

EXPLORATION OF THE INNER REGION OF THE SYSTEM HD 142527

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Context. HD 142527 is a well-studied Herbig Ae/Be star surrounded by a transitional disk with a large dust cavity, spiral structures, and an accreting low-mass companion. Despite extensive observations, the system's inner regions remain poorly understood, particularly regarding their influence on disk morphology and planet formation.

Aims. This study aims to investigate the inner region of HD 142527 (<50 au) with high detection sensitivity thanks to dedicated post-processing methods to search for undetected components and explore their potential role in the disk's structure and evolution.

Methods. We analyze high-contrast imaging data obtained with the SPHERE instrument at the Very Large Telescope (VLT). To enhance detection sensitivity, we apply the PACO and REXPACO algorithms, dedicated respectively to the detection of point-like sources and to the reconstruction of circumstellar disks, while relying on both angular and spectral variations.

Results. We revisit the known companion HD 142527 B and update its photometry, astrometry and accretion rate estimates. Furthermore, we identify a new candidate companion (CC) at an angular separation of $\sim 0.09''$ (~ 14 au). Though it is shown as a point-like object, the possibility that CC is a disk feature remains. Otherwise, it could be a young gas-giant planet or a brown dwarf with a mass of 15–50 M_{Jup} . Additionally, we report the discovery of a tightly wound H α spiral feature in the inner disk, reconstructed for the first time by high contrast imaging. The spiral implies varying accretion dynamically linked to the known companion B and possibly to CC, suggesting ongoing interactions that influence the disk's structure.

Conclusions. Our findings provide new insights into the complex interactions within the HD 142527 system, highlighting the role of multiple companions in driving disk asymmetries and facilitating planet formation. Future high-resolution observations and dynamical modeling will be essential to fully understand the system's architecture and evolution.