

IAF SYMPOSIUM ON PLANETARY DEFENSE AND NEAR-EARTH OBJECTS (E10)  
Planetary Defense from Asteroids and Comets (1)

Author: Dr. Marilena Amoroso  
Italian Space Agency (ASI), Italy, marilena.amoroso@asi.it

Dr. Simone Pirrotta  
Italian Space Agency (ASI), Italy, simone.pirrotta@est.asi.it

Mr. Vincenzo Della Corte  
INAF-IAPS, Italy, vincenzo.dellacorte@inaf.it

Dr. Elisabetta Dotto  
INAF - OAR, Italy, elisabetta.dotto@inaf.it

Dr. Ivano Bertini  
University of Naples "Parthenope", Italy, ivano.bertini@uniparthenope.it

Dr. John Robert Brucato  
INAF - Astrophysical Observatory of Arcetri, Italy, jbrucato@arcetri.astro.it

Dr. Andrea Capannolo  
Politecnico di Milano, Italy, andrea.capannolo@polimi.it

Mr. Biagio Cotugno  
Argotec, Italy, biagio.cotugno@argotecgroup.com

Mr. Prasanna Deshapriya  
University of Science & Technology of Hanoi (USTH), Sri Lanka, jdpdesh@gmail.com

Mr. Valerio Di Tana  
Argotec, Italy, valerio.ditana@argotecgroup.com

Mr. Igor Gai  
Alma Mater Studiorum - University of Bologna, Italy, igor.gai@unibo.it

Mr. Gabriele Impresario  
Agenzia Spaziale Italiana (ASI), Italy, gabriele.impresario@asi.it

Dr. Ieva Simone  
INAF, Italy, simone.ieva@inaf.it

Dr. Stavro Lambrov Ivanovski,  
INAF, Italy, stavro.ivanovski@inaf.it

Prof. Michèle Lavagna  
Politecnico di Milano, Italy, michelle.lavagna@polimi.it

Dr. Alice Lucchetti  
INAF - Osservatorio astronomico di Padova, Italy, alice.lucchetti@inaf.it

Dr. Elena Mazzotta Epifani  
INAF - Astrophysical Observatory of Arcetri, Italy, elena.mazzottaepifani@inaf.it

Mr. Pedro Henrique Hasselmann  
INAF - Astrophysical Observatory of Arcetri, Italy, pedro.hasselmann@inaf.it

Dr. Andrea Meneghin  
Italy, andrea.meneghin@inaf.it

Mr. Federico Miglioretti  
Argotec, Italy, federico.miglioretti@argotecgroup.com

Dr. Dario Modenini

Alma Mater Studiorum - University of Bologna, Italy, [dario.modenini@unibo.it](mailto:dario.modenini@unibo.it)  
Mr. Maurizio Pajola  
CISAS – “G. Colombo” Center of Studies and Activities for Space, University of Padova, Italy,  
[maurizio.pajola@gmail.com](mailto:maurizio.pajola@gmail.com)  
Dr. Davide Perna  
INAF - OAR, Italy, [davide.perna@inaf.it](mailto:davide.perna@inaf.it)  
Dr. Giovanni Poggiali  
LESIA - Observatoire de Paris, France, [giovanni.poggiali@obspm.fr](mailto:giovanni.poggiali@obspm.fr)  
Dr. Alessandro Rossi  
IFAC-CNR, Italy, [a.rossi@ifac.cnr.it](mailto:a.rossi@ifac.cnr.it)  
Dr. Emanuele Simioni  
Italy, [simioni@dei.unipd.it](mailto:simioni@dei.unipd.it)  
Mr. Simone Simonetti  
Argotec, Italy, [simone.simonetti@argotecgroup.com](mailto:simone.simonetti@argotecgroup.com)  
Dr. Marco Zannoni  
Alma Mater Studiorum - University of Bologna, Italy, [m.zannoni@unibo.it](mailto:m.zannoni@unibo.it)  
Mr. Giovanni Zanotti  
Politecnico di Milano, Italy, [giovanni.zanotti@polimi.it](mailto:giovanni.zanotti@polimi.it)  
Dr. Angelo Zinzi  
ASI - Italian Space Agency, Italy, [angelo.zinzi@asi.it](mailto:angelo.zinzi@asi.it)  
Dr. Massimo Dall’Ora  
INAF - Osservatorio Astronomico di Capodimonte, Italy, [massimo.dallora@inaf.it](mailto:massimo.dallora@inaf.it)  
Dr. Marco Lombardo  
Alma Mater Studiorum - University of Bologna, Italy, [marco.lombardo14@unibo.it](mailto:marco.lombardo14@unibo.it)  
Prof. Paolo Tortora  
Alma Mater Studiorum - University of Bologna, Italy, [paolo.tortora@unibo.it](mailto:paolo.tortora@unibo.it)

## LICIACUBE: A DEEP SPACE CUBSAT TO WITNESS THE FIRST ASTEROID KINETIC IMPACTOR TEST

### Abstract

Since the last few years several international space agencies are focusing their attention on small spacecraft technologies and capabilities for missions in science, exploration, and space operations. Moreover, the Near-Earth Objects (NEO) that could impact the Earth in the near future received increased interest. In this contest the Double Asteroid Redirection Test (DART) mission has been developed by NASA for Planetary Defence program. The DART mission is a spacecraft acting as a kinetic impactor that will change the orbit of an asteroid, by crashing itself on Dimorphos, the moonlet of the Didymos binary system, modifying its revolution period around the primary body. In order to increase the accuracy of the impact effect of the deflection measurement, the ASI LICIACube (Light Italian Cubesat for Imaging of Asteroids) 6U Cubesat, manufactured by the Italian aerospace company Argotec, has been designed to be carried as piggyback by the DART spacecraft. The LICIACube team includes a wide Italian scientific community, involved in the definition of all the aspects of the mission: trajectory design; mission definition (and real-time orbit determination during operations); scientific simulation and modelling. The DART/LICIACube mission, launched on 24th November 2021, is presently on its way to Didymos and the arrival is foreseen on September 26, 2022. Ten days before the impact, LICIACube will be released and it will perform braking manoeuvres in order to increase the relative velocity with respect to the DART spacecraft and will prepare for an autonomous flyby with Dimorphos. During the scientific phase LICIACube will pursue the following mission objectives: i) to testify the DART impact, ii) to characterize the impact ejecta plume, its structure and evolution, iii) to characterise the impact site (and possibly size and morphology of the crater) on Dimorphos’ surface, and iv) to image the non-impact hemisphere, thus increasing the accuracy of the shape determination. LICIACube is equipped with two imaging cameras:

LEIA (Liciacube Explorer Imaging for Asteroid), a narrow camera equipped with a Panchromatic filter, and LUKE (Liciacube Unit Key Explorer) a wide-angle camera, is the Gecko imager from SCS space, with RGB Bayer pattern filter. The images obtained by LICIACube will be downloaded directly to Earth thanks to the antennas of the NASA Deep Space Network and LICIACube Ground Segment, composed by the Argotec Mission Control Centre and the ASI Space Science Data Center for archiving and processing data. The LICIACube mission is a challenging opportunity for the implementation of a deep space mission, based on a small scale but highly technological platform.