



The new Near-Infrared Adaptive-Optics assisted high-resolution NIRPS spectrograph on the ESO 3.6m

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The Near-InfraRed Planet Searcher (NIRPS) is a new ultra-stable near-infrared spectrograph installed on ESO 3.6-m Telescope in La Silla, Chile. Aiming to achieve a precision of 1 m/s, NIRPS is operating together with HARPS. NIRPS has been designed to explore the exciting prospects offered by the M dwarfs, focusing on three main science cases: 1) High-precision RV survey of M dwarf aiming at detecting Earth-like planets in the habitable zone; 2) Mass (and density) measurements of planetary candidates orbiting M dwarfs from transit surveys, and 3) Atmospheric characterization of exoplanets via transmission spectroscopy. To achieve its science goals, NIRPS is operating in the Y-, J- and H-bands with continuous coverage from 0.97 to 1.8 μm . It will ensure high radial velocity precision and high spectral fidelity corresponding to 1 m/s in less than 30 min for an M3 star with $H = 8.4$. NIRPS is part of a new generation of adaptive optics (AO) fiber-fed spectrographs. NIRPS uses a 0.4-arcsecond multi-mode fiber, half that required for a seeing-limited instrument, allowing a spectrograph design that is half as big as that of HARPS, while meeting the requirements for high throughput and high spectral resolution. A 0.9-arcsecond fiber is used for fainter targets and degraded seeing conditions. The entire optical design is oriented to maximize high spectral resolution, long-term spectral stability and overall throughput. The instrument covers the 0.97 to 1.81 μm domain on 69 spectral orders with a spectral resolution of 80,000 recorded on a Hawaii 4RG 4096 \times 4096 infrared detector. In return for the manpower effort and financial contributions of the consortium to design, build, maintain and operate NIRPS for five years, ESO will grant the consortium a period of Guaranteed Time Observation (GTO) corresponding to 40% of the 3.6-m Telescope time, leaving ample time for community-driven science topics. Its first light was performed in May 2022. We present here the performance of the spectrograph and first tests on sky.