

Characterization of mature planets with a small telescope in space: the SPICES concept

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Abstract

SPICES (Spectro-Polarimetric Imaging and Characterization of Exoplanetary Systems) was proposed as a five-year M-class mission to ESA Cosmic Vision in 2010. Its purpose is to image and characterize long-period extrasolar planets located at several AUs (1-10 AU) from nearby stars (<20 pc) with masses ranging from a few Jupiter masses to super-Earths (~ 2 Earth radii, $\sim 10 M_{\text{earth}}$), possibly habitable. In addition, circumstellar disks as faint as a few times the zodiacal light in the Solar System can be studied. SPICES is based on a 1.5-m off-axis telescope and can perform spectro-polarimetric measurements in the visible (450 - 900 nm) at a spectral resolution of about 40. After introducing the science program of SPICES regarding mature planets and circumstellar disks, we will discuss the instrumental choices that we made to achieve very high contrasts of $10^9 / 10^{10}$ as well as a preliminary conceptual design of the mission. Finally, we will describe the on-going technical developments for the main sub-systems (coronagraphy, wavefront sensing and correction) and the possible extension to an L class mission.