSO “details”: management

Some management is needed:

- observers: regular 9-days duty at the LSO including a 2 days overlap
- a detail duty exchange procedure: instrumentation / building
- daily report of the observer on duty
- list of observer's duties
- a prevention plan
- TODO list and DONE list
- LSO intranet web page:



LSO “details”: management

Some management is needed:

- regular official meetings of the LSO group
- frequent visits of engineers and astronomers
- unofficial common lunches

LSO future plans

Observations, Instrumentation, Infrastructure

LSO future plans

A short extraction of the LSO todo list for near future:

Observations:

- regular observing programs of the CoM-S and CorMag instruments
- observations in frame of the coordinated observing campaigns

LSO future plans

A short extraction of the LSO todo list for near future:

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Instrumentation:

- CoMP-S+PDSS: reliability of motor actions for diffuser and focusing, measurements of the passbands, replacement of the camera module
- CorMag: ghosts, operation under winter conditions
- pointer R: to improve resolution ~10 times
- operation all instruments from an office including fine motions of the LSO bino-coronagraph
- an automatic motion of the dome to keep all optical instruments fed by solar light
- database of the acquired data of observations

LSO future plans

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- database of the acquired data of observations

Infrastructure:

- photolab → sleeping room and office
- rennovation of the bottom bathroom
- dismounting the 'plecháreň' storage place
- old battery room → storage place for flammable materials


On behalf of the LSO team:
thank you for your attention