Forging Advanced Liquid-Crystal Coronagraphs Optimized for Novel Exoplanet Research

Fact Sheet

Project Information

FALCONER

Grant agreement ID: 678194

Project website

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10.3030/678194

Project closed

EC signature date
16 December 2015

Start date
1 April 2016

End date
31 March 2021

Funded under
EXCELLENT SCIENCE - European Research Council (ERC)

Total cost
€ 1 499 522,00

EU contribution
€ 1 499 522,00

Coordinated by
UNIVERSITEIT LEIDEN
Netherlands

Objective

The 39-m European Extremely Large Telescope (E-ELT) has the potential to directly observe and characterize habitable exoplanets, but current technologies are unable to sufficiently suppress the starlight very close to the star. I propose to develop a novel instrumental approach with breakthrough contrast performance by combining coronagraphs based on brand-new liquid crystal technology, and sensitive imaging polarimetry. The novel coronagraphs will provide an achromatic rejection of starlight

even right next to the star such that exoplanets can be imaged efficiently in broadband light and characterized through spectropolarimetry. The coronagraphs will incorporate focal-plane wavefront sensing and polarimetry to achieve an ultimate contrast of 1E-9, which will enable the E-ELT to observe habitable exoplanets.

We will prototype coronagraph designs of increasing contrast performance, validate them in the lab, and apply them on-sky using 6-8 meter class telescopes. With our coronagraphs that offer a contrast improvement by a factor of 10 as compared to current systems in 360-degree dark holes, we will search for self-luminous exoplanets very close to stars at thermal infrared wavelengths, and characterize known targets with multi-wavelength observations. Through accurate photometry and polarimetry, we will study their atmospheric hazes. By combining liquid-crystal coronagraphy with sensitive polarimetry, we will study the inner regions of protoplanetary disks to find signs of planet formation.

By manipulating both phase and amplitude in pupil and focal planes, we will establish hybrid coronagraph systems that combine the strengths of individual concepts, and that can be adapted to the telescope mirror segmentation and the observational strategy. The proposed research will demonstrate the technologies necessary for building an instrument for the E-ELT that can successfully study rocky exoplanets in the habitable zones of nearby stars.

Fields of science (EuroSciVoc)

natural sciences > physical sciences > astronomy > planetary sciences > planets > **exoplanetology**

natural sciences > physical sciences > astronomy > **observational astronomy**

Programme(s)

H2020-EU.1.1. - EXCELLENT SCIENCE - European Research Council (ERC) MAIN PROGRAMME

Topic(s)

ERC-StG-2015 - ERC Starting Grant

Call for proposal

ERC-2015-STG

See other projects for this call

Funding Scheme

ERC-STG - Starting Grant

Host institution

UNIVERSITEIT LEIDEN

Net EU contribution

€ 1 499 522,00

Total cost

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Address

RAPENBURG 70
2311 EZ Leiden
Netherlands

Activity type

Higher or Secondary Education Establishments

Links

Contact the organisation Website
Participation in EU R&I programmes
HORIZON collaboration network

Beneficiaries (1)

UNIVERSITEIT LEIDEN

Netherlands

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