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CO-LOCATION SATELLITE GPS AND SLR GEODETIC TECHNIQUES AT THE FELIX AGUILAR ASTRONOMICAL OBSERVATORY OF SAN JUAN, ARGENTINA

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This work shows the strategy followed for the co-location of the Satellite Laser Ranging (SLR) ILRS 7406 telescope and the antenna of the permanent Global Positioning System (GPS) station, located at the Félix Aguilar Astronomical Observatory (OAFA) in San Juan, Argentina. The accomplishment of the co-location consisted in the design, construction, measurement, adjustment and compensation of a geodesic net between the stations SLR and GPS, securing support points solidly built in the soil. The co-location allows the coordinates of the station to be obtained by combining the data of both SLR and GPS techniques, achieving a greater degree of accuracy than individually. The International Earth Rotation and Reference Systems Service (IERS) considers the co-located stations as the most valuable and important points for the maintenance of terrestrial reference systems and their connection with the celestial ones. The 3 mm precision required by the IERS has been successfully achieved.

A co-localization site is defined by two or more space geodetic techniques occupying nearby places, linked to each other with very precise measurements in 3D, as shown in Figure 1. The IERS considers the co-located stations as the most important points that define the International Terrestrial Reference Frame (ITRF) (Altamini 2005, Thaller et al. 2011). The accuracy recommended by the IERS in determining the local ties of the network is at least 3 millimeters. Because the instrumental centers are located inside each apparatus, access is impossible by direct measurement methods. To achieve the local ties accurately, a geodesic network with support points must be assembled, whose coordinates must be determined very well. To get this, a support network of 12 points had to be built in our case, with a mathematical solution using our own net compensation software. The calculated X, Y, Z instrumental coordinates in meters are as follows: GPS Antenna: 1984095.7826, -5068868.327, -3314485.5004 SLR Telescope: 1984106.7928, -5068867.4829, -3314479.9346. Finally, the co-location vector between the GPS antenna and the SLR telescope, calculated by coordinate differences, gives a result of 12.3659 meters, with errors less than three millimeters, as the IERS suggests. This indicates that the work has been satisfactory.

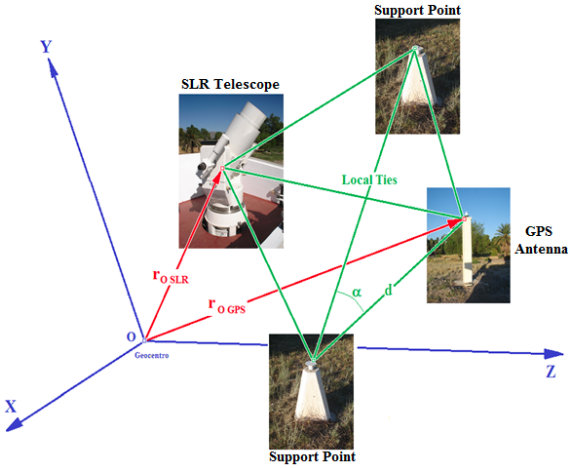

Fig. 1. Absolute geodetic coordinate system X, Y, Z. The instrumental geometric centers are inaccessible directly. In order to determine the distance between the GPS antenna and the SLR telescope, a high-precision geodetic network must be constructed using support points distributed around the instruments.

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