

# Italy INAF Analysis Center

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**Abstract** This report summarizes the activity of the Italian INAF VLBI Analysis Center. Our Analysis Center is located in Bologna, Italy and belongs to the Institute of Radio Astronomy (IRA), which is part of the National Institute of Astrophysics (INAF). IRA runs the observatories of Medicina and Noto, where two 32-m twin VLBI AZ-EL telescopes are located. This report contains the AC's VLBI data analysis activities and illustrates the local surveys carried out in 2013 at IRA observatories.

## 1 Current Status and Activity

The ITRF2013 Call for Participation (CfP) was issued at the end of March 2013. According to the call, *“the owners of co-location sites are solicited and highly encouraged to consider conducting new local tie surveys using the most up to date survey methods. The results of least squares adjustments of the survey observations should be provided to the ITRS Center in the form of SINEX format, with full variance-covariance information.”* The submission of the new tie vectors linking the co-located space geodetic instruments was due as early as possible and no later than the end of February 2014.

The CfP and its deadline induced us to plan new local tie surveys at both Medicina and Noto by the summer of 2013. In particular, the tie vector at the Medicina site was surveyed during June 2013 (from June 11<sup>th</sup> until June 14<sup>th</sup>) and the tie vector at Noto

was surveyed during three full days from July 10<sup>th</sup> until July 12<sup>th</sup>, 2013. The method that was adopted to conduct the surveys is based on the well-established protocol described in several papers [1, 2]. As usual, the surveys were carried out in close cooperation with the Department of Civil, Chemical, Environmental, and Material Engineering (DICAM) of the University of Bologna. Three high quality total stations from Leica (TDA5005, TS30, and TCA2003, <http://www.leica-geosystems.com>) were contemporarily used to minimize the observation time and increase the total number of measurements available to estimate the conventional reference point of the VLBI telescopes. Following the ITRF2013 CfP requirements, the GPS antennas were not removed to avoid undesirable possible discontinuity in the position time series when the antenna is restored back to its original marker. This was easily achieved following the GPS choke ring antenna survey approach described in detail in [1].

The surveys and the computation of the tie vectors at both sites were performed as part of a ten-week internship project agreed upon between the IRA and the IGN School in Geomatic Sciences, Ecole Nationale des Sciences Géographiques (ENSG) in Marne la Vallée, France. The internship involved Mr. Clément Iphar, a student of the school interested in geodesy and in the applications of terrestrial geodetic techniques for the computation of the ITRF.

The alignment of the tie vectors into the ITRF from the local topocentric frame was achieved using a set of points surveyed with both terrestrial techniques and GPS. The tie vectors were submitted in September 2013 to the ITRS Center in Paris and are now available for the computation of the new ITRF2013.

It is worth mentioning that the 2013 survey in Medicina confirms the general trends reported in

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[3], with a striking stability of the tie vector Up component. The details and the results of the surveys will be summarized and discussed in two reports that will be submitted to the ITRS Center.

## 2 Data Analysis and Results

The IRA started to analyze VLBI geodetic databases in 1989, using a CALC/SOLVE package on the HP1000 at the Medicina station. In subsequent years, the same software was installed first on an HP360 workstation and later on an HP715/50 workstation. In more recent years, two HP785/B2600 workstations and an HP282 workstation were used. In 2007, a new Linux workstation was set up for the migration of all the VLBI data analysis, and Mark 5 Calc/Solve was installed. During 2013, our Analysis Center continued its participation in the IVS TROP Project on Tropospheric Parameters. Tropospheric parameters (wet and total zenith delay and horizontal gradients) of all IVS-R1 and IVS-R4 24-hour VLBI sessions were regularly submitted.

## 3 Outlook

We will continue with the regular submission of INAF tropospheric parameters to the IVS Data Center. We are also going to monitor the GPS-VLBI tie vectors at our sites on a regular basis, possibly every second year, to continue the investigations into the local movements and into the local site stability.

## References

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