

STSM TITLE: “Preparing future missions for solar flare X-ray polarimetry”

Dates: 18-22 August 2014

COST Action: MP1104
Reference : COST-STSM-MP1104-180814-046462
Location: Northumbria University in Newcastle Upon Tyne (UK)

Host: Prof. Valentina Zharkova
Granted: Dr. Sergio Fabiani (INFN, Sezione di Trieste)

Introduction

I visited Prof. Valentina Zharkova of Northumbria University in Newcastle Upon Tyne (UK) to discuss about solar flare X-ray polarimetry.

In this STSM we started a collaboration to give to future mission proposals of solar flare X-ray polarimetry the needed theoretical basis to result competitive in next calls.

We need to provide more precise information about the detector capabilities, with respect to the simple sensitivity estimation. Therefore, the aim of this STSM was to match the theoretical simulation tools managed by Prof. Valentina Zharkova with the simulation software of the Gas Pixel Detector polarimeter to derive simulations of measurements for some relevant science cases.

Activity

- 18 August – Introduction to the solar physics activity carried out at the Northumbria University by prof. Zharkova and her group. Start of the discussion about solar flare polarization models and the key parameters in the observations.
- 19 August – I held a seminar to explain the experimental activity of polarimetry carried out with the Gas Pixel Detector at the INAF-IAPS and future prospects of Compton polarimetry, including a discussion of further mission proposals.
- 20 August – We started a deep discussion about the present status of the source simulation software and how to make its output compatible with the simulation tools of the photoelectric polarimeter Gas Pixel Detector.
It turns out that the present simulator of flare models must be updated to take properly into account the projection of the polarization vector onto the polarization plane (which is convenient to identify as the pane defined by the magnetic field and the wave vector of propagating radiation) and its projection along the viewing angle towards the detector placed at the Earth position. Moreover, the relativistic energy distribution of beamed electrons must be taken into account. These two issues were treated properly but separately in two papers by Zharkova et al 1995 and 2010. Prof. Valentina Zharkova will provide a new updated version of the simulation software in which both these issues are implemented.
- 21 August – In the mean while of the upgrade of the simulation software of flare models we started to define the data format we need to make suitable the simulator output for the detector simulator.
- 22 August – We started to run the first simulation to verify the compatibility of both simulation tools (models and detector).

Conclusion

This STSM was extremely important to find a match between the two different approaches, one from the point of view of the theoretical modeling and the other from the point of view of the instrumentation.

The STSM allowed us to do a step forward in our collaboration in the framework of the preparation of the proposal of the SEELPE mission (with an X-ray solar polarimeter on board) to the next ESA-CAS call.