

# Modeling the first millimeter detection of the disk around a young, isolated, planetary-mass object.

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OTS44 is, up to date, one of only four free-floating planets known to have a disk. In Joergens et al. (2013), we showed that it is the coolest and least massive known free-floating planet ( $\sim 12 M_{\text{Jup}}$ ) with a substantial disk that is actively accreting. Recently, we have obtained Band 6 (233 GHz) ALMA continuum data of this very young disk-bearing object (Bayo et al. 2017). The data shows a clear unresolved detection of the source. We performed radiative transfer modeling of the full SED of the object and compared the parameters obtained to disk mass estimates via empirical correlations derived for young, higher-mass, central (substellar) objects. The range of values obtained are between 0.07 and 0.63  $M_{\oplus}$  (dust masses). We compare the properties of this unique disk with those recently reported around higher mass (brown dwarfs) young objects in order to infer constraints on its mechanism of formation. While extreme assumptions on dust temperature yield disk-mass values that could slightly diverge from the general trends found for more massive brown dwarfs, a range of sensible values provide disk-masses compatible with a unique scaling relation between  $M_{\text{dust}}$  and  $M_{\star}$  through the substellar domain down to planetary masses. In addition, the constraints on the flaring index imposed by our modeling, suggests that, given the youth of the source, dust settling must have not proceeded too far yet (which explains the apparent contradiction with the results of Liu et al. 2015).