

**PDC2023**  
**Vienna, Austria**

**DART'S PLANETARY DEFENSE INVESTIGATION AND ACHIEVING THE  
MISSION'S LEVEL 1 REQUIREMENTS: CURRENT STATUS AND ONGOING  
ACTIVITIES**

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**Keywords:** *DART, kinetic impactor, Didymos, Dimorphos, NEO*

**ABSTRACT**

DART, the Double Asteroid Redirection Test, successfully impacted asteroid Dimorphos on September 26, 2022, becoming the first mission to demonstrate asteroid deflection. Shared live via a NASA broadcast, over a million concurrent viewers around the world watched as the DART spacecraft streamed images to Earth up to the final second before its impact with Dimorphos. Autonomously targeting a small asteroid with limited prior knowledge at high speed was a key accomplishment for the DART mission and one of the mission's Level 1 requirements. Since that time, the DART Investigation Team has been working to achieve the remaining Level 1 requirements that drive the mission:

- **DART-2.** Cause at least a 73 s change in the binary orbital period.
- **DART-3.** Obtain ground-based observations of the Didymos system before and after spacecraft impact to measure the change in the binary orbital period to within 7.3 s ( $1\sigma$  confidence).
- **DART-4A.** Obtain a measure of the momentum transfer enhancement parameter referred to as "Beta" ( $\beta$ ) using the best available estimate of the mass of Dimorphos.
- **DART-4B.** Constrain the location and surface characteristics of the spacecraft impact site and estimate the dynamical changes in the Didymos system resulting from the DART impact.

During a NASA press conference on October 11, 2022, the DART team announced their initial result that the binary orbit period of Dimorphos had been changed by 32 minutes with an uncertainty of  $\pm 2$  minutes, accomplishing the Level 1 requirement of DART-2. Currently, the DART Investigation Team is undertaking a range of activities to accomplish the other Level 1 requirements, including: acquiring telescopic observations from Earth and space-based facilities; analyzing spacecraft images captured by DART and by the Light Italian CubeSat for Imaging of Asteroids (LICIACube), contributed by the Italian Space Agency; modeling the ejecta formation and evolution; simulating DART's kinetic impact event; and modeling the dynamics of the Didymos system. The DART Investigation Team includes scientists from over

100 different institutions that represent 28 different countries, supporting international cooperation for the international issue of planetary defense. The DART Investigation Team will continue their work through the end of NASA's DART project in September 2023. This presentation will provide the latest status and ongoing activities of the Investigation Team to achieve the mission's Level 1 requirements.