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The Population of Optically Faint GEO Debris

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The 6.5-m Magellan telescope 'Walter Baade' at the Las Campanas Observatory in Chile has been used for spot surveys of the GEO orbital regime to study the population of optically faint GEO debris. The goal is to estimate the size of the population of GEO debris at sizes much smaller than can be studied with 1-meter class telescopes. Despite the small size of the field of view of the Magellan instrument (diameter 0.5-degree), a significant population of objects fainter than $R = 19$ th magnitude have been found with angular rates consistent with circular orbits at GEO. We compare the size of this population with the numbers of GEO objects found at brighter magnitudes by smaller telescopes.

The observed detections have a wide range in characteristics starting with those appearing as short uniform streaks. But there are a substantial number of detections with

variations in brightness, flashers, during the 5-second exposure. The duration of each of these flashes can be extremely brief: sometimes less than half a second. This is characteristic of a rapidly tumbling object with a quite variable projected size times albedo. If the albedo is of the order of 0.2, then the largest projected size of these objects is around 10-cm.

The data in this paper was collected over the last several years using Magellan's IMACS camera in f/2 mode. The analysis shows the brightness bins for the observed GEO population as well as the periodicity of the flashers. All objects presented are correlated with the catalog: the focus of the paper will be on the uncorrelated, optically faint, objects. The goal of this project is to better characterize the faint debris population in GEO that access to a 6.5-m optical telescope in a superb site can provide.