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NEO ORBITS AND SIZES FROM IOTA OCCULTATION OBSERVATIONS

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ABSTRACT

Two years ago, we gave a paper [1] at PDC2021 about the first results from occultations of stars by Near-Earth Asteroids (NEAs). That showed the great improvement in the accuracy of the orbits that could be achieved with NEA occultations, which complement radar observations to comparable precision in the sky-plane. Details were given about the refinement of the orbits of (3200) Phaethon and (99942 Apophis), which in combination with the radar observations, retired the risk of Apophis collision for at least a century. This paper will describe continued successes with occultations by Phaethon and attempts to observe occultations by Apophis. We will show that Apophis is now too far away from Earth to produce observable occultations due to Fresnel diffraction “smearing”. The main recent efforts have been for occultations by (65803) Didymos. The first success wasn’t until 2022 October 15, after the DART-Dimorphos impact and after radar observations were obtained at the same time, but there have been several well-observed

occultations since then. Several attempts have been made to observe occultations by Dimorphos, but the small object has been elusive; nevertheless, two occultations by it have been recorded, which can help accurately measure the relative orbit. It's unfortunate that none of the pre-impact occultations by either Didymos or Dimorphos were observed, due to unfavorable weather and other factors. By the time of the PDC conference, the Didymos occultations will be too short to observe with IOTA's commonly used video systems, and like Apophis, Fresnel diffraction smearing will add to future difficulties. We will report a success with another NEA, (1866) Sisyphus, in November 2022.

[1] Dunham, D., Buie, M., et al. (22 others), Accurate NEO Orbits from Occultation Observations, Paper IAA-PDC-21-6-09, 7th IAA Planetary Defense Conference, online, April 2021.