Multi-wavelength modeling of the spatially resolved debris disk of HD 107146

Steve Ertel, Sebastian Wolf, Stanimir Metchev, Glenn Schneider, John M. Carpenter, Michael R. Meyer, Lynne A. Hillenbrand, Murray D. Silverstone

(Submitted on 6 Jul 2011)

(abridged) We aim to constrain the location, composition, and dynamical state of planetesimal populations and dust around the young, sun-like (G2V) star HD 107146}. We consider coronagraphic observations obtained with the Advanced Camera for Surveys (HST/ACS) onboard the HST in broad V and broad I filters, a resolved 1.3mm map obtained with the Combined Array for Research in Millimeter-Wave Astronomy (CARMA), Spitzer/IRS low resolution spectra, and the spectral energy distribution (SED) of the object at wavelengths ranging from 3.5micron to 3.1mm. We complement these data with new coronagraphic high resolution observations of the debris disk using the Near Infrared Camera and Multi-Object Spectrometer (HST/NICMOS) aboard the HST in the F110W filter. The SED and images of the disk in scattered light as well as in thermal reemission are combined in our modeling using a parameterized model for the disk density distribution and optical properties of the dust. A detailed analytical model of the debris disk around HD 107146 is presented that allows us to reproduce the almost entire set of spatially resolved and unresolved multi-wavelength observations. Considering the variety of complementary observational data, we are able to break the degeneracies produced by modeling SED data alone. We find the disk to be an extended ring with a peak surface density at 131AU. Furthermore, we find evidence for an additional, inner disk probably composed of small grains released at the inner edge of the outer disk and moving inwards due to Poynting-Robertson drag. A birth ring scenario (i.e., a more or less broad ring of planetesimals creating the dust disk trough collisions) is found to be the most likely explanation of the ringlike shape of the disk.

Comments: 15 pages, 9 figures, accepted for publication in A&A
Subjects: **Solar and Stellar Astrophysics (astro-ph.SR)**; Earth and Planetary Astrophysics (astro-ph.EP)
Cite as: **arXiv:1107.1057 [astro-ph.SR]**
(or **arXiv:1107.1057v1 [astro-ph.SR]** for this version)

Submission history

From: Steve Ertel [view email]

[v1] Wed, 6 Jul 2011 08:40:17 GMT (811kb,D)

Which authors of this paper are endorsers?