



10837 - Establishing the Nature of a Mysterious Evolved Star, HD179821

Cycle: 15, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

<i>Visit</i>	<i>Targets</i>	<i>Configurations</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
01	(1) HD179821	WFPC2	1	16-May-2006 21:15:28.0	yes

1 Total Orbits Used

ABSTRACT

We propose to reobserve the spherical circumstellar shells of an evolved star, HD 179821. The nature of this object, whether it is an intermediate-mass post-asymptotic giant branch star or a massive super-giant, has been debated over years. The past investigations scrutinized the properties of the object and its circumstellar shells. This enigmatic object possesses characteristics of a post-AGB star and a yellow hyper-giant, and there is no evidence that unambiguously defines the nature of this object. The circumstellar shell of HD 179821 was imaged in the previous WFPC2 observations during cycle 6, and its multiple concentric arcs extending out to about 8 arcsec were revealed. The purpose of the proposed HST observations is to obtain the second-epoch images of this source and perform proper-motion measurements of the shells in order to directly determine the distance to this object, thereby establishing its incredibly elusive nature once and for all. It has been nearly 10 years since the last observations. Given the object's rather high expansion velocity of 34 km/s, the expected angular expansion is 72 milli-arcsec if the object is located at 1 kpc and 12 milli-arcsec if 6 kpc. These values are well above the smallest material motion we can measure, 2 to 3 milli-arcsec, in our methodology that has

been proven in our recent proper-motion measurements on a proto-planetary nebula, the Egg Nebula, using the archived HST/NICMOS near-IR continuum data. We estimate that the new distance measurement is of about 10% error. Once we obtain the distance to HD 179821, we will construct a radiative transfer model of the object to constrain physical parameters of the star and shells with a greater certainty. Then, we can confront theories of the stellar evolution with the newly obtained revelation. In addition, we can examine if all shells are moving at the same speed, since there are multiple shells around HD 179821. It is typically assumed that the expansion of the circumstellar shells is constant over the lifetime of the nebula. Our results will immediately test the validity of this one of the most fundamental assumptions in the stellar outflows.

OBSERVING DESCRIPTION

We request one orbit, with which we will repeat the WFPC2/F547M observations of GO-06737. The original observations (GO-6737) consisted of a set of observations with three distinct exposure times (0.11 sec, 4.0 sec and 30 sec) using 3-point linear dithering. While the long exposure frames help to maximize the dynamic range needed to detect faint shell structures, the short exposure frames allow to recover information in saturated pixels affected by the bright central star and/or cosmic rays. We will use a 3-point linear dither pattern with non-integer-pixel shifts with 4.0 and 30.0 sec exposure times. While we execute the 4.0-sec exposure only once, we repeat the 30.0-sec exposure 5 times to maximize the dynamic range. ATD-GAIN=15 is used to mitigate the effects due to the bright central star as the previous observations. By dithering the exposures, we can not only remove cosmetic defects, but also drizzle the image into higher resolution. Drizzling will also help to put the two-epoch data in the same spatial resolution, so that we can determine proper motions of the nebula relatively easily. We need to specify ORIENT in order for the WFPC2 chevron to cover approximately the same sky as the previous observations so that we can use field stars in the WF2-4 FoV's for geometric registration.

Proposal 10837 - Visit 01 - Establishing the Nature of a Mysterious Evolved Star, HD179821

Wed May 17 01:15:32 GMT 2006

Visit		Proposal 10837, Visit 01 Diagnostic Status: No Diagnostics Scientific Instruments: WFPC2 Special Requirements: ORIENT 156.1206D TO 186.1206 D								
Patterns	#	Primary Pattern		Secondary Pattern		Exposures				
	(1)	Pattern Type=LINE Purpose=DITHER Number Of Points=3 Point Spacing=0.341 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=25.6 Angle Between Sides= Center Pattern=false			(1-2)				
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	HD179821 Alt Name1: IRAS19114+0002 Alt Name2: GSC00463-03866	RA: 19 13 58.6092 (288.4942050d) Dec: +00 07 31.93 (.12554d) Equinox: J2000		V=8.12	Reference Frame: ICRS				
<i>Comments: oxygen rich post-AGB or yellow supergiant star with 4" dust shell</i>										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	(1) HD179821	WFPC2, IMAGE, PC1-FIX	F547M	ATD-GAIN=15			Pattern 1-2 (1)	4.0 Secs [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[1]
2	(1) HD179821	WFPC2, IMAGE, PC1-FIX	F547M	ATD-GAIN=15			Pattern 1-2 (1)	30.0 Secs X 5 [==>(Pattern 1, Copy 1)] [==>(Pattern 1, Copy 2)] [==>(Pattern 1, Copy 3)] [==>(Pattern 1, Copy 4)] [==>(Pattern 1, Copy 5)] [==>(Pattern 2, Copy 1)] [==>(Pattern 2, Copy 2)] [==>(Pattern 2, Copy 3)] [==>(Pattern 2, Copy 4)] [==>(Pattern 2, Copy 5)] [==>(Pattern 3, Copy 1)] [==>(Pattern 3, Copy 2)] [==>(Pattern 3, Copy 3)] [==>(Pattern 3, Copy 4)] [==>(Pattern 3, Copy 5)]	[1]	

