

Resonant Structure in the Kuiper Disk

E.K. Holmes, S.F. Dermott, and K. Grogan

Abstract

There is a possible connection between structure in evolved circumstellar disks and the presence of planets, our own zodiacal cloud being a proven example. Asymmetries in such a disk could be diagnostic of planets which would be otherwise undetectable. A Kuiper dust disk will have a resonant structure, with two concentrations in brightness along the ecliptic longitude arising because 10-15% of the Kuiper belt objects are in the 3:2 mean motion resonance with Neptune. We conduct an observational search in the 60 μm COBE data for the Kuiper disk, which is predicted to be, at most, a few percent of the brightness of the zodiacal cloud. By removing emission due to the background zodiacal cloud and the dust bands, we expect to see the trailing/leading signature of Earth's resonant ring. However, when subtracted from the data, we find that none of the empirical background zodiacal cloud models give the residuals predicted by theory. We conclude that a dynamical two-component (both inner and outer) zodiacal cloud model must be created to complete the search.