DISCOVERY OF AN EXTREMELY RED OBJECT IN THE FIELD OF HD 155826

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ABSTRACT

We have discovered an extremely red object, LSF 1, located $7''$ southwest (P.A. 217°) of the bright spectroscopic binary system HD 155826. Originally reported by *IRAS* as one source detected at $12\text{--}60\ \mu\text{m}$, and found as a single $6\text{--}25\ \mu\text{m}$ source of similar flux in the *Midcourse Space Experiment* Galactic plane survey, two bright point sources were found in arcsecond resolution infrared images obtained with the MIRLIN camera at the Infrared Telescope Facility and confirmed by the Long Wavelength Spectrometer camera on Keck I. While HD 155826 itself was easily detected in all the broadband and narrowband filters from 0.9 to $12\ \mu\text{m}$ that we used, the new counterpart, LSF 1, is only visible at $10\ \mu\text{m}$. In Gunn z , J , H , and K' , the upper limit to the new object's magnitude is ~ 14 . The detection of the new bright IR source explains the confusing $[K]\text{--}[N]$ *IRAS* colors that originally implied that HD 155826 was a possible Vega-like system. The “anomalous long-wavelength emission” is found to arise entirely from the new source. Without mid-IR extension or excess long-wavelength emission, HD 155826 should no longer be classified as a Vega-like system. We suspect LSF 1 to be either a highly reddened carbon star or a Class II YSO, with no association with the high proper motion HD 155826 system.

Subject headings: infrared: stars — planetary systems: protoplanetary disks — stars: carbon — stars: imaging — stars: individual (HD 155826) — stars: pre-main-sequence

1. INTRODUCTION

HD 155826 is one of the most unusual objects listed in the *IRAS* point-source catalog of possible Vega-like systems (Aumann 1985), with extremely large $12\text{--}25\ \mu\text{m}$ and $12\text{--}60$ colors of 1.98 and 4.45, respectively. The nature of the system is uncertain—reported by Gliese (1969), Aumann (1985), and Walker & Wolstencroft (1988) as a spectroscopic binary with two components of near equal luminosity and spectral type (F5 V to G3 V, $M_V \sim 6.6\text{--}6.8$), by Sylvester et al. (1996) as a single-star system, and by Soderhjelm (1999) using the *Hipparcos* survey as indeterminate. There is good agreement in the literature that the star(s) lie ~ 30 pc from the Sun, within 12° of the Galactic center and $7'$ of the Galactic plane. HD 155826 is easily found optically at $V \sim 6$ and is a well-known object in many sky surveys; the system is also known as HR 6398, HIP 84425, SAO 208951, Gliese 662, IRAS 17:12:09–3832.4, and MSX 5C-G348.5124–00.1118 in the literature.

Vega-like systems are characterized by a bright, young, central MS star surrounded by at least a few hundredths of an Earth mass of orbiting dust. This dust reradiates absorbed starlight as thermal IR radiation with large effective surface area, leading to a net spectral energy distribu-

tion for the system with a mid-IR “excess” over the Rayleigh-Jeans spectrum expected from the stellar photosphere. Examples of Vega-like systems are β Pic (Smith & Terrile 1984), α PsA (Holland 1998), and α Lyr (Aumann et al. 1984). The dust in these systems is most probably small and created by planetesimal-planetesimal or planetesimal-stellar interactions, in that most dust formed during the initial collapse of the system has been either accreted into larger bodies or blown out of the system by radiation pressure from the primary on timescales of $10\text{--}100$ Myr.

In a search for an extended debris ring similar to those found around the other Vega-like systems, we imaged the system in the near- and thermal-infrared using a modern high spatial resolution mid-IR camera. While we were easily able to detect it as an unresolved point source in our $zJHK'$ images, what we found in the mid-IR was quite surprising; rather than the single mid-IR source reported by the *IRAS* (Aumann 1985) and the *Midcourse Space Experiment* (*MSX*; Egan et al. 1999) sky surveys, we found two bright IR sources of 630 and 1300 mJy at $10.8\ \mu\text{m}$, with a separation of $7''.3$. The brighter IR source had no optical counterpart down to 15th magnitude in V , while the fainter mid-IR source was coincident with the optical position of HD 155826. Both sources showed no mid-IR extension, contrary to our expectations for a Vega-like system.

Here we describe the details of our observations, compare them to a compendium of previous optical, IR, and millimeter-wave observations, and discuss some simple models for the identity of the new IR source (hereafter termed LSF 1). Bright, yet distant and cold, without an optical counterpart, the new object is too big to be a planet, too small and hot to be Galactic cirrus, too bright and cold to be a brown dwarf, and too blue to be an IR-bright galaxy. It is most likely an extremely reddened carbon star at ~ 10 kpc distance or an emergent young stellar object (YSO) with a thick circumstellar disk of surrounding material at ~ 0.33 kpc distance. In any case, we have determined why

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HD 155826 was mistakenly identified as such an anomalous Vega-like system.

2. OBSERVATIONS

We used the NASA/Infrared Telescope Facility (IRTF) 3 m on the nights of UT 2000 June 18–19 to image the area around HD 155826, an easily observed serendipitous southern target during an observing run to photometrically image comets. In the thermal IR, observations were taken on 2000 June 18 using the 8–25 μm Si:Sb BIB 128 $\times$ 128 MIRLIN camera.⁸ Images in 50% and 10% filter passbands centered at 10.8 (N) were obtained with a plate scale of 0".475 pixel⁻¹ and a full field of view of 30" $\times$ 61". The seeing was typically 0".6, and the image resolution $\sim$ 0.6" at N . Background subtraction was carried out by chopping the secondary mirror at a 4 Hz rate with 80" throw in the north-south direction and by nodding the telescope a similar distance in the east-west direction after co-adding a few hundred chop pairs. The sensitivity of our observations was limited by background removal in our chop/nod subtractions. The point-source sensitivity for the instrument was 30 mJy in 1 minute (1σ) at 10 μm . Typical on-source integration times were 1–5 minutes. The infrared bright star η Sgr was used as an absolute flux standard (Sylvester et al. 1996 for U – M bands; Tokunaga et al. 1984 for N), and Fomalhaut, with known mid-IR extension, was observed to determine the image quality. Only data taken at air mass less than 3 were used for analysis, and an air-mass correction of 0.065 mag per air mass was applied to the data. The image performance of our instrument was tested by observing Fomalhaut during the same run; we easily detected an extended source out to 8" diameter at 10.8 μm for a system with known disklike morphology of diameter $\sim$ 20" (Holland 1998). A typical IRTF/MIRLIN thermal infrared image is presented in Figure 1a. The MIRLIN photometry for HD 155826 and LSF 1 is listed in Table 1 and plotted in Figure 2a.

Two weeks later, confirmation images were obtained at 11.7 μm using the Long Wavelength Spectrometer (LWS) imager at Keck I with a 10% filter (Fig. 1b). The LWS camera (Jones & Puetter 1993) has a Si:As moderate-flux 128 $\times$ 128 array detector sensitive from 3.5 to 25 μm . The pixel scale at Keck I was 0".08, giving a 10".2 field of view. The point-source sensitivity (1σ in 1 minute) at 11.7 μm was $\sim$ 3 mJy. During our observations on 2000 July 25, the seeing was $\sim$ 0".9 and the total integration time was 54 s. Sky conditions were not photometric, so these data were used only to verify the existence and position of the new source, with HD 155826 located at the 0.63 Jy object and the new source at the 1.3 Jy location. The ratio of counts for the two sources is 2:1, in agreement with the MIRLIN absolute photometry. Both objects appear stellar.

In the near-IR, the 1–5 μm InSb 256 $\times$ 256 NSFCAM camera (Shure et al. 1994) was used to obtain $zJHK'$ broad-band images on 2000 June 19. A plate scale of 0".3 pixel⁻¹ was used, with a full field of view of 1'.25 and a telescope nod of 60" EW. The seeing at 2.2 μm varied between 0".6 and 1".4 and was dominated by atmospheric effects. The Elias Faint Standard stars (Elias et al. 1982; Carney et al. 1983) HD 18881 and SAO 72310 were used for absolute calibration. The estimated 5σ point-source sensitivity in an 11 s

exposure was 14.5, 13.7, 13.6, and 13.2 mag at z , J , H , and K' , respectively⁹. Typical on-source integration times were on the order of 0.5–1.0 minutes. Only data taken at air mass less than 2 were used for analysis, and an air-mass correction of 0.25 mag per air mass was applied to the data. Typical near-infrared images are presented in Figure 1a. HD 155826 is the overexposed central object, and there is no apparent z or K' counterpart for LSF 1 down to 5σ sensitivity limits of 14th magnitude. The NSFCAM photometric upper limits are listed in Table 1 and plotted in Figure 2a.

3. DISCUSSION

3.1. Previous Optical Detections and Nondetections

HD 155826 is bright at visible and near-IR wavelengths and is a well-known object in many sky surveys. With little difficulty, we were able to register it and the other bright objects in z and J images as field stars within 2", verifying the location and resolution of our observed field. The visible and near-IR fluxes for HD 155826 are given in Table 1 and plotted along with our measurements in Figure 2a. The resulting spectral energy distribution (SED), from 0.36 to 10.8 μm , is described extremely well by a 6100 K graybody, with maximal νF_ν at V .

LSF 1 is another matter, however. Searching through the optical Digitized Sky Survey (DSS), we find no object with $V < 15$ within 10" of HD 155826; this is consistent with a Rayleigh-Jeans extrapolation of our NSFCAM 5σ upper limits to 0.55 μm . Sylvester et al. (1996) did not detect any optical counterpart for the new source when obtaining the autoguided UKIRT/CGS3 mid-IR spectrum of HD 155826. J. McConnell (2001, private communication) reported no red object near HD 155826 on a photographic-IR objective-prism plate (ammonia-sensitized, I – N , 1 hr exposure) taken with the 61/91 cm Curtis Schmidt telescope at Cerro Tololo; the plate covers 0.7–0.9 μm at a dispersion of 3400 Å mm⁻¹ at the telluric A band and reaches $I \sim 14$ in 1 hr with a spatial resolution of $\sim$ 1". Unfortunately, the Two Micron All Sky Survey (2MASS), with effective resolution $\approx$ 10", would be unable to distinguish the two sources, so we cannot use this deep survey to search for a near-IR counterpart. While the *Infrared Space Observatory* (ISO) would have been able to resolve the two objects, no measurement of a field containing HD 155826 was found in the ISO archive.

3.2. IR Surveys

The *IRAS* sky survey, while discovering thousands of new IR sources, was extremely coarse, with an effective spatial resolution $\gtrsim$ 30" (Neugebauer et al. 1984); we expect confusion of the two sources in the *IRAS* survey. In fact, the spatial location of LSF 1 is closer to the reported centroid location found for HD 155826 by *IRAS* than is the optical position of HD 155826. The more recent higher angular resolution four-band mid-IR *MSX* Galactic plane survey (Egan & Price 1996; Egan et al. 1999) reported only one bright source at the location of HD 155826. A query to the *MSX* project has verified that the SPIRIT III instrument, with an effective spatial sampling of $\sim$ 10"–18" (depending on the density of sampling), would be unable to resolve two

⁸ The MIRLIN User Guide by M. Ressler can be found at <http://cougar.jpl.nasa.gov/MIRLIN/guide.html>.

⁹ The NSFCAM ETC is available at <http://irtf.ifa.hawaii.edu/Facility/nsfcam/nsfcam.html>.

FIG. 1a

FIG. 1b

FIG. 1.—Mid-IR images of HD 155826 and LSF 1. (a) NASA/IRTF discovery images of HD 155826 and the new mid-IR source. No object is apparent to the southwest other than HD 155826 in the *Z*, *J*, *H*, and *K'* images, while a second source is clearly detected at *N*. An *N*-band MIRLIN image of the extended disk system of Fomalhaut is shown for comparison. (b) Confirmatory images from Keck/LWS at $11.7\ \mu\text{m}$, taken 2 weeks later. An image of the calibrator star α Her is shown for comparison.

TABLE 1
PHOTOMETRY FOR HD 155826 AND LSF 1

Telescope/Instrument	Resolution Element Size (arcsec)	Sources Contributing to Observed Flux	Central Wavelength (μm)	νF_ν ($10^{-12} \text{ W m}^{-2}$)	References
UKIRT/UKT9.....	0.5	HD 155826	0.38 (<i>U</i>)	37.6	1
	0.5	HD 155826	0.45 (<i>B</i>)	68.4	1
	0.5	HD 155826	0.55 (<i>V</i>)	81.4	1
	7.8	HD 155826	1.22 (<i>J</i>)	42.9	2
	7.8	HD 155826	1.65 (<i>H</i>)	26.5	2
	7.8	HD 155826	2.18 (<i>K</i>)	13.3	2
	7.8	HD 155826	3.54 (<i>L</i>)	3.55	2
	7.8	HD 155826	3.76 (<i>L'</i>)	2.89	2
<i>IRAS</i>	5	HD 155826	4.77 (<i>M</i>)	1.56	2
	> 30	Both	12	0.93	2, 3, 4
	> 30	LSF 1	25	0.64	2, 3, 4
	> 60	LSF 1	60	0.41	2, 3, 4
<i>MSX</i>	> 120	LSF 1	100	<7.8	2, 3, 4
	~18	Both	8.8	0.59	5
	~18	Both	12.2	0.69	5
	~19	LSF 1	14.7	0.81	5
IRTF 3 m/NSFCAM.....	~23	LSF 1	21.7	0.49	5
	1.3	LSF 1	0.9 (<i>z</i>)	<1.3 $\times 10^3$	6
	1.3	LSF 1	1.25 (<i>J</i>)	<1.0 $\times 10^3$	6
	1.3	LSF 1	1.65 (<i>H</i>)	<3.0 $\times 10^4$	6
IRTF 3 m/MIRLIN.....	1.3	LSF 1	2.13 (<i>K'</i>)	<1.0 $\times 10^4$	6
	1.3	LSF 1	10.8	0.36	6
	1.3	HD 155826	10.8	0.17	6
UKIRT/CGS3.....	5.5	HD 155826	7.5–13.5	0.45–0.40	2
	5.5	HD 155826	15.8–23.9	0.32–0.12	2
JCMT/UKT14.....	17	LSF 1	800	<8.3 $\times 10^4$	2
	19	LSF 1	1100	<2.2 $\times 10^4$	2

NOTE.—All quoted upper limits are 3σ , except for the IRTF values, which are 5σ . The estimated systematic errors on the quoted radiances are 20% (2σ).

REFERENCES.—(1) Mermilliod et al. 1987. (2) Sylvester et al. 1996. (3) Aumann 1985. (4) Walker & Wolstencroft 1988. (5) Egan & Price 1996. (6) This work.

objects separated by $7''.3$; indeed, in the 6.8–10.8 (*A*), 11.1–13.2 (*C*), and 13.5–15.9 μm (*D*) *MSX* bands, HD 155826 looks pointlike. The 18.2–25.1 μm *E*-band (21.34 μm) source looks elongated in one direction, but given the low signal-to-noise ratio (S/N) and the fact that this band has the least sampling, this is of low significance. The *IRAS* and *MSX* mid-IR fluxes for HD 155826 and LSF 1 are given in Table 1.

HD 155826 was observed on 1998 September 3 with the *Hubble Space Telescope* (*HST*) near-IR camera NICMOS as part of a survey program of Vega-like stars (*HST* Cycle 7N, program ID 7835). Coronagraphic mode observations were obtained in four filters (F165M, F171M, F180M, and F207M) with a full field of view $8''$ in extent. High sensitivity to low-contrast circumstellar flux or possible faint planetary companions was achieved by subtracting a reference point-spread function (PSF) star, similarly imaged to HD 155826, from the images. No evidence of light scattered from circumstellar material extended beyond the central PSF was found. While an object at a separation of $2''.75$ (P.A. = $321^\circ.28$) was detected, analysis of the filter photometry for this object indicated that it was not a brown dwarf but possibly a highly reddened field stellar object.

3.3. Stellar Photosphere

A composite SED of HD 155826 and LSF 1, derived from the quoted *IRAS* fluxes (Aumann 1985), the *MSX* Galactic

plane survey point-source fluxes (Egan et al. 1999), the optical–near-IR spectroscopy of HD 155826 by Sylvester et al. (1996), and our NSFCAM and MIRLIN observations, are shown in Figure 2*a*. Within the errors of the measurement, the “spectroscopic binary” does not have any significant infrared excess over that expected for a 6100 K stellar photosphere; the 0.63 Jy at 10.8 μm we find for HD 155826 is the flux expected for a $V = 6$, F7 V star. With no obvious extension of the main-sequence HD 155826 system, we assume that its SED longward of 11 μm is that expected for a normal stellar photosphere; no Vega-like dust disk is present. Sylvester et al. (1996) came to a similar conclusion using narrow field of view ($5''.5$ diameter) spectroscopic measurements of HD 155826. The “anomalous long-wavelength” excess previously attributed to circumstellar dust in HD 155826 is then, in fact, the flux emitted by the newly discovered object, which has no apparent optical or near-IR emission.

We have checked this assertion by searching in the SIMBAD archive and found the nearest known bright IR sources more than $2'$ distant from HD 155826. As the same amount of anomalous long-wavelength excess flux appears to have been detected by both the *IRAS* and *MSX* surveys within the errors of their measurements, we conclude that any “contaminating source” must be contained within the *IRAS* and *MSX* beams containing HD 155826. As the $30'' \times 60''$ spatial extent of our ground-based MIRLIN IR images extends well beyond 2 *MSX* resolution elements, we

Fig. 2.—(a) Composite IR SEDs for LSF 1, and HD 155826. The upper filled circle is the MIRCIN 10.8 μm flux for the new IR source, and the lower filled circle is the MIRCIN 10.8 μm flux for HD 155826. The open circles and crosses are the UKIRT photometric and spectral measurements of HD 155826 from Sylvester et al. (1996) and the optical photometry of Mermilliod (1986). The MSX and IRAS photometric observations are denoted by the open triangles and boxes, respectively. The filled triangle is the 8.8 μm MSX flux for the new source, after removal of the 6100 K photosphere contribution. (b) “Corrected” SED for the new source, after removal of the estimated HD 155826 flux. Also shown are two possible models for the source—the ISO spectrum of extreme carbon star 00210+6221 (Volk et al. 2000) scaled to the SED of LSF 1, and the SED for the unusual YSO HL Tau (Adams et al. 1988) scaled to LSF 1. Neither model is a perfect fit; the extreme carbon star model requires increased absorption by ISM silicates and a source of 60 μm flux, while the YSO model is highly deficient at 12–16 μm and should be detectable at J and K.

can safely assert that all the excess flux must be due to the one newly discovered object.

3.4. An Unusual Source

LSF 1 is somewhat peculiar. The huge IR/optical luminosity ratio demands that the new source be either cold, obscured by optically thick dust, at high redshift, or extremely reddened. The 10–60 μm SED is very flat, with spectral index $\alpha = 0.3$ for $\nu F_\nu \propto \nu^\alpha$. Assuming that LSF 1 and HD 155826 are associated, the 1.3 FWHM PSF diameter at 10 μm implies that any unresolved source at the 31 pc distance of HD 155826 should be 40 AU or less in size. The 7.3 separation corresponds to a distance from HD 155826 to LSF 1 of ~ 200 AU. A fit to the IRAS 12–60 μm fluxes

yields a color temperature of ~ 220 K and a lower size limit of ~ 2 AU, assuming an optically thick source with 1.3 Jy at 10 μm . Compared to Gliese 229B, the object is too large, bright, and cold to be a brown dwarf (estimated $T > 900$ K, estimated flux 0.001–1 mJy at 31 pc; Lunine et al. 1986; Matthews et al. 1996) and too large and hot to be a planet at 200 AU. In the absence of an entirely new class of body, we thus conclude that LSF 1 is most likely *not* associated with HD 155826. As HD 155826 has a high proper motion of ~ 0.4 yr $^{-1}$, we can also test the assumption of association between the two objects directly, by reimaging HD 155826 at 10 μm in 2–3 yr and measuring the separation between the two mid-IR sources.

If instead LSF 1 is extragalactic, a distant ultraluminous IR galaxy seen through the plane of the Milky Way is also a possibility, with the optical flux from the galaxy seen through large optical depth, $A_V = 20$. The optical flux observed for a collection of IR-bright galaxies with $f_{60} \sim 1$ Jy is below a few $\times 10^{-16}$ W m $^{-2}$, comfortably below our near-IR upper limits (Veilleux et al. 1999). However, the IRAS 12–25 and 25–60 colors for the new source are unlike any IR-bright galaxy in the literature; the general SED trend of decreasing flux from 12 to 100 μm is indicative of a system much warmer than the 10–30 K temperatures common in intragalactic material (Tran et al. 2001). This result is not surprising, given that Occam’s razor suggests that any object located within 12° of the Galactic center and less than 7' from the Galactic plane, where the angular density of Galactic stars is maximal, is associated with the Milky Way.

Assuming LSF 1 is Galactic but much farther than 31 pc, we can still make some statements with respect to its identity. At low redshift and moderate reddening, the central source must be either very extended and cold or totally obscured by other cold, extended material. At $T \sim 220$ K and source angular diameter $\theta < 2''$, the new source is too small, hot, and blue to be cirrus ($T \sim 15$ and 175 K for the best two-component model, $\theta > 3'$; Paley et al. 1991; Verter & Rickard 1998; Herbstmeier et al. 1998), and too cold and bright to be a brown dwarf ($T > 900$ K; Lunine et al. 1986; Matthews et al. 1996).

The most likely candidate object is a carbon star with an optically thick shell of circumstellar material. With more than 6000 known carbon stars (D. Backman 2000, private communication; Volk et al. 2000), detection of a new carbon star in the Galactic plane is very probable. We expect an extreme carbon star to demonstrate silicate absorption due to ISM dust grains from 8 to 10 μm , a strong emission feature due to SiC at 11.3 μm , an excess above graybody at $25 < \lambda < 35$ μm , an optical flux $V < 16$, and radio emission due to CO and CN. LSF 1 has an SED qualitatively similar to that of an extreme carbon star; there is evidence for a strong 11.3 μm emission feature and a 25–35 μm excess (Fig. 2b). CO has also been reported in the direction of HD 155826 by Walker & Wolstencroft (1988). However, the 8–25 μm absolute flux level of the new source is about a factor of 10 less than expected for an extreme carbon star from Volk et al. (2000), while the 60 μm flux is only about a factor of 2–3 less, proportionately much larger than expected. Assigning 90% of the IRAS 12 μm flux and all of the 25 and 60 μm flux to the new source, the location of the new source in the [12]–[25] versus [25]–[60] IRAS color-color plot of Cohen et al. (1989) is still far from the region of C-rich stars.

If the new source is a carbon star, then it is more distant and more reddened than the “typical” carbon star, and

should show an extremely pronounced silicate absorption. To match our observed difference spectrum for the new source, the model spectrum of 00210 + 6221 in Figure 2*b* was normalized for a source 4 times farther away, or at ~ 10 kpc distance. From 6 to 25 μm , the increase in interstellar reddening for such a distant source is only significant above the error of the measurements in the 8–13 μm absorption band of interstellar silicates, e.g., an additional 0.65 mag of extinction at 8.3 μm and 0.51 mag at 10.8 μm . The factor of ~ 2 decrease is in qualitative agreement with the difference between the observed flux and the model flux of 00210 + 6221 (Fig. 2*b*). The increased reddening versus the nearby carbon stars can thus easily explain the model over-prediction of the 8 and 10 μm fluxes. We note that finding a new carbon star near the Galactic center with its higher stellar density is entirely reasonable. Follow-up observations of the new IR source at 8–40 μm and $R > 20$ spectral resolving power with instruments like the *SIRTF* IRS or the *SOFIA* FORCAST should be able to detect the expected pronounced 6–40 μm carbon star spectral features.

The possibility that LSF 1 might be a protostellar system or YSO must also be considered. The stellar appearance and flux level of the new source could easily be explained by such a source. Following the classification scheme of Lada (1988), we consider the three classes of YSOs in turn. The relatively flat spectrum found for the new IR source is unlike the highly embedded Class I YSOs (e.g., GL 4176 and GL 4182; Persi et al. 1986), with spectra composed of condensed sources with color temperatures typically ~ 500 –2000 K, embedded in bright, extended 50–100 K material. The observed SED is similar to some of the more unusual spectra found for the relatively exposed Class II YSOs (e.g., HL Tau), typically found with optical T Tauri counterparts and circumstellar disks emerging from the surrounding nebula (Lada 1991; Fig. 2*b*). The distance to an HL Tau-like object that best matches our observed difference spectrum in Figure 2*b*, 0.33 kpc, is only twice the distance (160 pc) to HL Tau itself and is thus entirely plausible; interstellar reddening should not be a factor for such a close object. The new source spectrum is unlike the Class III IR spectra (Lada & Wilking 1984) of the classical bright, exposed T Tauri stars with reddened stellar photospheres.

The lack of any detected extension or an optical counterpart argues against a Class II YSO, as does the SED maxi-

mum at 10 μm , although a number of objects without optical counterparts have been found in the *IRAS* PSC (Yun & Clemens 1995). The CO found by Walker & Wolstencroft (1988) in the direction of HD 155826 is expected for such a Class II YSO (e.g., HL Tau; Sargent & Beckwith 1987). A YSO model does explain naturally the huge 60 μm flux found for the new source, unlike any other model we can propose, unless we assume yet another optically faint, cold IR source contaminating the *IRAS* 60 μm field (which may be possible, as the effective aperture at 60 μm is more than twice the aperture at 12 and 25 μm ; see Table 1) or a very reddened, distant source. Combined with medium resolution 6–40 μm spectroscopy, a deep search for an optical counterpart, to be conducted in the near future, will be conclusive in determining the veracity of this model.

4. CONCLUSIONS

In conclusion, we have detected a new IR-bright and optically faint source, LSF 1, within 7'' of the spectroscopic binary system HD 155826 using the NASA/IRTF and Keck telescopes. It is not clear if LSF 1 is associated with HD 155826, but repeated observations of the high proper motion HD 155826 system should resolve this issue. Neither HD 155826 nor the new IR source show any extension at 10.8 μm attributable to a surrounding dusty debris disk; neither is likely to be a Vega-like system. LSF 1 is extremely red and is most probably either an extreme carbon star at ~ 10 kpc distance or, less likely, a Class II YSO at ~ 0.33 kpc distance. A good high-resolution mid-IR spectrum of the new source will determine if it is a carbon star, while a deep optical search down to $V \sim 28$ will determine if there is any T Tauri optical counterpart to a Class II YSO.

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