

Mission Report:

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The proposed action was planned to visit Dr. Clemens Thum (the polarization expert of the IRAM 30m Millimeter Radiotelescope) with whom I have long collaborated. In 2007, we started a long-term 3mm and 1.3mm polarization monitoring of 36 of the brightest radio-millimeter and gamma-ray blazars in the northern sky (PI I. Agudo & C. Thum). The project has now accumulated 7 years of data. A database containing the entire data set has been programed and was almost ready to provide science-ready products. No other group worldwide has previously performed such a comprehensive study of the millimeter polarimetric properties of blazars, the most active and wildly variable class of radio loud active galactic nuclei.

The planned stay was successfully performed as planned from the 22nd of September to the 1st of October, 2014. The main objectives and achievements of the stay were:

a) To calibrate all data since the last reduced epoch (December 2013):

This task was actually achieved by I. Agudo some days before the stay started, which helped to speed up the remaining tasks that needed more intense interaction between Dr. Thum and myself.

Also before the date of start of the visit, Dr. Thum ensured that the new data was fully compatible with the previous data in the data-base and solved the few minor issues that allowed all the data new to be fed into the data-base, and hence to work with the entire data set on a homogeneous way.

b) To fine-tune all details concerning the calibration, flagging, and presentation of the data reduced so far:

The calibration of the instrumental polarization of the entire data-base was checked, and turned out the confirmation of the goodness of the 3mm instrumental polarization calibration.

An issue on the 1.3mm phase calibration of the U and V stokes parameters existing for data before November 2011 was discussed. A solution will be found and implemented by Dr. Thum and collaborators during the coming month.

A significant amount of time during this stay was spent to clean the entire data-base from bad data and outliers, as well as to refine an automatic data-flagging scheme that is now implemented on the data-base.

The representation tools for the scientific output from the data were also tested and refined, specially on which regards to the design of an automatic tool to deal with the 180° indetermination for the representation of the linear polarization angle. The final solution for linear polarization angle determination (based on the work by Kiehlmann et al. 2013) will be implemented by Dr. Thum during the coming 1-2 weeks.

c) To plan the first set of our publications from the data-base:

An agreement was made to prepare, on a short time scale of no more than four months, a series of three scientific publications to be submitted in parallel for a first-line European Astronomy and Astrophysics journal.

These three papers include **i)** a publication containing all details about the observing program and its observing strategy, data reduction, and calibration, as well as the complete set of plots of data (Agudo, Thum, et al, in prep.), **ii)** a second publication dealing with a deep study justifying and characterizing the first reliable detection of circular polarization at millimetre wavelengths in a blazar sample (Thum, Agudo, et al., in prep.), and **iii)** a third publication making a complete characterization of the variability properties of the four-Stokes parameters in our sample of sources for the time range of our observing program from 2007 to 2014 (Agudo, Thum et al., in prep.).

All relevant data to start working on these publications were compiled and shared during the stay. An IDL script to read the output data tables from the data-base and prepare plots and LaTeX tables has been written by I. Agudo. This, together with the representation tools discussed in section c) allow to start working on the editing of publication *i)* immediately. A script to represent circular polarization and to make statistical studies, developed by Dr. Thum, also allows starting to work on publication *ii)* since this stay was performed. The above-mentioned IDL script is the base of the statistical tool for the cross correlation and discrete correlation function planned for paper *iii)*.

A second series of scientific publications was also discussed. These include: **1)** A statistical characterization of the millimetre total flux as compared with gamma, X-ray, & optical light curves for every source, **2)** A statistical characterization of the millimeter linear polarization as compared with optical polarization for sources in our sample, **3)** a characterization of 3mm and 1.3mm total flux and polarization evolution as compared with 7mm VLBA imaging sequences from BU-Blazar group (with whom I have long collaborated).

In summary, the mission was fully successful on which regards to fulfilling the planned objectives, and also on ensuring an excellent and unique scientific output of our data-base both on an immediate time scale and in the near future.

A handwritten signature in blue ink, appearing to read 'Iván Agudo', with a large, stylized flourish extending from the end of the name.

Dr. Iván Agudo

JIVE Support Scientist