

# Pollux: a European high-resolution spectropolarimeter for the Habitable Worlds Observatory

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Habitable Worlds Observatory is a next-generation space telescope started by NASA following the recommendation of the US astronomy decadal survey in 2021. It will combine the key features of LUVOIR-B and HabEx projects and promises to provide unprecedented capabilities for exoplanetary science and astrophysics. As a continuation of our study for LUVOIR-A project, we propose a European-led, high-resolution spectropolarimeter, Pollux, to become part of the telescope payload. Pollux includes a core instrument consisting of two channels operating in the near (236-472 nm) and medium (118-236 nm) ultraviolet with the spectral resolution of  $R=133\,000$  and  $95\,000$ , respectively. The corresponding instrument's maximum throughput values are 17 and 10%. Each of the channels represents an echelle spectrograph with a dedicated birefringent polarimeter and a concave toroidal grating acting as the camera mirror and cross-disperser. We also suggest to supplement it with one or two additional channels. A visible-NIR (427-1050 nm) option is more easily feasible. It could be based on an echelle spectrograph with cross-dispersing immersed grating and a simple refractive camera working with a birefringent polarimeter. Using optical components with high technological readiness and using the experience of building ground-based instruments like X-Shooter NIR, we expect to reach the resolution of  $R=77\,000$  and maximum throughput of 62%. A more challenging option is to create a dedicated far UV (below 120 nm) channel based on either a large ( $>210$ mm) echelle grating with high resolution  $R=120\,000$  or a single concave grating ( $\sim 60$  mm) with a medium resolution of  $R=18\,000$ .

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