

# Asteroid Spectral Imaging Mission (ASPECT) payload for AIM-D<sup>2</sup> spacecraft

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## Introduction

Asteroid Spectral Imaging Mission (ASPECT) is a part of the ESA-NASA AIDA (Asteroid Impact & Deflection Assessment) project. In 2016 it underwent preliminary design study and was down selected as the only COPIN payload (CubeSat Opportunity Payload) for European AIDA component AIM-D<sup>2</sup> (Asteroid Impact Mission – Deflection Demonstration). ASPECT is a 3U CubeSat with a visible – near infrared (VIS-NIR) spectral imager payload. The payload, avionics, and cold gas propulsion units occupy each 1U space. Its task is to characterize the surface composition of the DART (Double Asteroid Redirection Test) spacecraft impact target – the binary asteroid Didymos.

## ASPECT technical objectives

ASPECT technical objectives	
AT1	Demonstration of CubeSat autonomous operations in deep space environment
AT2	Navigation in the vicinity of a binary asteroid
AT3	Demonstration of satellite survival during impact
AT4	Demonstration of joint spacecraft - CubeSat operations
AT5	Demonstration of spectral imaging of asteroid materials

## ASPECT scientific objectives

ASPECT scientific objectives and results	
<b>AS1</b>	Map the surface composition of the Didymos system
<b>Result</b>	Composition and homogeneity of the Didymos asteroid, changes as a result of DART impact
<b>Result</b>	Information on the origin and evolution of the Didymos binary system
<b>AS2</b>	Photometric observations and modeling of the Didymos system under varying phase angle and distance
<b>Result</b>	Surface particle size distribution and composition for Didymos II and Didymos I (simultaneous modeling of photometry and spectroscopy)
<b>AS3</b>	Evaluate space weathering effects on Didymos II by comparing mature and freshly exposed material
<b>Result</b>	Information on the surface processes on airless bodies due to their exposure to the interplanetary environment
<b>AS4</b>	Identify local shock effects on Didymos II based on spectral properties of crater interior
<b>Result</b>	Information on the processes related to impacts on small Solar System bodies
<b>AS5</b>	Observations of the plume produced by the DART impact
<b>Result</b>	Evolution and composition of the DART impact plume
<b>AS6</b>	Map global fallback ejecta on Didymos II and Didymos I
<b>Result</b>	Detailed global mapping of fallback ejecta on both Didymos I and Didymos II