Proceedings Article

High-resolution and high-precision color-differential astrometry for direct spectroscopy of extrasolar planets onboard SPICA: science and validation experiment

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Abstract References

abstract

We describe the principles and potential of Color-Differential Astrometry (CDA), a high-resolution technique easily implementable on the Science Coronographic Instrument (SCI) of the SPICA satellite, and aimed here at the direct detection and spectroscopy of giant Extrasolar Planets (ESP). By measuring the photocentre of the source diffraction pattern relatively between dispersed spectral channels, CDA gives access to flux ratio and angular information well beyond the telescope resolution limit. Applied to known ESPs, it can yield the inclination (thus the mass) and spectrum of the planet. Our estimates show that low-resolution spectroscopy of Jupiter-radius ESP can be measured within a few hours for planets at orbital distances ranging from 0.05 AU to a few AUs, thus complementing the detection range expected using the coronographic measurements. More generally, it may also apply to any unresolved source with some wavelength-dependent asymmetry. In addition to the ESP cases considered for the scientific signal and to their associated fundamental noises, we also present the instrumental effects and a dedicated optical testbench. The combined effects of several instrumental noise sources can be introduced into our numerical model (pointing errors, beam tip-tilt, optical aberations, variations of the detector gain table), and then confronted to measurements from the experimental testbench.© (2012) COPYRIGHT Society of Photo-Optical Instrumentation Engineers (SPIE). Downloading of the abstract is permitted for personal use only.

Topics

Diffraction ; Jupiter ; Planets ; Sensors ; Spectroscopy ; Telescopes

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