PHYSICS AND ASTRONOMY SEMINAR

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"Dust depleted inner disks in a large sample of transition disks through long-baseline ALMA observations"

Abstract

"Transition disks with large inner dust cavities are thought to host massive companions. However, the disk structure inside the companion orbit and how material flows toward an actively accreting star remain unclear. We present a high resolution continuum study of inner disks in the cavities of 38 transition disks. Measurements of the dust mass from archival Atacama Large Millimeter/Submillimeter Array observations are combined with stellar properties and spectral energy distributions to assemble a detailed picture of the inner disk. An inner dust disk is detected in 18 of 38 disks in our sample. Of the 14 resolved disks, 9 are significantly misaligned with the outer disk. The near-infrared excess is uncorrelated with the mm dust mass of the inner disk. The size-luminosity correlation known for protoplanetary disks is recovered for the inner disks as well, consistent with radial drift. The inner disks are depleted in dust relative to the outer disk and their dust mass is uncorrelated with the accretion rates. This is interpreted as the result of radial drift and trapping by planets in a low α ($\sim 10^{-3}$) disk, or a failure of the α-disk model to describe angular momentum transport and accretion. The only disk in our sample with confirmed planets in the gap, PDS 70, has an inner disk with a significantly larger radius and lower inferred gas-to-dust ratio than other disks in the sample. We hypothesize that these inner disk properties and the detection of planets are due to the gap having only been opened recently by young, actively accreting planets."

Thursday, March 19, 2020

1:30 p.m.

CLE – Room C108