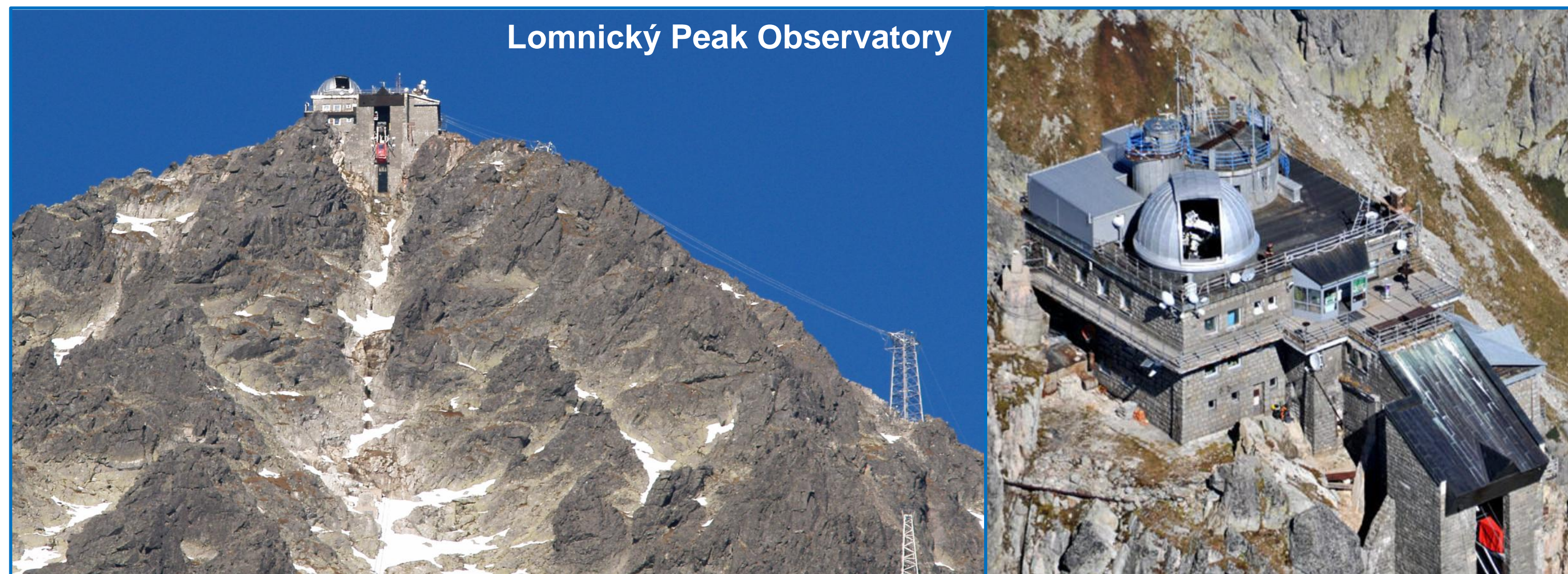


Solar Chromospheric Detector at Lomnický Stit Observatory for measurements of solar magnetic and velocity fields (and CoMP-S instrument)

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We report on Solar Chromospheric Detector (SCD) instrument and Coronal Multi-channel Polarimeter mounted at the Double Solar Coronagraphs at Lomnický Stit Observatory and working simultaneously. The SCD is a single beam instrument designed and developed for measurements of velocity and magnetic fields in prominent spectral lines of the solar chromosphere, mainly for eruptive events. It is a combination of a tunable 5-stage Lyot filter and a polarimeter. The Coronal Multi-channel Polarimeter for Slovakia (CoMP-S) was designed and manufactured by HAO/NCAR (Boulder, USA) with a tunable Lyot filter and polarimeter for visible and near IR spectral regions. It is proposed for coronagraphic observations of magnetic and velocity fields in the solar corona and in prominences. A fundamental upgrade of this instrument has been done (in 2014) with pair of cameras sensitive in the near IR spectral region.

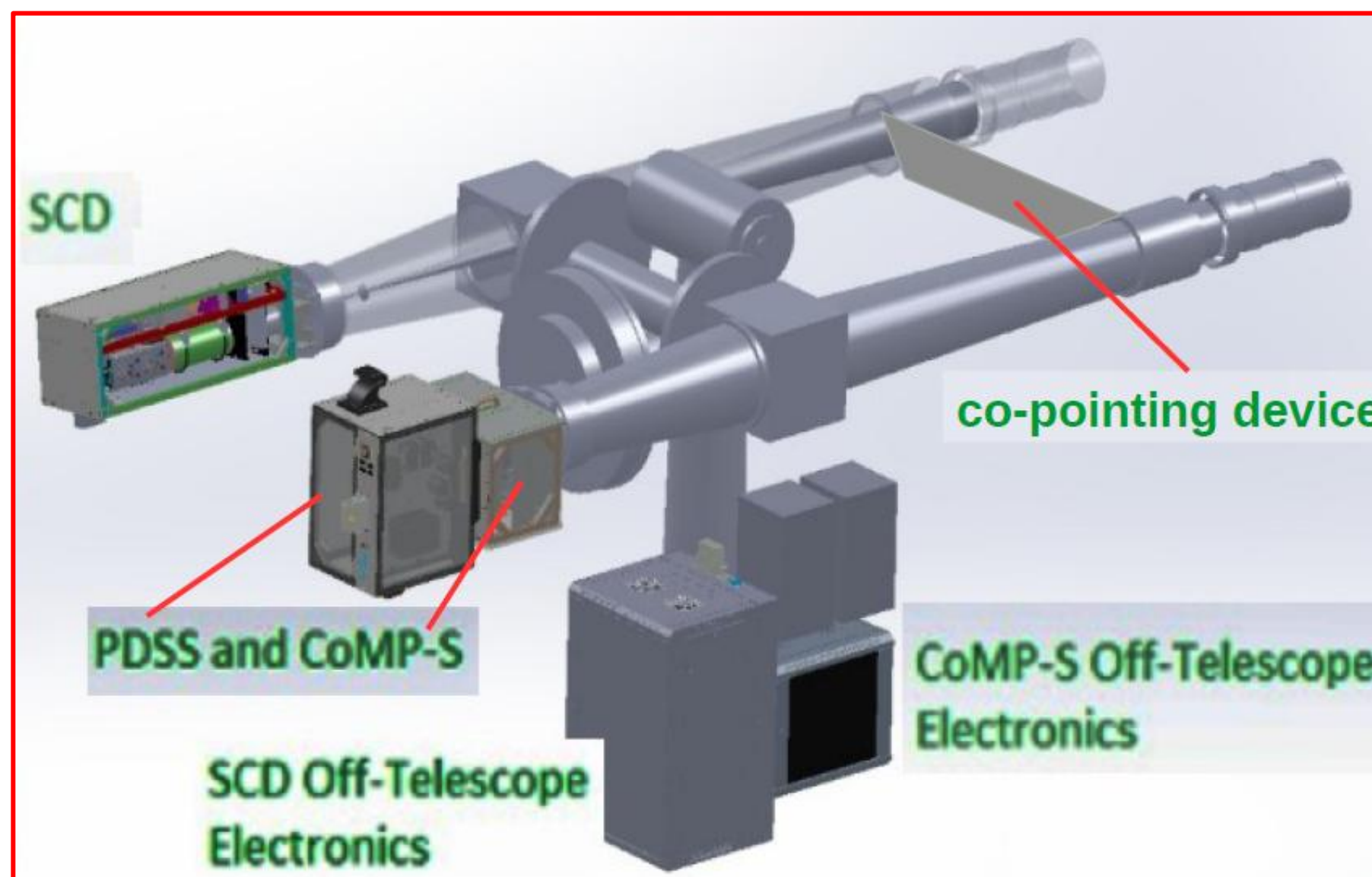
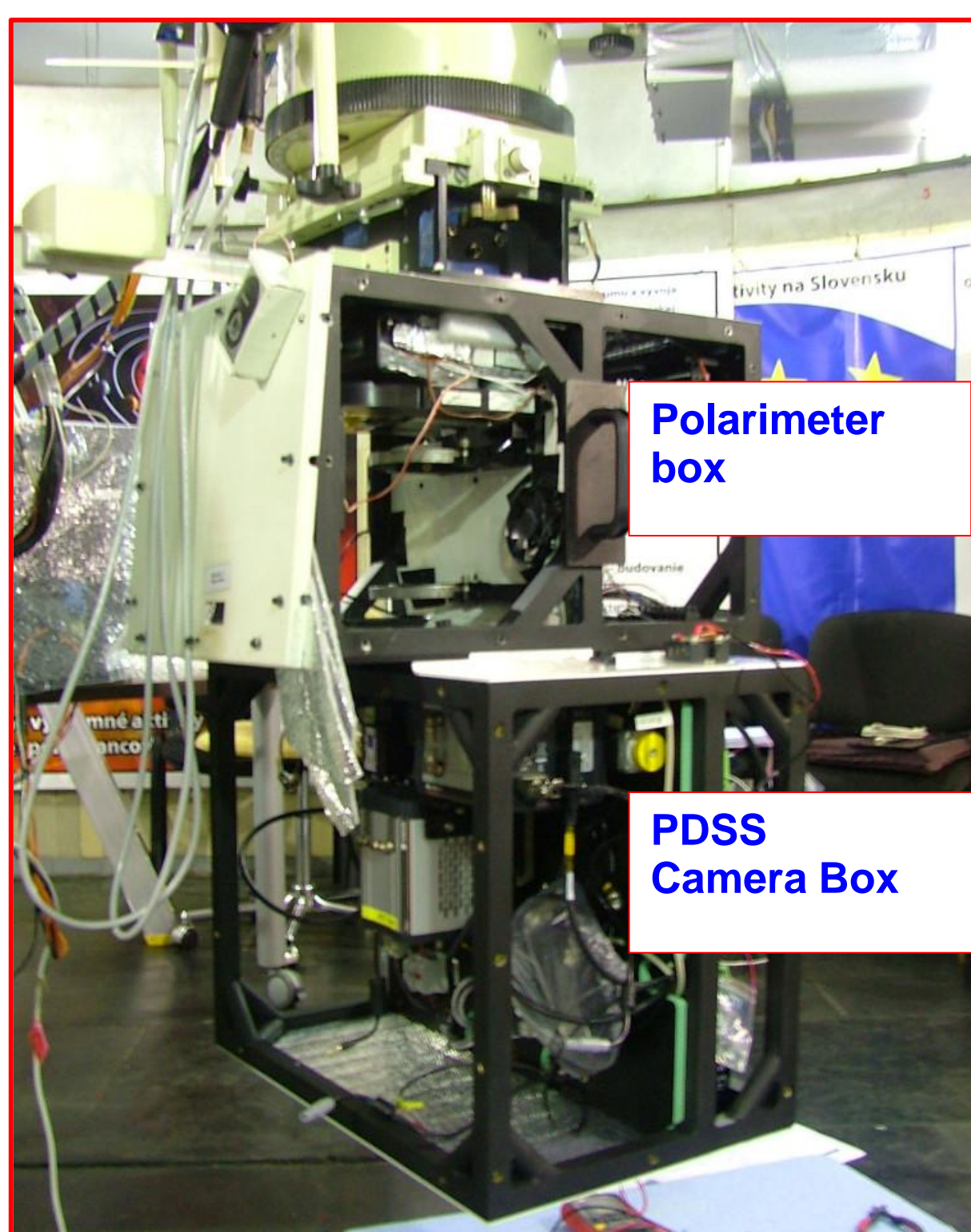


- 2633 m above sea level in High Tatras mountain in the North Slovakia
- One of a few sites still performing routine ground based coronal observations
- Astroclimate: 120 days/year – observations of prominences only
70 days/year – observations of emission corona



- co-pointing device Hanco Engineering
- two Zeiss 200/3000 coronagraphs installed in 1961 and 1970
- optical twins with co-pointing precision of 2 arcsec
- diameter of the solar image in the focal plane: 4 cm
- field-of-view: 1.02 - 1.84 of the solar radius
- diffraction limited from 530 nm to 1100 nm
- focusing by moving the objective lens along the optical axis ~80mm

Coronal Multi-channel Polarimeter CoMP-S with new PDSS camera modul



Main features

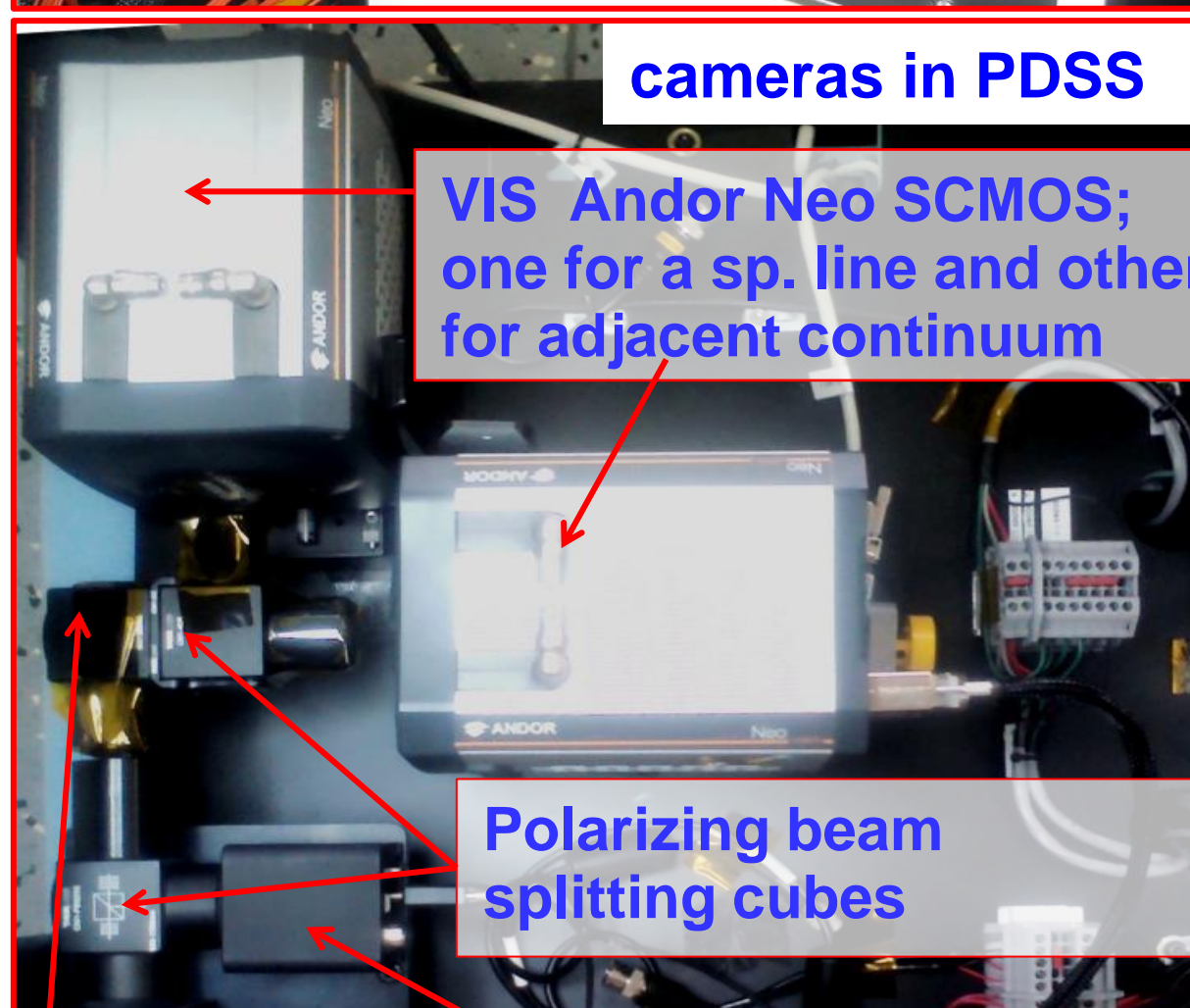
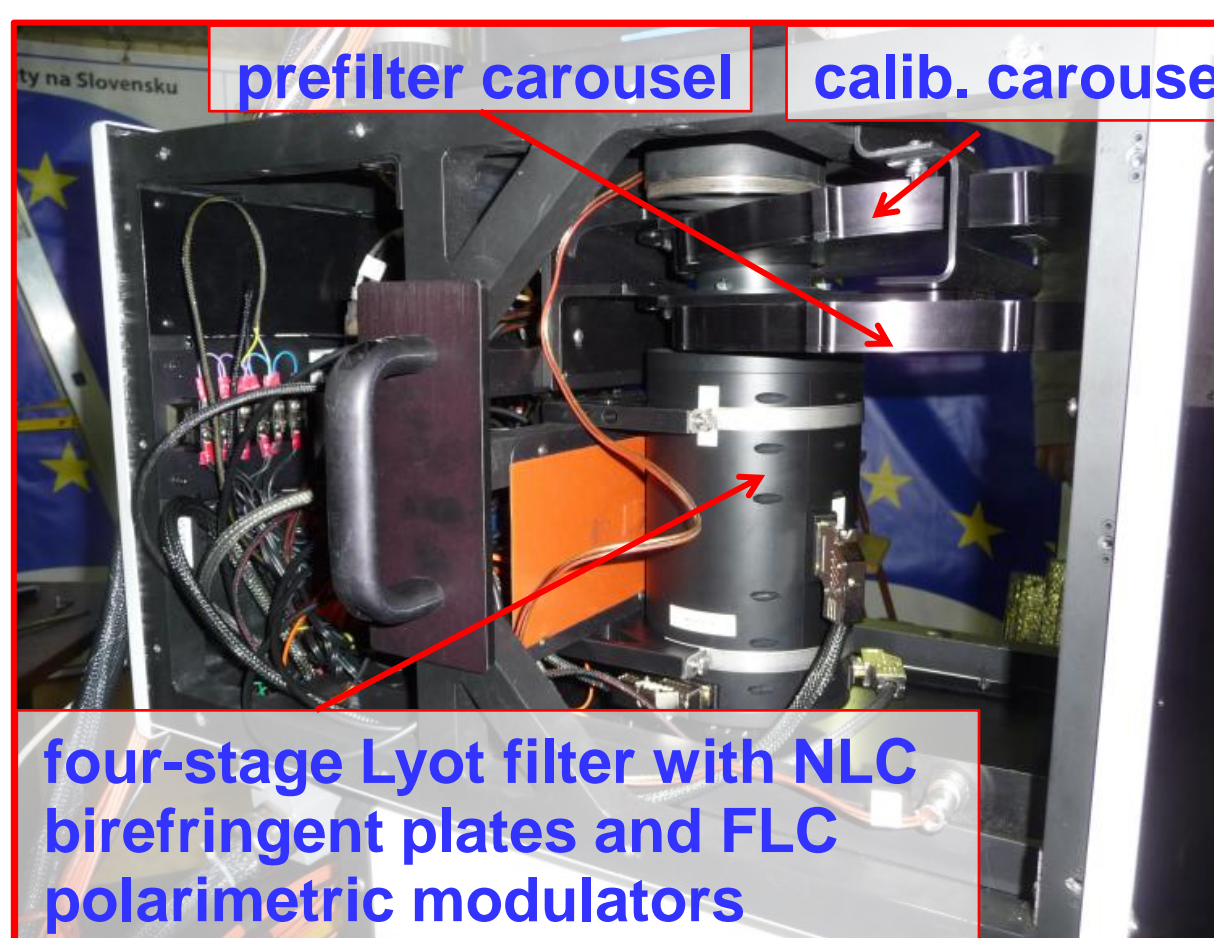
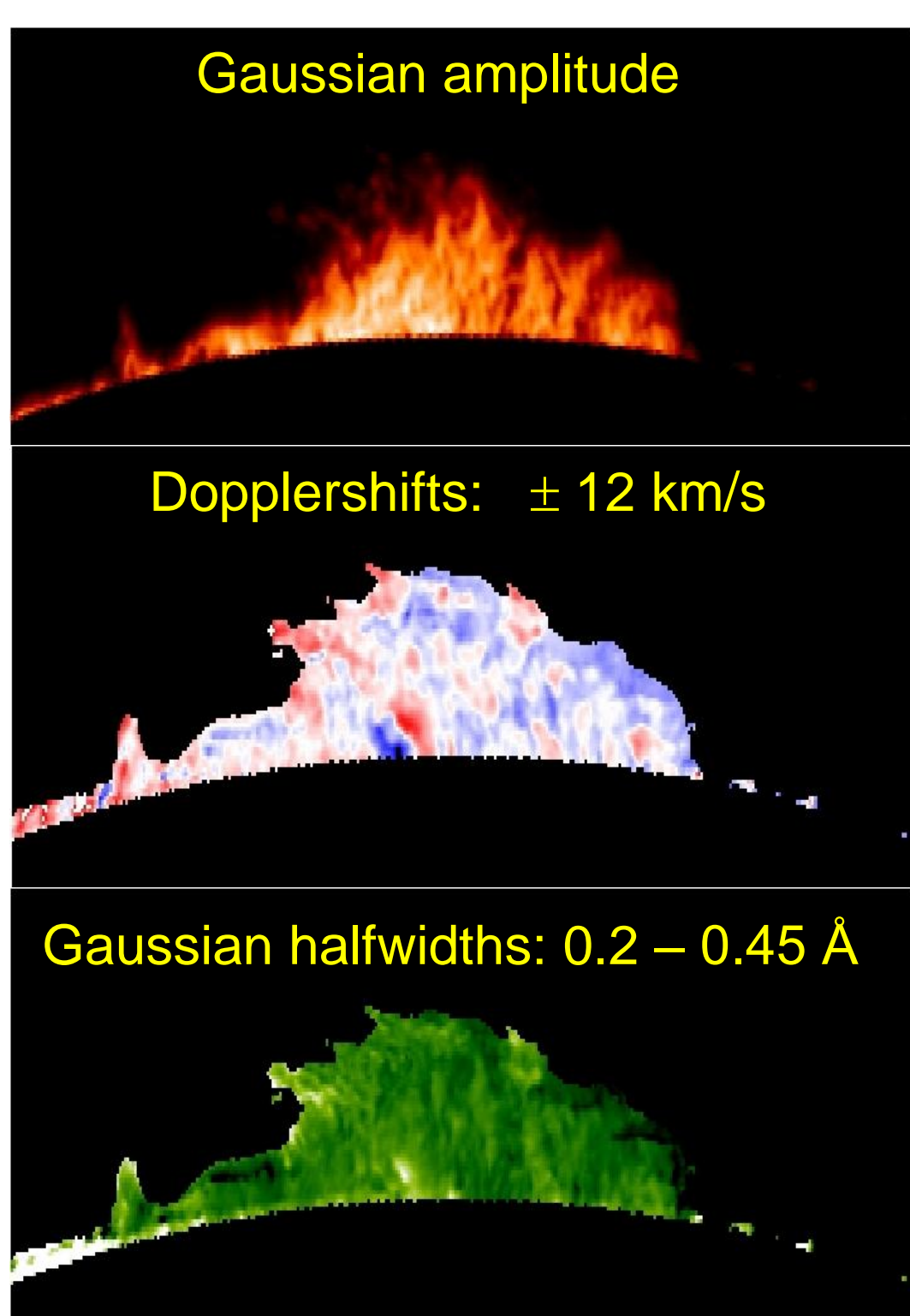
- designed mainly for off-limb observations
- field of view: 14 arcmin × 11 arcmin
- 4-stage tunable Lyot filter with polarimeter (two ferro-liquid crystal polarizers),
- FWHM of transm. fnc 0.28 – 1.3 Å for range 5300 – 10830 Å
- sequential measurement of several VIS and near-IR lines
- deliverables: 2D full Stokes I, Q, U, V
- actual observational output: linear combinations of I ± Q, I ± U, I ± V,
- then, the four Stokes reconstructed from the combinations

Selected emission lines

given by prefilters available in the prefilters

prominences	He I 587.6 nm D ₃
	H α 656.3 nm
	Ca II 854.2 nm
	He I 1083.0 nm
corona	Fe XIV 530.3 nm
	Ca XV 569.5 nm
	Fe X 637.5 nm
	Fe XI 789.2 nm
	Fe XIII 1074.7 nm
	Fe XIII 1079.8 nm

Results of profile Gaussian fitting



An example of COMP-S observations

Data taken during HOP 186 „Mass loading of quiescent prominences from multi-wavelength observations“

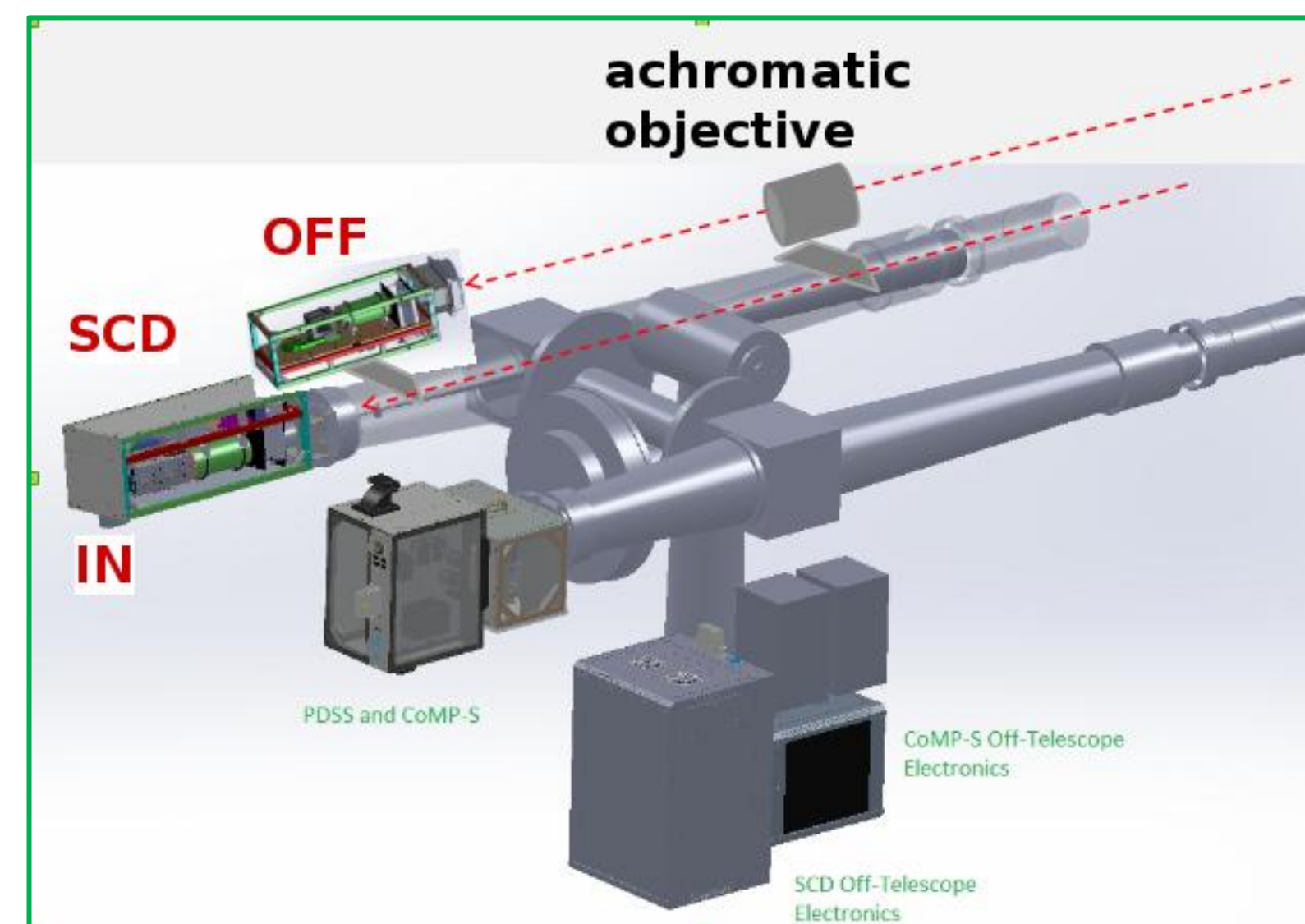
- Quiescent prominence observed on 20 October 2012 at 07:09 UT
- H-alpha profile scanned in 11 wavelength positions in profile, only Stokes I total
- scan time: 20.75 s
- Wavelength steps: in the core: ±0.1 Å, in the wings: ±0.2 Å
- FWHM of filter: 0.45 Å
- post-facto 4 × 4 pixel binning
- Final sampling: 1.3 arcsec/px

Solar Chromospheric Detector (based on concept of COMP-S)

Designed mainly for on-disc observations

Prepared for two possibilities:

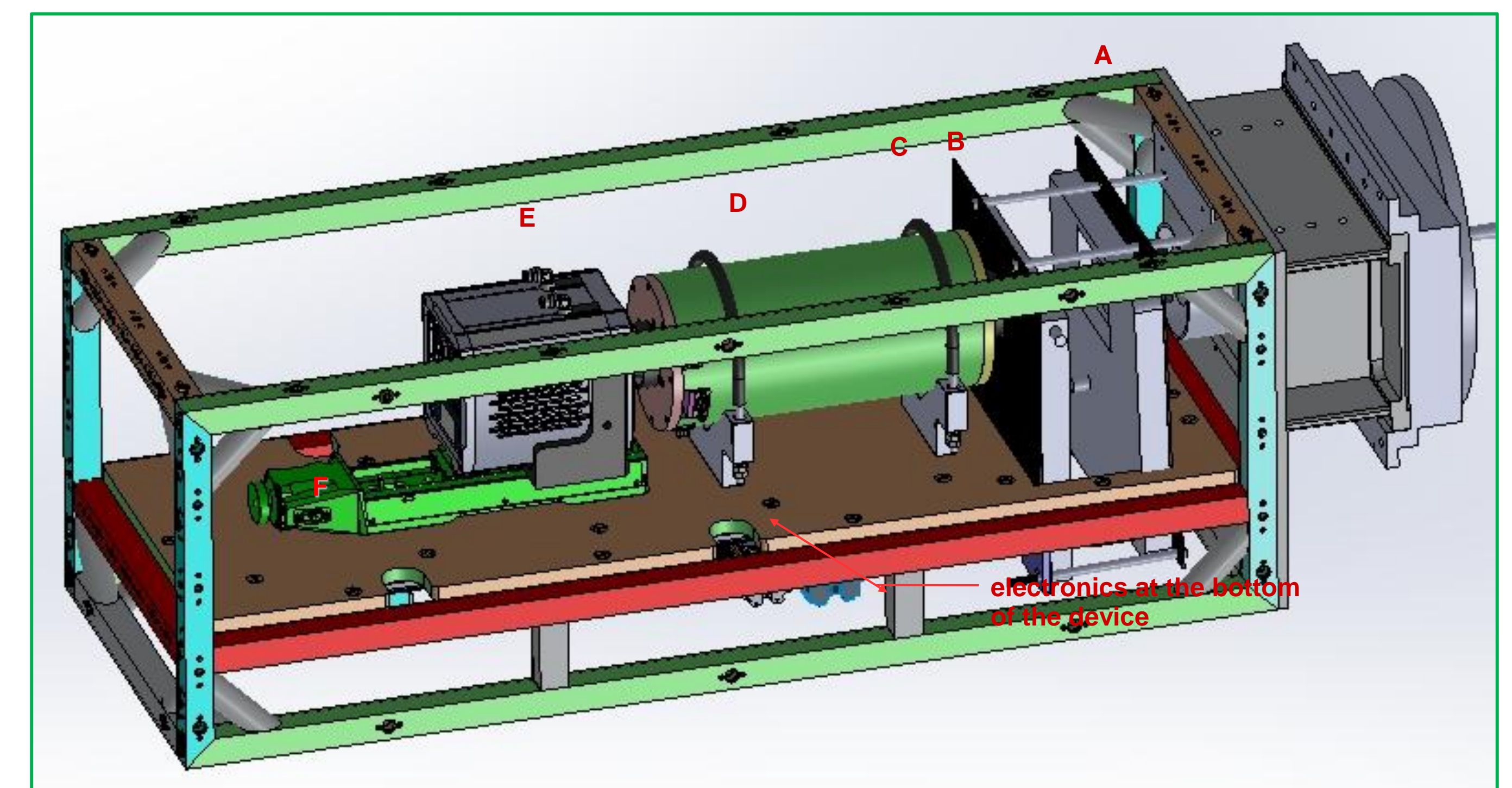
- as postfocus instrument of the left coronagraph – option „IN“
- mounted on tube of the left coronagraph in open optical design with achromatic objective – option „OFF“



Advantages of the two possibilities:

- IN – no mounting points and additional weight on tube of the left coronagraph
- OFF – achromatic objective; no need for changing of focus length for observations in different spectral lines

SCD components and parameters



- A: mechanical interface,
- B: carousel prefilter: lines selection in 5000-11000 Å, chromospheric: He I 587.6 nm, Na I 589.6nm, H I 656.3 nm, Ca II 849.8 nm, Ca II 854.2 nm, Ca II 866.2 nm, He I 1083.0 nm
- photospheric: Fe I 557.6 nm, Fe I 630.15 nm, Fe I 630.25 nm
- C: calibration carousel
- D: 5-stage tunable Lyot filter with polarimeter (two ferro-liquid crystal polarizers)
- E: Camera: Andor Neo sCMOS
- F: pointing device for camera
- Dimensions height, length, width: 30x110x40 cm

Spectral resolution of the SCD birefringent filter ranges from 0.44 nm for observations of the He I 587 nm line up to 1.67 nm in case of the He I 1083 nm. A spatial resolution of 1.5 arcseconds and temporal resolution of 10 seconds are expected in practice for a full scan of particular spectral line.