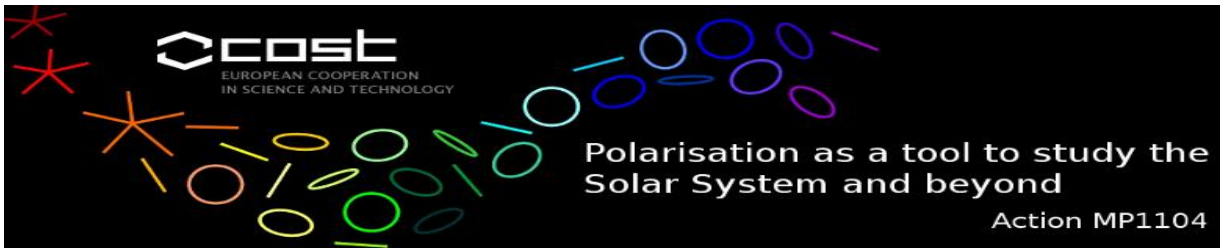

STSM Scientific Report Template

Applicant and home institution : Martin Pertenais, IRAP Toulouse (France)

Visited scientist and host institution : Frans Snik, Leiden Observatory (the Netherlands)

Dates of STSM : 08/12/14 – 12/09/14

Explain briefly below how your STSM matched one of these key-points :

1. strengthen current collaborative projects
2. establish new collaborations
3. obtain necessary knowledge for the application of new techniques
4. use host infrastructures that are not available at the home institute.

The goal of this STSM was to strengthen current collaborative projects and to obtain necessary knowledge for the application of new techniques.

We first worked on the UVMag project where Frans is acting as an advice collaborator for the polarimetric module. We could work this week on the optical design of the instrument and managed to improve it considerably by modifying the type and space position of the polarizer. This was thus a real success for the collaboration on this project.

The second achievement was made in the knowledge transfert about polarized fringes occuring by using thin waveplates. We worked on the theoritical model to calculate these fringes and the code to apply this model to our designs. Thanks to this STSM I am now able to determine and characterize the error induced by the fringes in the optical design.

Describe below the activities carried out during the STSM and the main results obtained.

- Optical design

With the help of Frans I was able to exploit an idea I had some weeks ago, to put the polarizer after the spectrograph of UVMag/Arago instead of right after the polarization modulator at the focal plane of the telescope. This works really well and may allow to decrease the cross-dispersion needed by a factor of 2, and as a consequence also decrease the size of the focusing optics and of the detectors. To do this, we needed to check if the spectrograph was not “killing” the polarization information and if we were able to measure the incoming polarization state.

- Polarized fringes

The biggest part of the work done during the STSM was about the study of the polarized fringes appearing when using thin waveplates.

Using the knowledge of Frans and his PhD student Gerard van Harten and the work they did for X-Shooter for example, we worked on the mathematical/physical theoritical description of these fringes, using Berreman calculation. I was then able to write a code to determine the amount and the characteristics of the polarized fringes I get with my design for UVMag/Arago. This is done in order to calculate error matrices to check if the scientific requirement is achieved, even with these fringes.

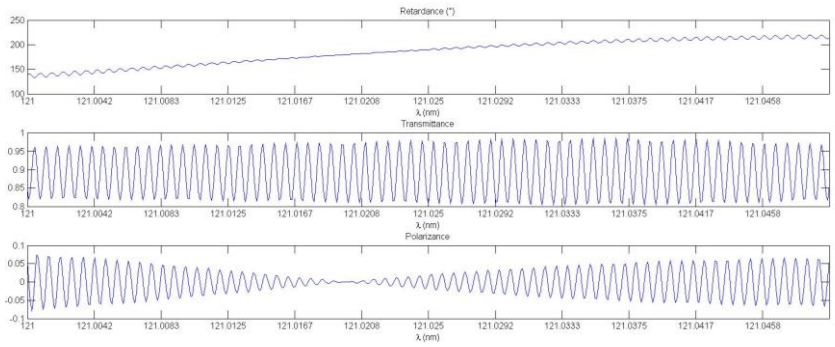

Fig. 1 : Plot of the fringes obtained with the polarimetric modulator of UVMag. Retardance, total Transmittance and Polarizance in a small spectral range of 0.05nm in the FUV

Thanks to this week of work, I am now able to build a better design and to determine precisely the accuracy of the polarimetric measurement. Especially for the preparation of the proposal for the M4 call of the ESA.