COST
Short Term Scientific Missions
Report – 15 December 2013

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Period: 13 – 26 October 20123

STSM Title: Polarimetry of the solar corona with the Turin-filter at Lomnicky Observatory

Scientific Report

Backgroud and Objectives of the STSM

The overreaching goal of this STSM was to assess the possibility of integrating the liquid crystal Lyot filter developed by the INAF - Turin Astrophysical Observatory, Italy, to the ZEISS coronagraph of the Lomnicky Peak Observatory, Astronomical Institute of the Slovak Academy of Sciences (AISAS), in Tatranská Lomnica, Slovakia. A positive result of this integration test would make possible to implement a long-term observation plan (1 year at least), to carry out spectro-polarimetric observations of the coronal “green-line” emission (FeXVI, 530.3 nm). The science goal of hese observation is to study the coronal magnetic fields that drive the dynamics of the solar wind.

The Turin coronal magnetograph (CorMag) is a four-stage Lyot filter with an electro-optically tunable bandpass. The full width at half maximum of the filter is 0.15 nm. The center wavelength of the bandpass is tuned by using nematic liquid crystal variable retarders (LCVR’s). A separate LCVR, in tandem with the filter, is used for the polarimetric measurements Mechanical adaptation of OATo Lyot filter for Lomnicky coronograph.

For the detailed plan of this STSM see Fineschi’s report. Here, the work for the mechanical adaptation of the CorMag to the Zeiss coronagraph is described.

Mechanical adaptation of OATo Lyot filter for Lomnicky coronograph.

The OATo Lyot liquid crystal filter is pictured in Figure 1, the actual filter body is the red cylinder enclosed in the mechanical housing holding relay optics and telescope interface.

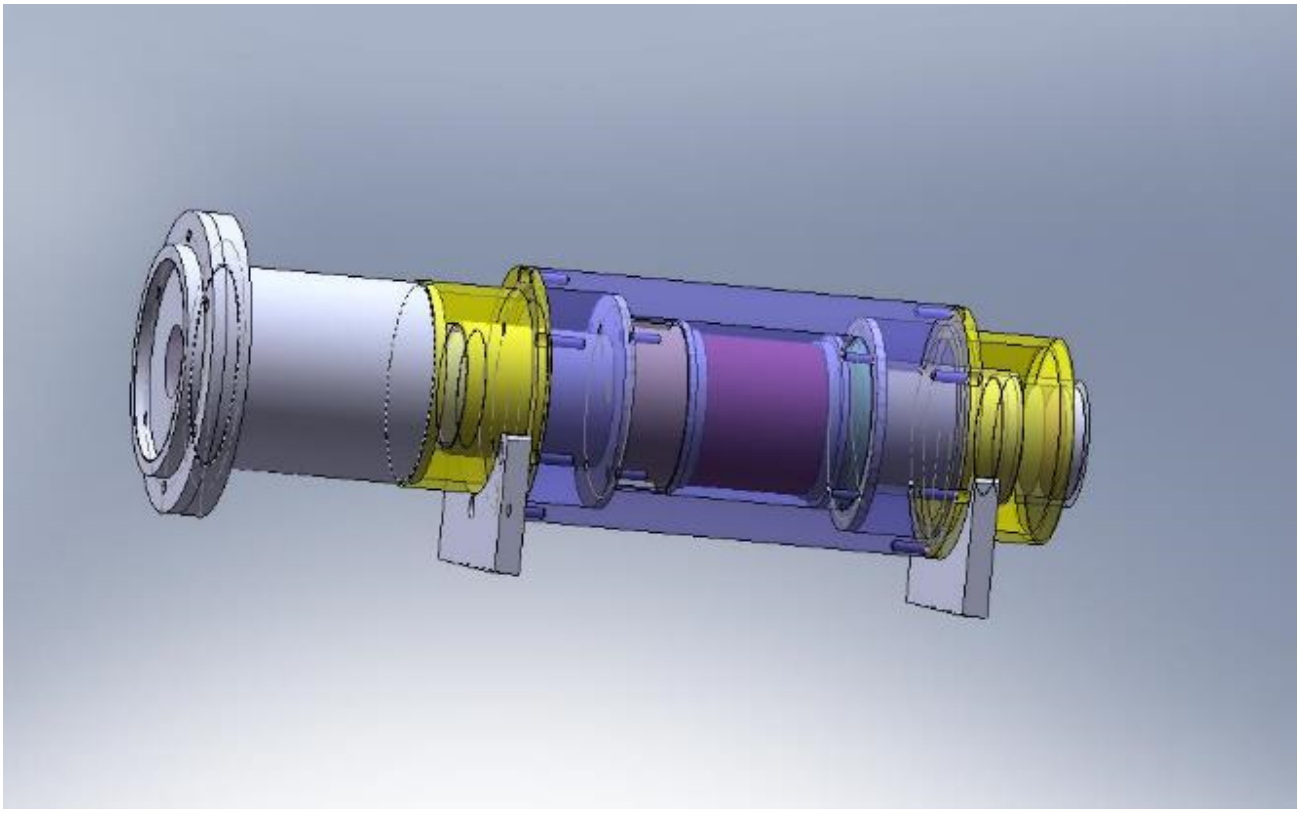

Figure 1- Opto-mechanical CAD drawing of the case of the Lyot Liquid Crystal Filter.

This configuration has been designed for the transportable optical telescope used for the 2010 solar eclipse observations, the telescope tube and objective being on the left side, the CCD camera on the right.

The adaptation for the Lomnicky Stit Observatory coronagraph has required some modifications, carried out at the Torino Observatory workshop:

1. the re-design of the telescope interface and the field stop assembly;
2. the construction of a new rotatable mount easily removed from the main body for an extra polarizer to be used for flat fielding and calibration purposes.

The new configuration is the one of Figure 2:

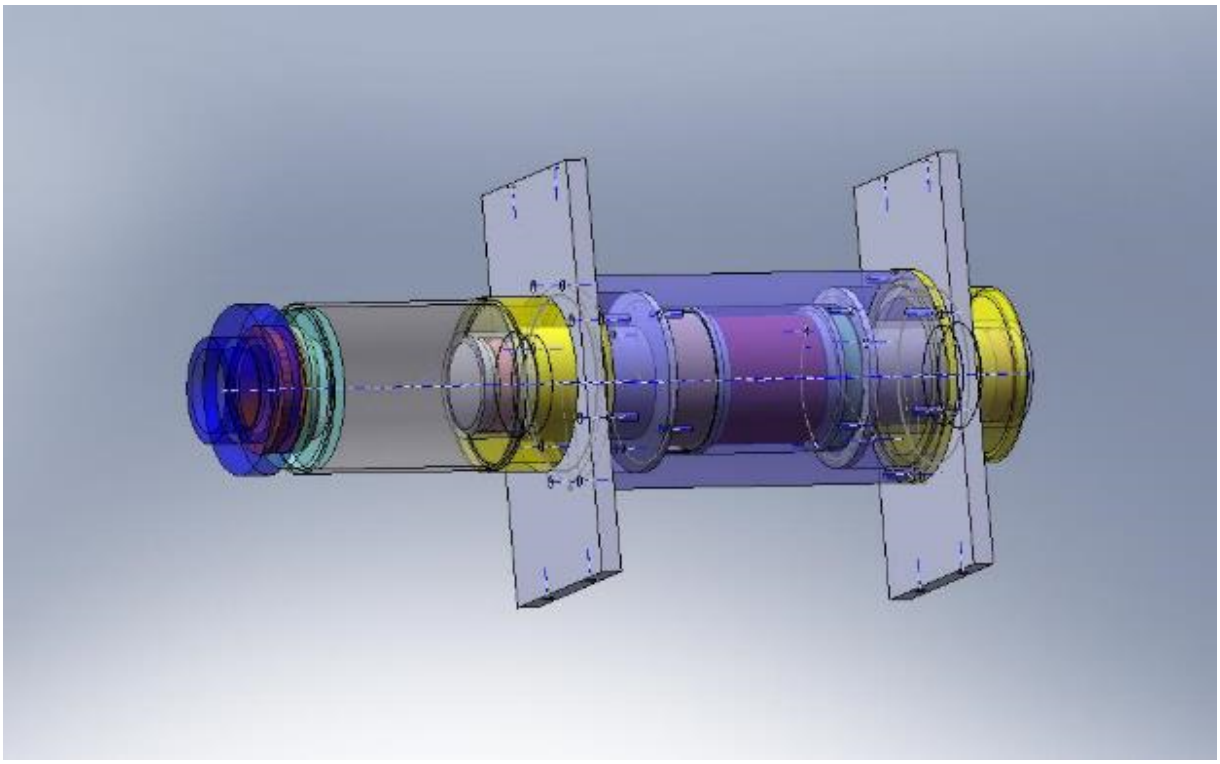

Figure 2 – Mechanical configuration of the LCTF for Lomnicky Stit Coronagraph

The dark blue and brown components on the left side are the extra polarizer mount to be removed for observations after preliminary calibration frames.

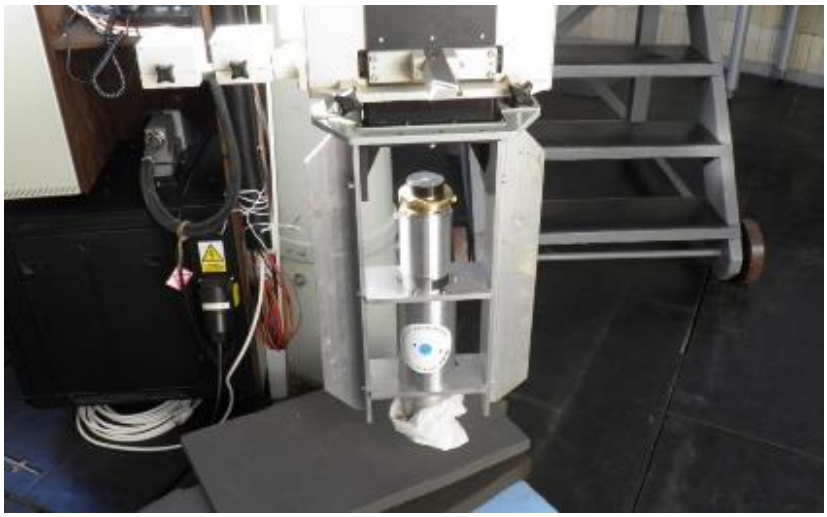

Figure 3 – Pictures of the CorMag installed in the coronagraph frame

The filter mounted on the coronograph is shown in Figure 3, the enclosing frame has been prepared in situ by Lomnicky people and proved very effective in keeping the filter in tight alignment with telescope optical axis.

The focusing procedure is a two-steps one: the CCD camera is focused first until we get well defined images of field stop, then the telescope in focused at the sharpest solar limb image (cfr.Fig.4).

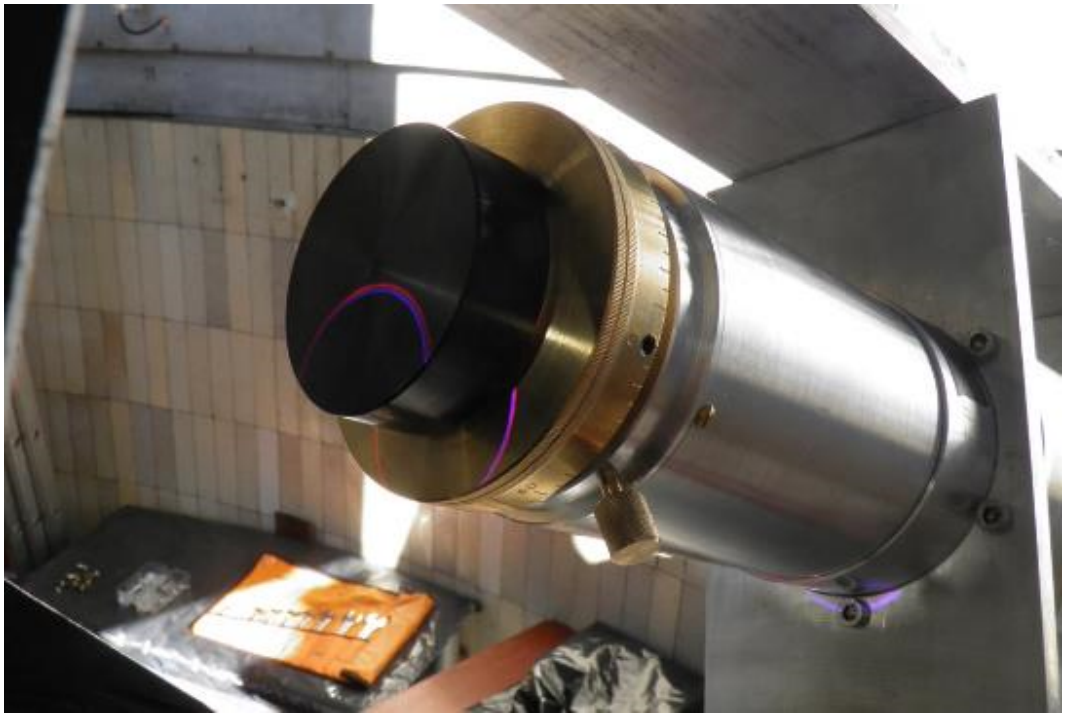

Figure 4 – A suggestive pictures of the focusing procedure

Some pictures showing different details of the installation of the CorMag as focal plane instrumentation of the coronagraph are showed in Figure 5.

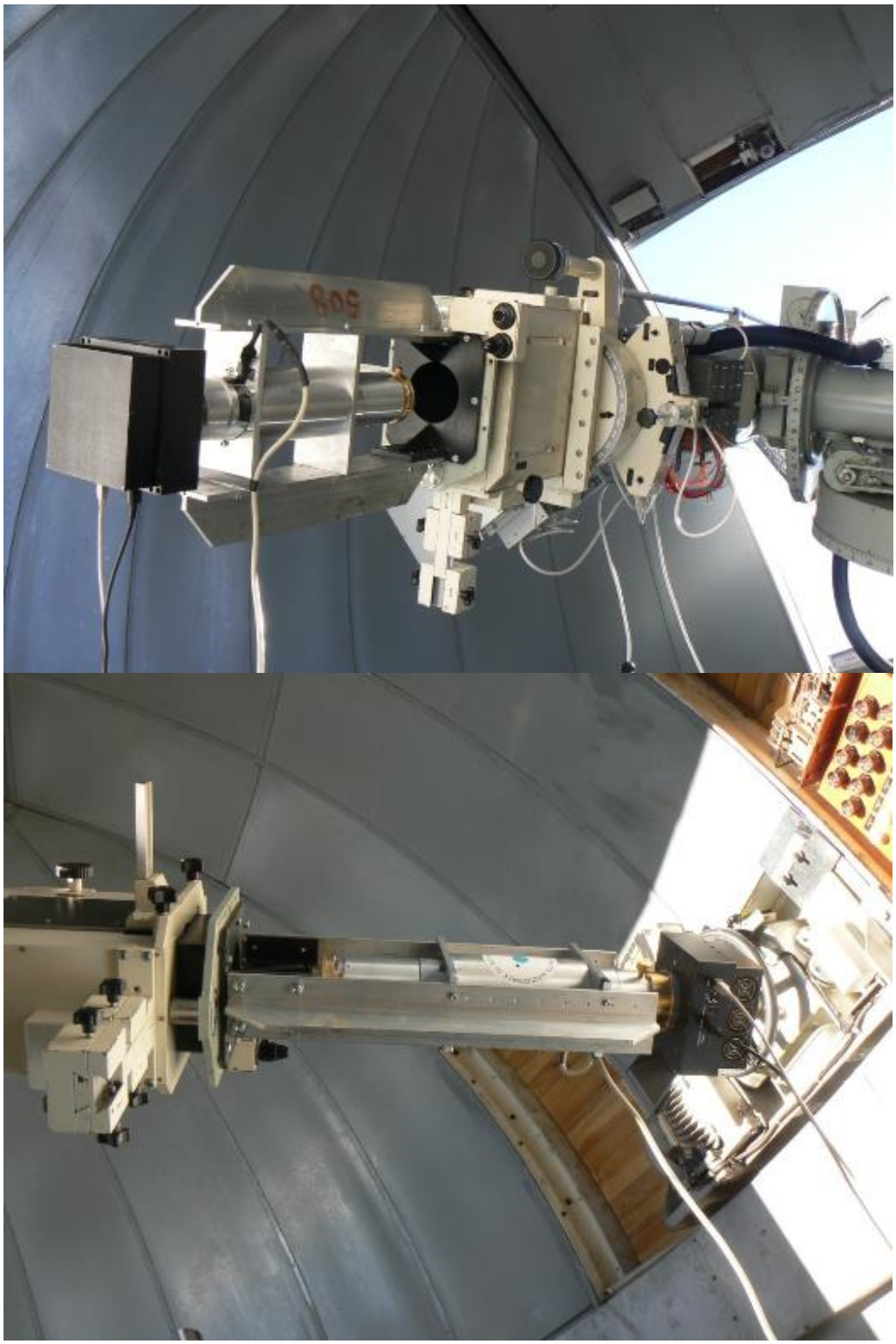

Figure 5 – Pictures of the CorMag installed on the Lomnicky Stit Observatory coronagraph