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Author: Prof. Filippo Graziani
G.A.U.S.S. Srl, Italy

Mr. Riccardo Di Roberto
G.A.U.S.S. Srl, Italy

Mr. Marco Truglio
G.A.U.S.S. Srl, Italy

Dr. Vladimir Kouprianov
University of North Carolina at Chapel Hill, United States

Dr. Igor Molotov
Keldysh Institute of Applied Mathematics, RAS, Russian Federation

Mr. Viktor Voropaev
Keldysh Institute of Applied Mathematics, RAS, Russian Federation

Mr. Sergei Schmalz
Keldysh Institute of Applied Mathematics of RAS, Russian Federation

CASTELGAUSS PROJECT: OBSERVATIONS OF NEOS AND GSO OBJECTS AT THE
ISON-CASTELGRANDE OBSERVATORY

Abstract

In October 2017 observations of satellites and space debris in geostationary orbits have been successfully started at the ISON-Castelgrande Observatory, in the framework of CastelGAUSS Project – a collaboration of Italian GAUSS Srl and Russian KIAM RAS – located in and assisted by the Castelgrande Municipality (Potenza, Italy) at 1250 meters altitude, sharing the same mountain area with the Italian astronomical observatory run by INAF-Capodimonte.

The aim of the new Observatory is to study the characteristics of space debris and NEOs (including asteroids), the optical observation of rotation period, size and shape of the detected body, photometric measurements, surface composition and positional measurements of active GEO satellites.

Currently in use is a custom-built 22 cm aperture telescope with 510-mm focal length on a Skywatcher EQ-6 Pro mount, with a 3056 px FLI MicroLine 9000 CCD (4 deg FOV), inside a 3 m Scopedomo cupola; the entire setup is operated by the FORTE software package; the whole system has been set up for remote and automatized operation.

Astrometric observations are of two modes: tracking – for selected objects, and survey – for selected sky areas. On clear winter nights, up to 300 different space objects were successfully observed. In tracking mode the lowest apparent magnitude of a space object reached so far was 17.1 mag, and in survey mode – 15.5 mag. Thanks to clear horizon, observations are possible at 5 deg altitudes. Also, photometric observations have been successfully performed for the purpose of rotation period determination.

Obtained images can be processed both manually and automatically either during or after the observation by the APEX software package, which is coded mostly in Python, thus having the advantage of using third party modules for astronomy tasks, and it is a fully developed pipe-line providing complete image calibration, astrometric photometric reduction, automatic object detection and identification, and many other features. Positional measurement accuracy is 1-2 arcseconds. Observation scheduling and orbit determination are done at KIAM conjunction analysis centre, and calculated orbits are stored in a database maintained there.

GAUSS and KIAM can offer satellite operators a contract service to provide positional measurements and orbital solutions of high accuracy. ISON-Castelgrande Observatory is a part of a larger world-wide ISON network of observatories coordinated by KIAM, which ensures observations even during bad weather at Castelgrande.

Installation of a 35 cm telescope for tracking of faint space debris is planned in the nearest future.