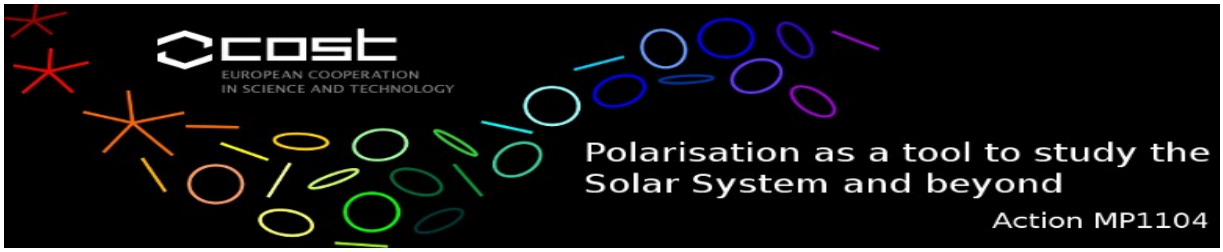

STSM Scientific Report

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STSM title: Combining Near Infrared and Optical Polarimetry in a sample of Fermi-Blazars.

Reference : ECOST-STSM-MP1104-220615-056420

Dates of STSM :22-06-2015 to 02-07-2015

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.

This STSM seeks to strengthen one of the collaborative projects between the home institute, leading the GASP-WEBT network, and the host institute. In particular, the visited scientist and few others have obtained NIR photopolarimetry of a sample of blazars in two epochs during 2011, which needs to be complemented with photometric information at different bands. A large and well developed network of collaborating observatories provides data to GASP-WEBT collaboration. At the host institute we have been collecting a significant amount of both optical and NIR photometric observations from different telescopes at Teide and La Palma Observatories, in particular during ToO triggered by flaring states of the sources. The purpose of this STSM was to put together multiwavelength data to provide sufficient information to interpret the NIR polarimetric observations.

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

During this STSM, we organized the NIR and optical polarimetric and photometric observations of a sample of 26 Blazars covering several months during year 2011. We have to access data in different format provided by follow-up programs at various observatories. Below we list the data sources at different wavelength ranges.

The NIR photo-polarimetric data were obtained using the instrument LIRIS at the WHT (La Palma observatory), which has been complemented with NIR photometry obtained at the Carlos Sanchez Telescope (Teide Observatory).

The optical photo-polarimetric data were collected from Steward Observatory (Arizona), Calar Alto Observatory and Lowell Observatory, with the addition of photometric data from the telescope IAC80 (Teide Observatory).

To do a more detailed analysis, we expand our data-sample with the VLBA radio data from the Boston group (43 GHz) and the MOJAVE Project (15 GHz), as well as the milimetre data of SMA observer center(230 GHz and 345GHz).

We assembled the light curves of the Blazars in the sample. Two examples for the blazars OJ287 and 3C 454.5 are shown in the next page. On the left plot you can see the photometric light curve at different frequencies and on the right one the time evolution of the polarization percentage P for different frequencies as well as the EVPA(the $\pm n\pi$ ambiguity was fixed by assuming that the most likely value is that minimizing the angle variation, i.e. we added/subtracted 180° when needed to minimize the difference between subsequent points separated by less than 5 days).

Now we are investigating the relation between NIR-optical flares and polarization variability. We have already noticed that in some sources there are episodes of both Flux-Polarization correlation and anti-correlation, which suggests that the observed polarization may come from different components. Indeed, multiple synchrotron contributions, likely originating from different locations in the jet, have been proposed to explain the multifrequency behaviour of blazars by several authors.

Another aspect we are investigating is whether the polarization degree and angle depend on wavelength, which is an important diagnostic for the identification of multiple polarized non-thermal emission regions and their relationship with the moving components observed in high spatial resolution, such as those obtained by VLBA/VLBI.

In the next months, we finalize a draft paper which will be sent for publication when it is ready.

Figure: In the left side, from top to bottom: light curve in V band, R band, J band, Kshort band, 15 - 43 GHz and 230 – 345 GHz. In the right side, from top to bottom: Percentage of polarized flux in optical and NIR, percentage of polarized flux in 15-43 GHz, EVPA "corrected" for the $\pm n\pi$ ambiguity in optical and NIR, and EVPA "corrected" for the $\pm n\pi$ ambiguity in 15-43 GHz for object OJ 287.

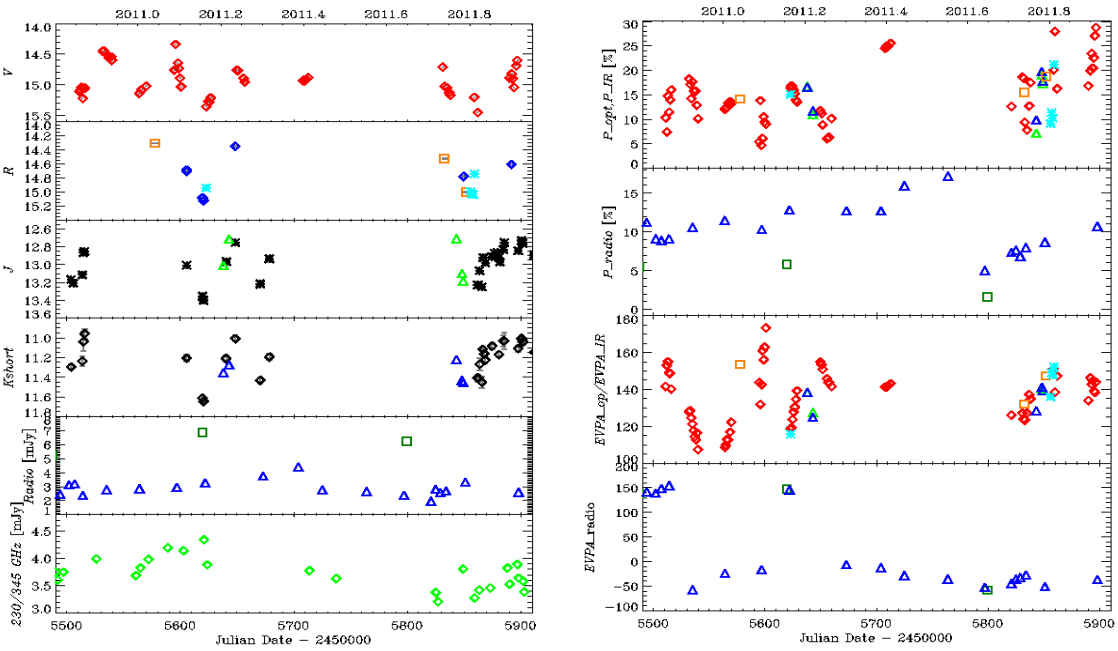

Figure: Same as in top figure for object 3C 454.3.