



STSM Scientific Report

Applicant and home institution : Dr. Talvikki Hovatta, Aalto University, Metsähovi Radio Observatory, Finland

Visited scientist and host institution : Prof. V. Pavlidou & Dr. D. Blinov, University of Crete, Greece

Dates of STSM : November 2 – 10, 2014

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 project matched points 1 and 4 above by strengthening the collaboration between the applicant and the scientists working at University of Crete. The applicant and the host scientists have already had previous successful collaborations and this work on polarization monitoring of TeV blazars was a new collaborative effort between them. The applicant also got to use the RoboPol instrument mounted on the 1.3m telescope at Skinakas Observatory. There are no such facilities available in Finland.

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

In spring 2014, we were granted 7 nights of observing time (PI Hovatta) at Skinakas Observatory, to monitor TeV-detected blazars in optical polarization with the RoboPol instrument. The main goal of this project is to compare the optical polarization properties of the TeV-detected and non-detected blazars in a systematic way, as this has only recently become possible with the increased number of TeV-detected objects.

During the first day of the visit we gathered all the RoboPol data from the 2014 season observed so far, and established that there are observations of 36 TeV-detected objects. The RoboPol observations are complemented by monitoring of 12 of these objects done at the Nordic Optical Telescope (PI Lindfors). We combined the two data sets and identified that in some objects the RoboPol observations are affected by the large host galaxy falling into the aperture, and re-calibration of some of the data are needed. Dr. Blinov began working on this. We also identified a suitable set of control sources from the RoboPol sample, i.e. sources not detected at TeV energies, to be used as the comparison sample. We selected 14 objects that have similar spectral energy distribution classifications as the TeV-detected objects so that the only major difference between the samples is the TeV-detection.

On the second day of the visit, we discussed the analysis methods to be used in the study. For example, it is not straightforward to compare variations in the polarization angle between the objects, as the sampling is not uniform, and typical mean and standard deviation estimates do not quantify the angle variations very well. We settled on using the derivative of the angle change in the comparison. In the case of polarization degree variability, we decided to use the intrinsic modulation index, as defined in Richards et al. (2011, ApJS, 194, 29), because the likelihood approach accounts for the number of data points (i.e. sampling), and also incorporates the uncertainties in the estimates.

The latter part of the visit was spent at Skinakas observatory where Dr. Hovatta was observing with the RoboPol instrument. During the first two nights some observing was done but time was also lost due to clouds and dust that prevented observations. The last two nights were lost due to thick clouds and high humidity. During these days, Dr. Hovatta wrote the scripts to analyze the data. Once the observing season ends (later in November or in December), we will analyze the data and write the article discussing the findings. It will be submitted before the next RoboPol observing season begins in April 2015.