

Validation of the ESA's IZN-1 station and overview of current station capabilities

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The ESA laser ranging station IZN-1 was deployed in Tenerife in 2021. The goals of these assets are to support future Space Traffic Management (STM) applications, to carry out precise orbit monitoring of satellites and space debris and to operate direct-to-ground satellite laser communications. The station performs routinely Satellite Laser Ranging (SLR) at 532 and 1064 nanometres and passive observations of space objects. After an initial ranging campaign and following the site acceptance testing, IZN-1 joined the ILRS as engineering station, completing the qualification process in April 2022. In parallel, two additional independent validations of the station performance were conducted by the ESA Optical and Laser Expert Centre and the ESA/ESOC Navigation Support Office, the latter being one of the ILRS Analysis Centres. Since almost one year of regular remote operations, several targets including geodetic and navigation satellites were tracked. Moreover, active and passive observations of space debris with retroreflectors could be demonstrated.

Besides laser ranging, IZN-1 serves as an advanced technology test-bed supporting also optical communications. The station was recently upgraded with additional components for the 35 implementation of the IZN-1 optical communication mode and a first optical downlink from a LEO satellite was successfully acquired.

This paper provides a brief overview of the station architecture including the upgrades for optical communications. The results from the different validation entities will be presented as well as SLR and passive observations and optical communication sessions, highlighting the current IZN-1 capabilities.