Titre : RETINA - Researching Exoplanets Through Imaging for Narrow-angle Astrometry
Auteurs : Malbet F., Lizzana M., Pancher F., Rousset H., Soler S. (IPAG), Lagage P.-O., Ardellier F. Amiaux J., Doumeyrou E., Frugier P.-A., Martignac J., Pichon T., Royanette S. (CEA/DAp), Michelot J., Benkort D., Caranhac S., Monsinjon P., Muller P. (Pyxalis)

The main scientific objective of the RETINA project (“Researching Exoplanets Through Imaging for Narrow-angle Astrometry”) is to develop, up to a Technical Readiness Level (TRL) of 3, a focal plane made up of large-format visible detectors for very high-precision differential astrometry. This focal plane, made up of around a billion pixels whose position is known at the micro-pixel scale, will enable astrometric detection and characterization of Earth-mass exoplanets in the habitable zone of nearby solar-type stars. Achieving the accuracy required to detect these faint “oscillations” of host stars requires unprecedented astrometric precision of the order of ten micropixels on the focal plane.

The project proposes to increase the TRL of GIGAPYX 220 MP detectors of Pyxalis from TRL 3 to TRL 5 by 2029 for astrophysical applications. These detectors are considered essential for future high-precision space astrometry instruments, including ESA's proposed Theia mission and the High Resolution Imager (HRI) instrument aboard NASA's future Habitable Worlds Observatory (HWO).

The technical strategy is based on the use of large CMOS sensors and the development of precise calibration methods. A crucial aspect is to better understand the physics of detection at the pixel level, in order to control systematics effects at the micro-pixel level. The project will develop and test a calibration method using Young's fringe projection over the entire focal plane of at least 4 220 MP detectors to monitor geometry and intra-pixel response.

The consortium is made up of IPAG (Grenoble Alpes University), experts in detector calibration and astrometry, CEA / Irfu / DAp, with expertise in systems engineering for space missions, focal plane integration, detector characterization and the unique INTRAPIX platform, and Pyxalis, a company specializing in CMOS sensors and their manufacture.

The 48-month project is part of R&T in preparation for major space missions. It aims to deliver an engineering model of the focal plane by 2029. Key deliverables include the supply of six 220 MP CMOS sensors (different models for mechanical, electrical and performance testing), detector characterization, assembly of a representative focal plane, and development of a dedicated calibration unit.