



# DART's Planetary Defense Investigation and Achieving the Mission's Level 1 Requirements: Current Status and Ongoing Activities

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**DART**  
Double Asteroid Redirection Test

1



## Impact Dimorphos

During its Sept/Oct 2022 close approach to Earth

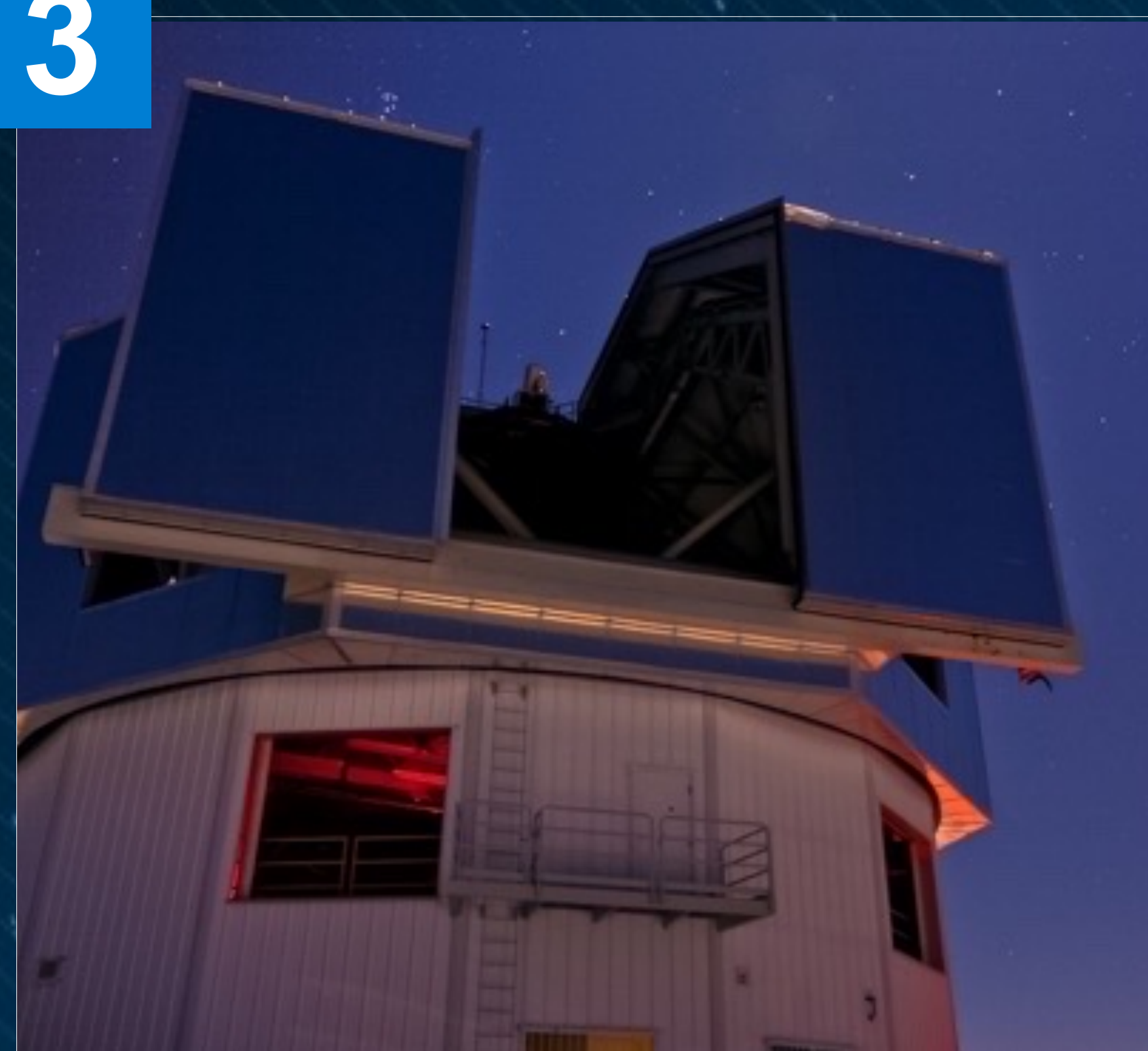
2



## Change the binary orbital period

Cause a  $\geq 73$ -second change in the orbital period of Dimorphos

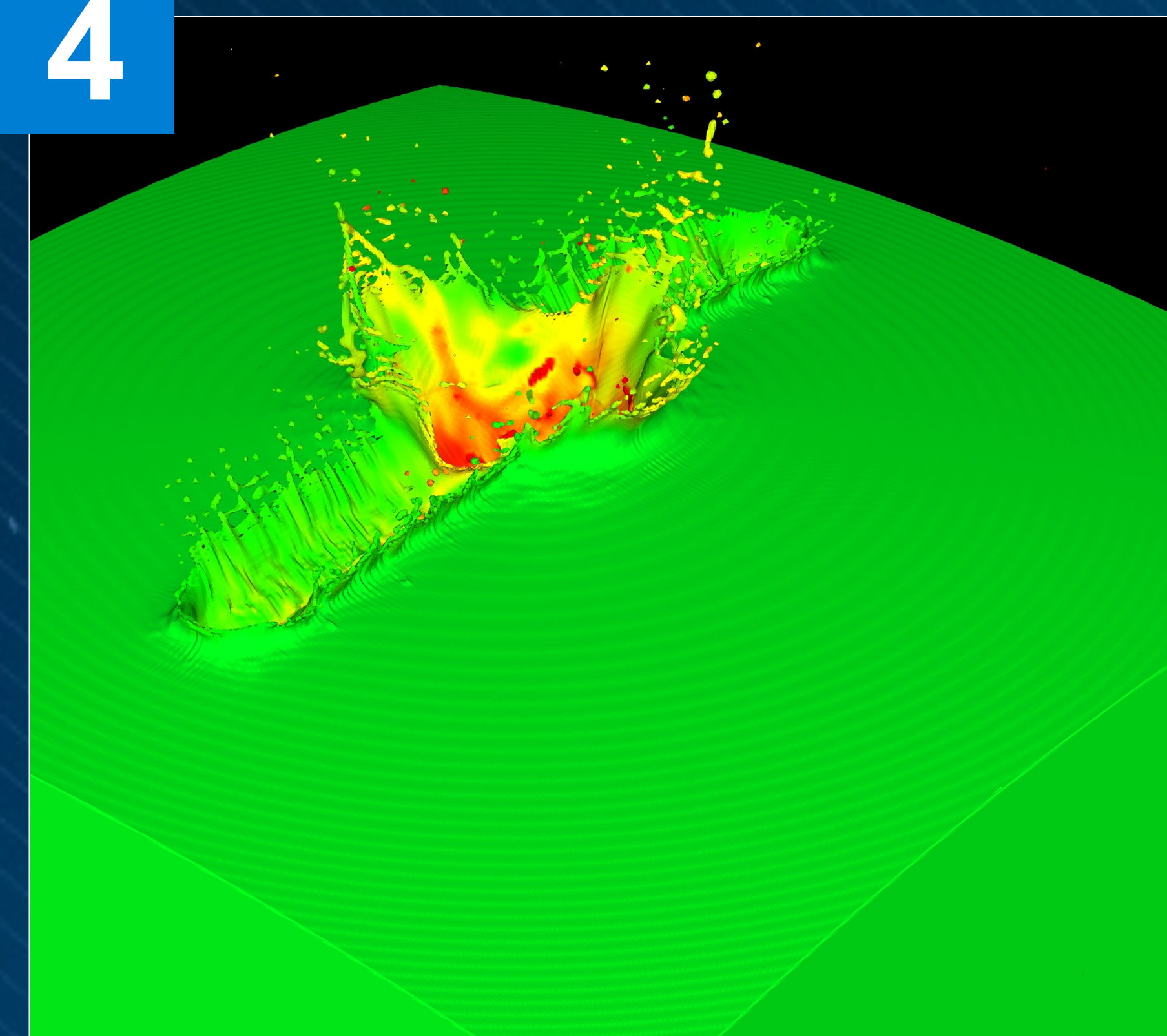
3



## Measure the period change

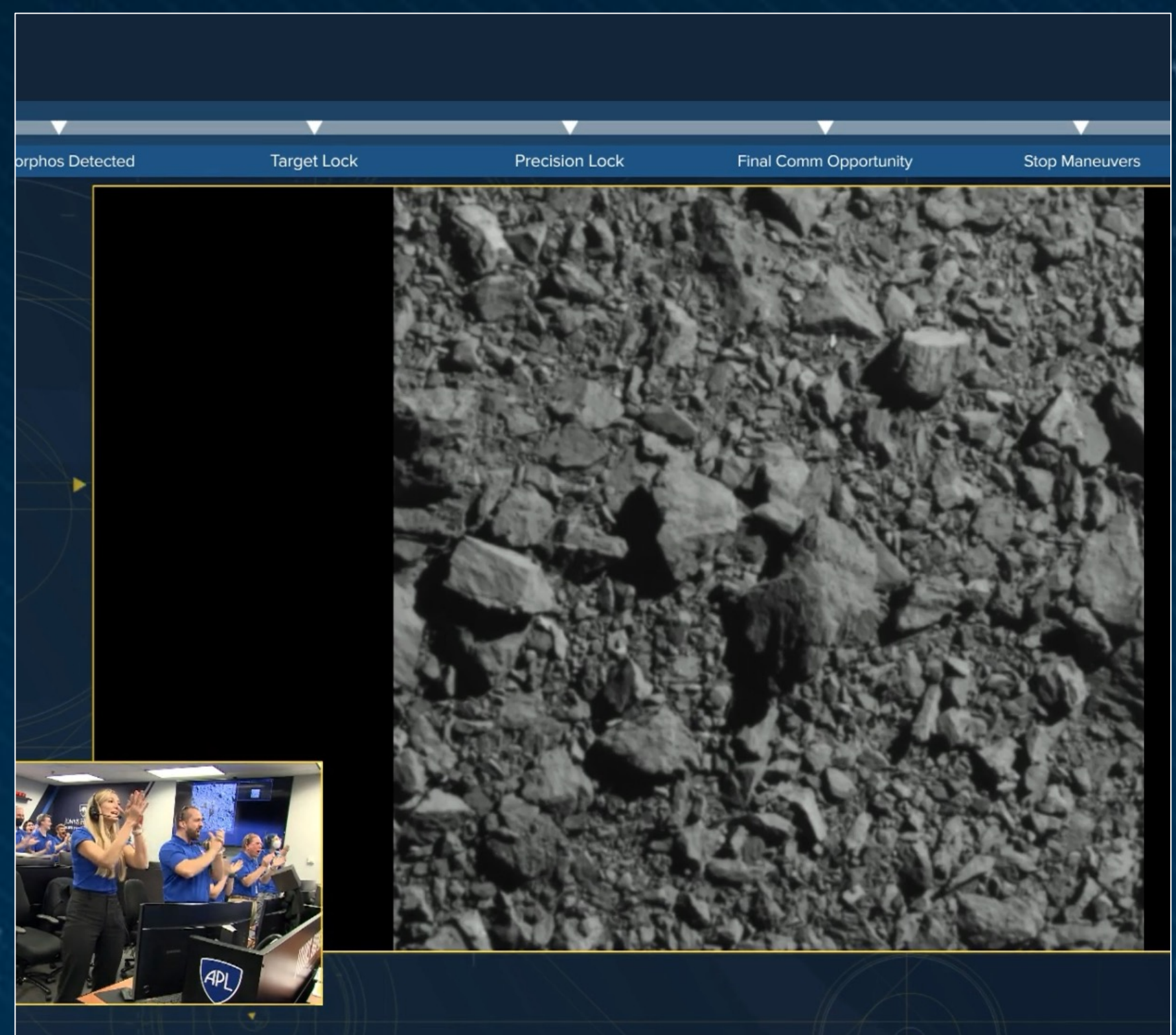
To within 7.3 seconds, from ground-based observations before and after impact

4



## Measure "Beta" and characterize the impact site and dynamical changes

*Beta* = the momentum enhancement factor

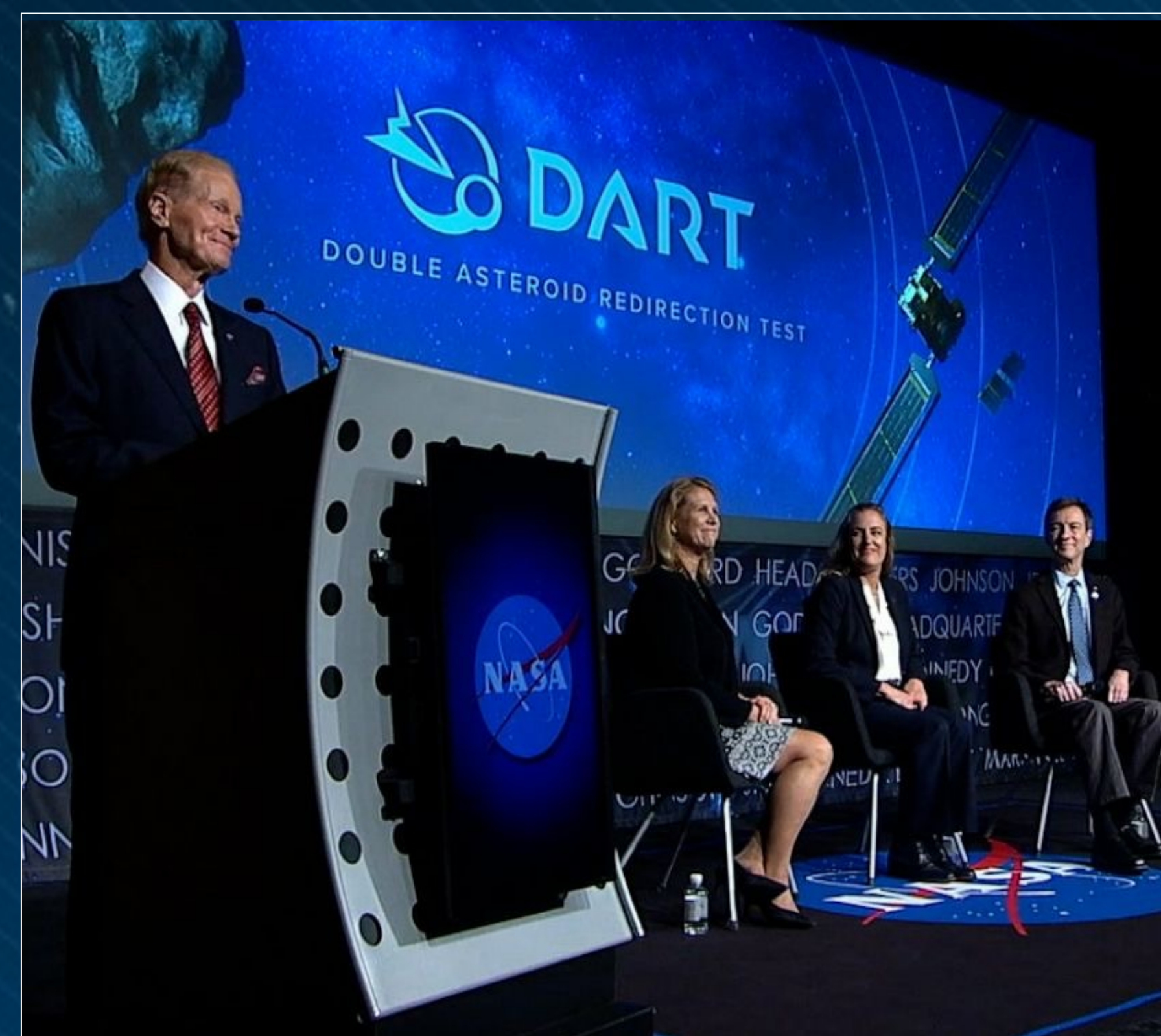


## September 26, 2022

DART impacted Dimorphos, with more than a million concurrent viewers watching the live NASA broadcast.

## Publication

Daly, R.T., Ernst, C.M., Barnouin, O.S. et al. Successful Kinetic Impact into an Asteroid for Planetary Defense. *Nature* (2023). <https://doi.org/10.1038/s41586-023-05810-5>

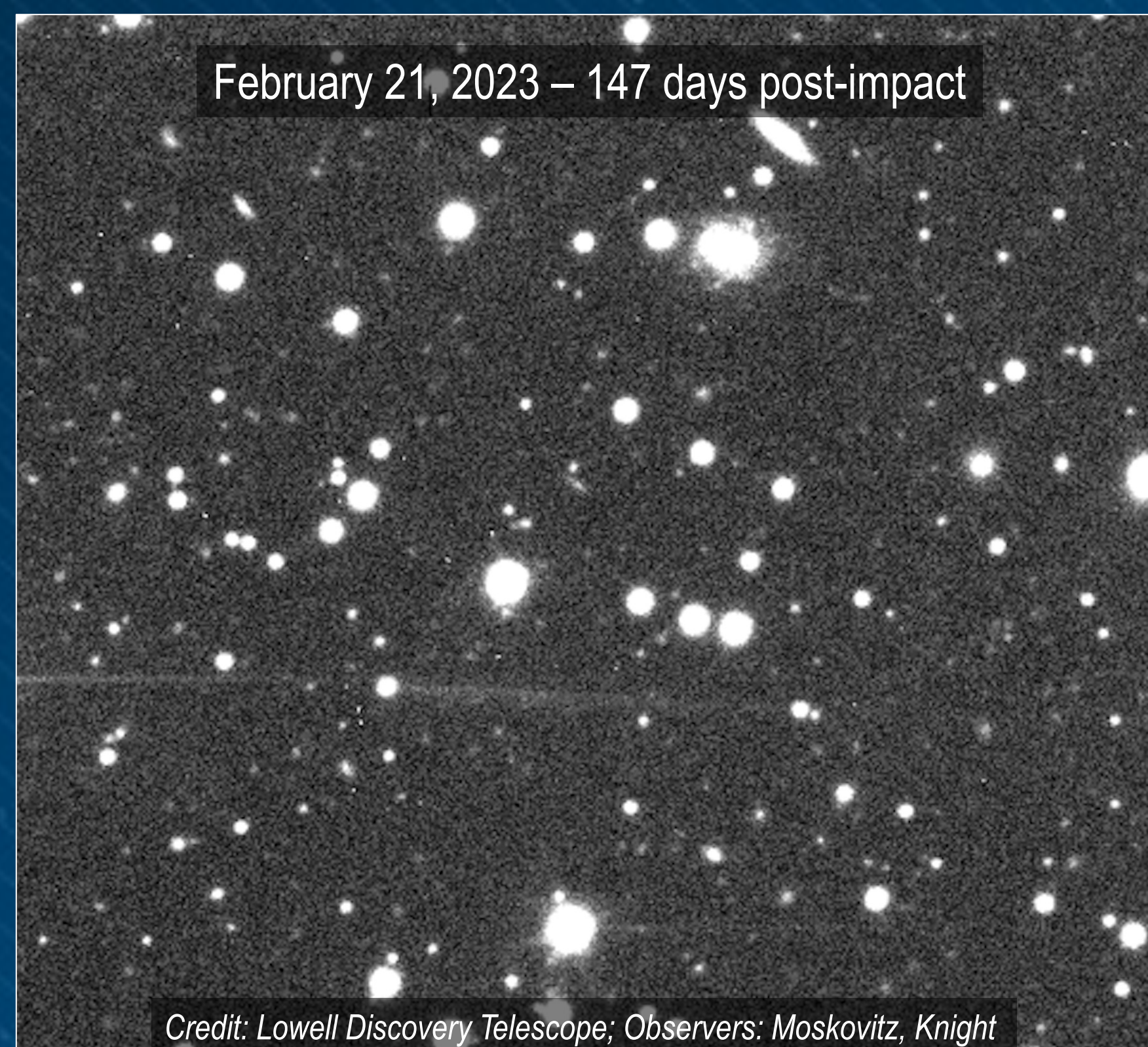


## October 11, 2022

NASA announced that DART shortened the orbital period of Dimorphos, with the initial data indicating a change of  $-33 \pm 1$  minutes.

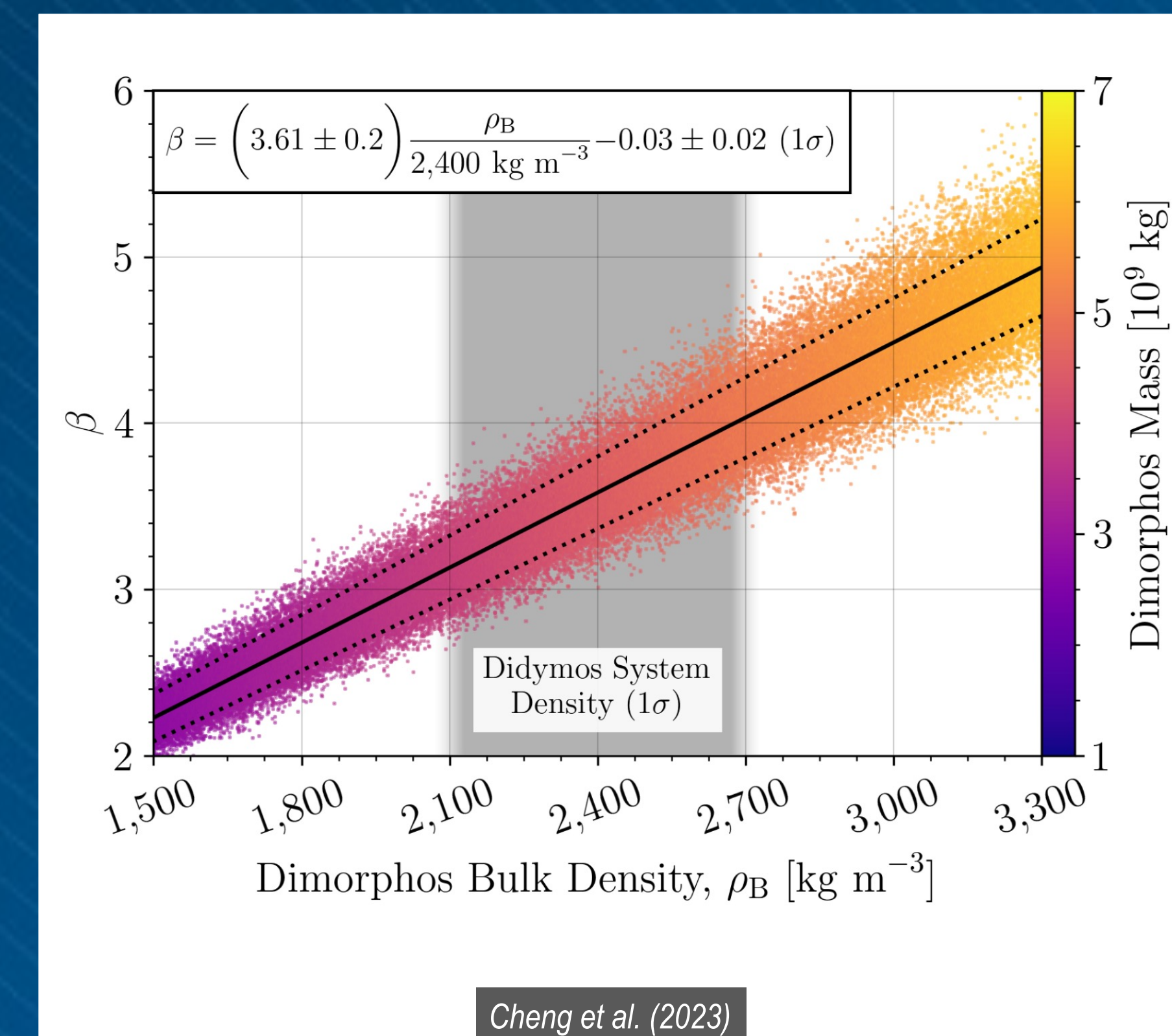
## Publication

Thomas, C.A., Naidu, S.P., Scheirich, P. et al. Orbital Period Change of Dimorphos Due to the DART Kinetic Impact. *Nature* (2023). <https://doi.org/10.1038/s41586-023-05805-2>



Telescopic observations continue through March 2023, with final analysis of all pre- and post-impact data completed by the end of April 2023.

Initial analyses of observations through 2022 by the DART Investigation Team indicate a period change of  $-33.14 \pm 0.02$ , surpassing the precision needed to meet this requirement. The final results using the full 2002-2023 observational dataset will be submitted for publication by July 2023.



## March 1, 2023

First DART post-impact results published, including a determination of Beta of  $\sim 3.6$  if Dimorphos and Didymos have the same densities and a study of the ejecta and its evolution using Hubble Space Telescope.

The DART Investigation Team will continue its work through September 2023 to fully investigate the asteroid properties, the ejecta, the impact event, and the dynamical effects from DART's first test of asteroid deflection.

## Publications

Cheng, A.F., Agrusa, H.F., Barbee, B.W. et al. Momentum Transfer from the DART Mission Kinetic Impact on Asteroid Dimorphos. *Nature* (2023). <https://doi.org/10.1038/s41586-023-05878-z>

Li, J.Y., Hirabayashi, M., Farnham, T.L. et al. Ejecta from the DART-produced active asteroid Dimorphos. *Nature* (2023). <https://doi.org/10.1038/s41586-023-05811-4>

