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ARIEL: Atmospheric Remote Sensing Infrared Exoplanet Large Survey. A proposal for the ESA Cosmic Vision M4

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Abstract.

The Atmospheric Remote sensing Infrared Exoplanet Large survey (ARIEL) is a proposal in response to the call for a Medium-size mission opportunity in ESAs Cosmic Vision 2015-2025 Science Programme for a launch in 2025 (M4). This mission will be devoted to observe spectroscopically in the IR a large population (hundreds to one thousand) of known planets in our Galaxy, opening a new discovery space in the field of extrasolar planet exploration and enabling a quantum leap in the understanding of the physics and chemistry of these far away worlds. The population of planets will include warm and hot gasgiants, Neptunes and large terrestrial planets. The main ARIEL goal is the determination of the composition, formation and history of these planetary systems In order to fulfill the scientific goals of ARIEL, we propose the development of a 1meter class aperture space telescope, passively cooled to 7080K, to observe the combined light of stars and their planets, building on the current experience of transit and combined light observations with Hubble, Spitzer, and ground-based telescopes. While JWST and EELT will initiate a detailed mid- to high-resolution IR spectroscopic observation of a few tens of planets, this mission will extend the study to a much larger (an order of magnitude difference) representative population of extrasolar planets discovered by ESA GAIA, Cheops, PLATO, NASA Kepler II, TESS and from the ground. The statistical perspective provided by this mission, will allow us to address some of the fundamental questions of the Cosmic Vision programme:

- What are the conditions for planet formation and the emergence of life?
- ls our Solar System unique, rare or very common?
- How does the Solar System work?