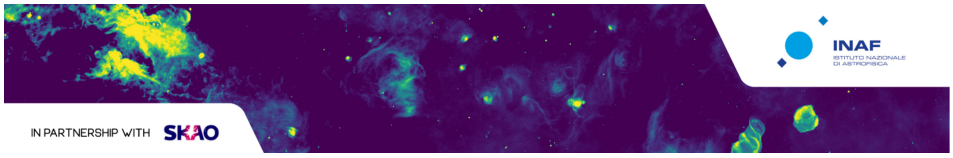

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Ionized gas emission in protoplanetary disks with SKA

Tuesday 25 November 2025 14:57 (3 minutes)

The study of protoplanetary disks and their evolution achieved major step forward in the past decades, thanks to the implementation of facilities operating at millimeter to centimeter wavelengths that allowed us to study the cold material orbiting young stars with increasing detail.
However, fundamental questions still remain regarding the mechanisms driving the evolution and dispersal of disks, the growth of dust grains and the formation of planets. In particular, the role of MHD and photoevaporative winds at different stages of disk evolution is still not completely estabilished, as well as their effect on planet formation processes.
One critical limitation of current millimeter-centimeter facilities is the lack of spatial resolution and sensitivity necessary to study the very inner regions of disks, where planet formation, accretion and material ejection are most active.

We discuss how SKA-Mid in the AA* configuration will address these challenges, by generating theoretical predictions and synthetic SKA observations to assess its potential in detecting and characterizing free–free emission and Hydrogen recombination lines in protoplanetary disks. We use existing disk wind models, including pure photo-evaporative, magneto-thermal, and isothermal magneto-hydro-dynamics wind models.

We estimate that free-free emission from disk winds can be detected and marginally spatially resolved with about 10h integration time with SKA-Mid in the AA* configuration. With 100h integration time, detection of Hydrogen recombination lines at SKA band 5b is possible only for the MHD models with the highest gas density and lower β (thermal-to-magnetic pressure ratio). However, stacking 12 H-lines available within Band 5b would enable detections across all the analysed models.

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Session Classification: Flash talks