

Presenting

Posters and Talks

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TU / **e**

Technische Universiteit
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University of Technology

Where innovation starts

POSTERS

My Message

- clear
- relevant
- in context
- repeated
- visual

Audience

many posters to see
may have read the abstracts....
may decide in ~5-10 s if they stay
spends ~30 s to get your message
likes one-liners + clear pictures

CatalysisCourse.com

Posters: often made mistakes

No clear message

- Often emphasis on **what & how**
and not on **why & consequences**
- **Title + Aims + Conclusions**
should tell the message

Dean C. Fines, Frank J. Low & Glenn Schneider UNIC/MOS Project, Steward Observatory, The University of Arizona

THE PRIMARY STARS (A & B)

[illegible]

Using the luminosity and temperature of components A and B their radii were calculated. In neglecting their duplicity we note that this overestimation is more significant for B than for A (see Soderblom et al. 1992). The results in Table 3 show that the radius of star B is slightly larger than star A, a result well within the precision of the relative measurements. The temperature of star B is also slightly cooler than star A, a result which occurs when both components of star B are considered, they can have radii smaller than that of star Aa (Ab is almost negligible), and as previously noted, the temperature of the components of star B is lower than that of star Aa. Adding the error to the star's apparent luminosity, Figure 3 will show that there are still differences between the two primary components. When compared in detail, the two components of star B are significantly different. The results have been reported in the paper by Soderblom, Henry & Balachandran (1992).

ABSTRACT

[illegible]

INTRODUCTION

HD98300 (SAO 17815; IRAS F11195-2432) was found by *2MASS* to contain the brightest planetary nebula system (PDS) in the sky (Zuckerman & Becklin 1993). Recently identified as one of 11 known members of the nearby TW Hydrae Association (Larmer et al. 2003; Webb et al. 1998), HD 98300 (TWA 4) system is comprised of two similar K dwarfs that have not yet reached the main sequence. Both stars are spectroscopic binaries with periods of 1.1 and 1.3 days (Larmer et al. 2003). HD 98300 has 4.6 mag and 4.67 mag, the two brightest components of HD 98300 separated by $\sim 0.8''$, are now resolved by *AAT* from 0.4 to 3.2 μm (Soderblom et al. 1998; Lane & Hines 1999). The two stars show similar spectral properties, but the spectra showed that northern star is 0.2 mag and 0.8 mag brighter at $0.4 \mu\text{m}$ with only a small difference visible at 3.2 μm . The two stars are separated by 0.8'' and of spectral type K5 and K7, respectively. The spectral type of the primary and of the secondary is B9 and B8, respectively. The primary is 1 AU (0.005") away from the secondary.

Using the sub-second resolution and large field-of-view capability of the millimetre afforded by the APOGEE survey, we have created two primary components in five bands from 0.85 to 1.9 μm , spanning the peak of the stellar spectral energy distributions. Our objective was to obtain precise relative and absolute photometry of the two stellar components and to search for a halo of scattered or reflected light from the PDG realizing that all other received planetary debris systems scatter and emit about equally.

OBSERVATIONS

mini

TABLE 1: PHOTOMETRY OF HD 96800

	Date	Power	W	W ₀	W ₁	W ₂	W ₃	W ₄	W ₅	W ₆	W ₇	W ₈	W ₉	W ₁₀	W ₁₁	W ₁₂	W ₁₃	W ₁₄	W ₁₅	W ₁₆	W ₁₇	W ₁₈	W ₁₉	W ₂₀	W ₂₁	W ₂₂	W ₂₃	W ₂₄	W ₂₅	W ₂₆	W ₂₇	W ₂₈	W ₂₉	W ₃₀	W ₃₁	W ₃₂	W ₃₃	W ₃₄	W ₃₅	W ₃₆	W ₃₇	W ₃₈	W ₃₉	W ₄₀	W ₄₁	W ₄₂	W ₄₃	W ₄₄	W ₄₅	W ₄₆	W ₄₇	W ₄₈	W ₄₉	W ₅₀	W ₅₁	W ₅₂	W ₅₃	W ₅₄	W ₅₅	W ₅₆	W ₅₇	W ₅₈	W ₅₉	W ₆₀	W ₆₁	W ₆₂	W ₆₃	W ₆₄	W ₆₅	W ₆₆	W ₆₇	W ₆₈	W ₆₉	W ₇₀	W ₇₁	W ₇₂	W ₇₃	W ₇₄	W ₇₅	W ₇₆	W ₇₇	W ₇₈	W ₇₉	W ₈₀	W ₈₁	W ₈₂	W ₈₃	W ₈₄	W ₈₅	W ₈₆	W ₈₇	W ₈₈	W ₈₉	W ₉₀	W ₉₁	W ₉₂	W ₉₃	W ₉₄	W ₉₅	W ₉₆	W ₉₇	W ₉₈	W ₉₉	W ₁₀₀	W ₁₀₁	W ₁₀₂	W ₁₀₃	W ₁₀₄	W ₁₀₅	W ₁₀₆	W ₁₀₇	W ₁₀₈	W ₁₀₉	W ₁₁₀	W ₁₁₁	W ₁₁₂	W ₁₁₃	W ₁₁₄	W ₁₁₅	W ₁₁₆	W ₁₁₇	W ₁₁₈	W ₁₁₉	W ₁₂₀	W ₁₂₁	W ₁₂₂	W ₁₂₃	W ₁₂₄	W ₁₂₅	W ₁₂₆	W ₁₂₇	W ₁₂₈	W ₁₂₉	W ₁₃₀	W ₁₃₁	W ₁₃₂	W ₁₃₃	W ₁₃₄	W ₁₃₅	W ₁₃₆	W ₁₃₇	W ₁₃₈	W ₁₃₉	W ₁₄₀	W ₁₄₁	W ₁₄₂	W ₁₄₃	W ₁₄₄	W ₁₄₅	W ₁₄₆	W ₁₄₇	W ₁₄₈	W ₁₄₉	W ₁₅₀	W ₁₅₁	W ₁₅₂	W ₁₅₃	W ₁₅₄	W ₁₅₅	W ₁₅₆	W ₁₅₇	W ₁₅₈	W ₁₅₉	W ₁₆₀	W ₁₆₁	W ₁₆₂	W ₁₆₃	W ₁₆₄	W ₁₆₅	W ₁₆₆	W ₁₆₇	W ₁₆₈	W ₁₆₉	W ₁₇₀	W ₁₇₁	W ₁₇₂	W ₁₇₃	W ₁₇₄	W ₁₇₅	W ₁₇₆	W ₁₇₇	W ₁₇₈	W ₁₇₉	W ₁₈₀	W ₁₈₁	W 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* Based on: Based 1998, MICHAEL EITZ, Personal Comm., IRAS Explanatory Supplement.

^a Measured from images independent of photometric calibration.

REFERENCES: (1) Sedláček et al. 1990; (2) This work; (3) Galen et al. 1999.

(4) Dykstra *et al.* 1996; (5) Roe *et al.* 1993; (6) Shaw, Weinstein & Jones 1995

THE PLANETARY DEBRIS SYSTEM

At 0.95 μm , where our resolution is highest, we have been unable to detect starlight reflected by the PDS. This implies $< 5\%$ for the reflected light relative to the direct emission from Ba-3e. The power emitted in our direction by the PDS divided by the total power emitted the Ba-3e systemic components and reflected from the PDS is 0.19. Therefore, at 0.95 μm we have placed an upper limit on the albedo of the reflecting material of 0.3. Note that we have also deduced that are generally smaller than 0.3 (e.g. IRAS Tiedense et al. 1999). In our filter set, we have no indication of the color of the stellar emission, so we cannot constrain the color of the PDS. This may be important for the albedo.

[illegible]

Just as we calculated the radii of the stars, we have also calculated an "equivalent" radius of 2 AU for the material orbiting around star B, even though in projection the IR source, clearly, is not circular in shape. This result is consistent with our proposed geometry of the PDS and constrains that portion of the belt that is visible directly. The actual radii of the inner debris orbits calculated from radiative equilibrium is about 4.5 AU.

In the solar system where the corresponding temperatures are 200 to 250 K, the dust is optically thin, of order 10^{24} , and its emission follows a blackbody at least out to 100 μ m. In HD 98808 the dust opacity remains high from 7 to at least 1000 μ m, but we find no indication of attenuation of light from star 2. This implies that the optical plane of the dust system is inclined to our line of sight by less than about 60 degrees.

The mean equilibrium temperature of the dust grains is about 1000 K. Because most of the particles in the disk are smaller than 1 μ m, they are probably higher than 1000 K. The observed emission is not inconsistent with assuming an equivalent black body emitting from a spherical grain that has a radius of about 1 μ m.

ARTIST RENDERING



Figure 1. (a) SEDs of primary components with blackbody fits. Expanded view shows the measurements used for the fits to A&B. (b) Spectral and temporal deviations of mean flux densities from blackbody fits. First epoch indicated by black bar (see Table 1).

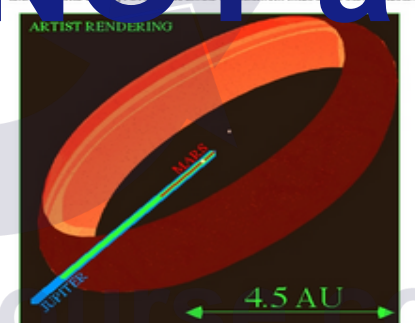


Figure 2. Artist rendering of our model of the HD 98908b PDS as it might appear in the near-to-mid infrared. The belt represents the range of orbital inclinations about a midplane inferred from the debris covering factor (20%) at the radiative equilibrium radius implied by the debris temperature of 144K. The orbital radii of Mars and Jupiter are included for comparison.

TABLE 2: DERIVED PROPERTIES OF THE COMPONENTS IN HD 98006

Comp.	Sp.	T ₂ (S) (°C)	T ₂ ^a (°C)	L (G/g)	R (G/g)	M (Mg)
A	K3	4300	3651 (20)	0.63 (0.22)	1.94 (0.06)	—
B	K7	3900	3429 (20)	0.57 (0.22)	2.12 (0.06)	—
PCB	—	—	164 (2)	0.11 (0.22)	417 (0.0001)	0.6

^aBased on B/V values from Solubility et al. (1996).

^aEffective temperature based on B-V index.

based on MacArthur's life in Figure 1. Errors are 1 σ from fitting procedure. Cumulative swimming intensity and $d = 46.7$ m.

The effective radius of a blackbody of temperature T_{eff}

SUMMARY

- Our high fidelity NiCMOS data enable us to determine precisely the SEDs of the two primary stars, and thus accurately determine their individual temperatures and luminosities, which are not dominated by the near infrared.
- The two stars differ slightly in temperature, but have nearly equal flux densities in the near-IR. The ratio of the total luminosities imply that B is slightly larger than A.
- The FDS also detect 165 stars, probably implying large opacity to at least 7000 Å, but with 100% efficiency.

We also have an independent estimate of \dot{M} from the PDS

- After careful perturbation and modeling, we place an upper limit of $< 5\%$ to the scattered light from the PDS compared with the direct light from B. The albedo of the debris is < 0.3 .
- We are lead to a plausible model for the PDS (Figure 2), in which about 0.1% of earth masses of material orbits stars (3a+3b) in a configuration similar to that of the zodiacal dust bands which are sustained by the asteroid families in our solar system (Lew et al. 1984).

CONCLUSIONS

In conclusion, we now have enough information about the stars in HD 98800 to test, and perhaps improve, models of FMS dwarfs. We can also construct plausible models of recently formed planetary debris systems with interesting similarities to our own planetary system. We note that as yet no other examples of very young systems of this type have been found, indicating that the formation of such systems is a rare process in our Galaxy. Future observations using adaptive optics on the larger telescopes and space missions such as NGST should resolve both the thermal and reflected components of the FDS around HD 98800. Infrared surveys now in progress and in the planning stage with SIRTF should provide new and better means of locating planetary debris disks, thus providing an answer to the question of how many young planets are found.

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Flux ratios in each band were determined by nulling component A, using B, from a flux-scaled replica of the original image (left panel).

Original image (middle panel) showing components A and B.

Flux ratios for components A and B in the three bands:

- $H\alpha: B = 0.8$
- $H\beta: B = 0.6$
- $H\gamma: B = 0.4$

The nulling process was applied iteratively to remove the unsubtracted wings of the PSF of the template star (right panel). $f = \text{flux}(A)/\text{flux}(B)$.

Figure 3

Posters: often made mistakes

Confusing – too much information

- just a collection of
all results obtained sofar
- unclear structure
- poor figures

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Posters: the main ingredients

- **Scientific question / aim / objective**
- **Approach with illustration**
- **Key results / understandable**
- **Answer in a clear conclusion**
- **Together: a clear message**

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Focus on **why**, major **result**, and **implications**
rather than on *what* and *how*

Posters: the presentation

- Be present and recognizable as presenter
- Make contact with visitors
- Prepare
 - a 30 sec short summary
with relevance, aims, and main conclusion
 - a 2-3 minute story for the 'average visitor'
 - don't get lost in details – unless asked
- Invite key persons to your poster
 - selectively hand out business cards with number?
- Have A4-sized copies of your poster available