**PDC2021**

**Vienna, Austria**

**Key International and Political Developments**

**Advancements and Progress in NEO Discovery**

**NEO Characterization Results**

**Deflection and Disruption Models & Testing**

**Mission & Campaign Designs**

**Impact Consequences**

**Disaster Response**

**Decision to Act**

**Public Education & Communication**

**Stellar occultations by NEOs: challenges and opportunities**

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##### ABSTRACT

The crucial tasks of impact mitigation is strongly influenced by our knowledge of the physical properties of NEAs. When considering specific objects, these are sometimes scarce and/or difficult to measure. Following the epochal change in astrometric accuracy brought by the Gaia mission (ESA), the technique of stellar occultations is rapidly evolving, with a renovated role in the characterization of Solar System objects, including NEAs.

In the case of Main Belt asteroids, occultations have been traditionally used to obtain accurate information on their projected shape and size. Additionally, occultations are capable to detect topographic features, or to eliminate the ambiguities on the direction of the spin axis.

Given the unprecedented astrometric quality brought by Gaia (in particular by its Data Release 2), recent occultation events by Trans-Neptunian Objects and Main Belt asteroids have reached an instantaneous position accuracy at milli-arcsec level, i.e. smaller than the object’s apparent size.

Gaia has also multiplied the number of observable occultations and expanded the domain of applicability of this technique to much smaller asteroid targets. In this respect, the set of occultations predicted and observed in 2019 by the NEA Phaethon, target of Jaxa/DESTINY+ mission, stands out. The success of these events is highly significant and represents a major breakthrough, given the high apparent motion and small size (~5.5 km) of the occulting object.

We will show that the accuracy of the astrometry derived from these events is at sub-mas level. Such measurements and their strong sensitivity, if applied to other NEAs, can be essential for measuring the Yarkovsky acceleration or other subtle dynamical effects. Measuring Yarkovsky makes also possible to derive the object density, a fundamental parameter for any physical characterization.

By carefully working on the available astrometry for the asteroid Didymos, target of the NASA/DART and ESA/Hera missions, we can demonstrate that even such a small ~1 km NEA can be an exploitable occultation target.

In this perspective we intend to promote Didymos occultation campaigns before and after the DART projectile impact, supported by specific expeditions deploying a network of portable telescopes. We intend, to get high-enough accuracy to detect the heliocentric orbit deflection induced by DART, at the same time breaking a new barrier for the smallest NEA occulter. This requires the observation of occultations by Didymos over a time span of a few years.

In parallel we plan to extend the application of this technique to other NEAs. We expect that future NEA occultations will expand our capabilities to access physical properties and contribute excellent astrometry to impact monitoring applications.

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***Comments:***

*Alternative sessions possible.*

*Poster preferred.*