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Bi-static Optical Observations of GEO Objects¹

Patrick Seitzer
Department of Astronomy
University of Michigan
pseitzer@umich.edu

Edwin S. Barker
LZ Technology, Inc.

Heather Cowardin
JETS

Susan M. Lederer
NASA/JSC

Brent Buckalew
JETS

A bi-static study of objects at Geosynchronous Earth Orbit (GEO) was conducted using two ground-based wide-field optical telescopes. The University of Michigan's 0.6-m MODEST (Michigan Orbital Debris Survey Telescope) located at the Cerro Tololo Inter-American Observatory in Chile was employed in a series of coordinated observations with the U.S. Naval Observatory's (USNO) 1.3-m telescope at the USNO Flagstaff Station near Flagstaff, Arizona, USA.

The goals of this project are twofold:

1. Obtain optical distances to known and unknown objects at GEO from the difference in the observed topocentric position of objects measured with respect to a reference star frame. The distance can be derived directly from these measurements, and is independent of any orbital solution. The wide geographical separation of these two telescopes means that the parallax difference is larger than ten degrees.
2. Compare optical photometry in similar filters of GEO objects taken during the same time period from the two sites. The object's illuminated surfaces presented different angles of reflected sunlight to the two telescopes.

During a four hour period on the night of 22 February 2014 (UT), coordinated observations were obtained for eight different GEO positions. Each coordinated observation sequence was started on the hour or half-hour, and was selected to ensure the same cataloged GEO object was available in the field of view of both telescopes during

the thirty minute observing sequence. GEO objects were chosen to be both controlled and uncontrolled at a range of orbital inclinations, and the objects were not tracked. Instead both telescopes were operated with all drives off in GEO survey mode to discover un-cataloged objects at GEO.

The initial results from this proof-of-concept observing run will be presented, with the intent of laying the foundation for future large-scale bi-static observing campaigns of the GEO regime.

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