11976 - Particle separation in and expansion of the dust arcs of the young star V1331 Cyg

Cycle: 16, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) V-V1331-CYG	WFPC2	4	27-Jan-2009 21:10:53.0	yes

4 Total Orbits Used

ABSTRACT

HST-WFPC2 imaging of the young star V1331 Cyg revealed several dust arcs seen in scattered light which were caused by short-lived strong winds arising from FU Ori-like outbursts. Most notably the brightest outer arc is encircled by an expanding CO ring which implies that the otherwise extremely well mixed gas and dust components were separated according to particle mass. This is presumably due to the dependence of the wind ram pressure on the ratio of particle cross section and mass as well as the brief acceleration period. Thus, we suspect that a FU Ori outburst acts as a cosmic mass spectrometer. In order to verify this hypothesis, we apply for 2nd epoch imaging to reveal the color gradient across the bright dust arc which will be induced by the grain sorting. Furthermore, the current imagery will allow us to prove directly the expansion of the arc by measuring its

proper motion. The proposed observations represent new diagnostics for what concerns studies of young stellar objects.

OBSERVING DESCRIPTION

Our observations are focused on two science goals: measuring the outward proper motion of the shell seen between radii of 10 to 16 arcsec from the star, and measuring its broadband colors to constrain the dust sorting process by the wind. The first goal requires deep imaging in the F606W filter in the WF3 camera, for direct comparison with the epoch 2000 WFPC2 observations. Two 1100s CR-SPLIT exposures will provide enhanced sensitivity over the 1st epoch observations. Thus, the astrometric accuracy is primarily limited by the archival data. In order to register the 1st and 2nd epoch frames, we will use the six faint stars covered by the WF3 FOV.

We require images in at least two broad-band filters in order to measure colors of the reflection nebulosity. These should be over as broad a color baseline as possible in order to provide the greatest leverage on the dust scattering properties, which in turn constrain the grain sorting properties of the wind. The WFPC2 F814W and F450W filters will be used. Two 1100s CR-SPLIT F814W exposure will fill out the second orbit. With the star's B-V color of 0.8mag (Herbig and Bell 1988) and the reduced throughput at F450W, another two orbits will be devoted to obtain two 2300s exposures in F450W. Extrapolating from the existing F606W image, this strategy will yield a S/N>5 in each WF3 pixel on the extended shell, and S/N of 10 or better in F606W and F814W. 2x2pixel rebinning will be employed in the measurements of color gradients in the shell.

Short exposures in each filter will be used to centroid the images.

V1331 Cyg is near the CVZ, with some visibility all year long (modulo the moon).

Visit

Proposal 11976, Visit 01, implementation Wed Jan 28 02:10:58 GMT 2009

Diagnostic Status: No Diagnostics

Scientific Instruments: WFPC2

Special Requirements: (none)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	V-V1331-CYG	RA: 21 01 9.2100 (315.2883750d)		V=11.8	Reference Frame: ICRS
	Alt Name1: HBC302	Dec: +50 21 44.80 (50.36244d)			
	Alt Name2: GSC03596-00959	Equinox: J2000			

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.This object was generated by the targetselector and retrieved from the SIMBAD database.

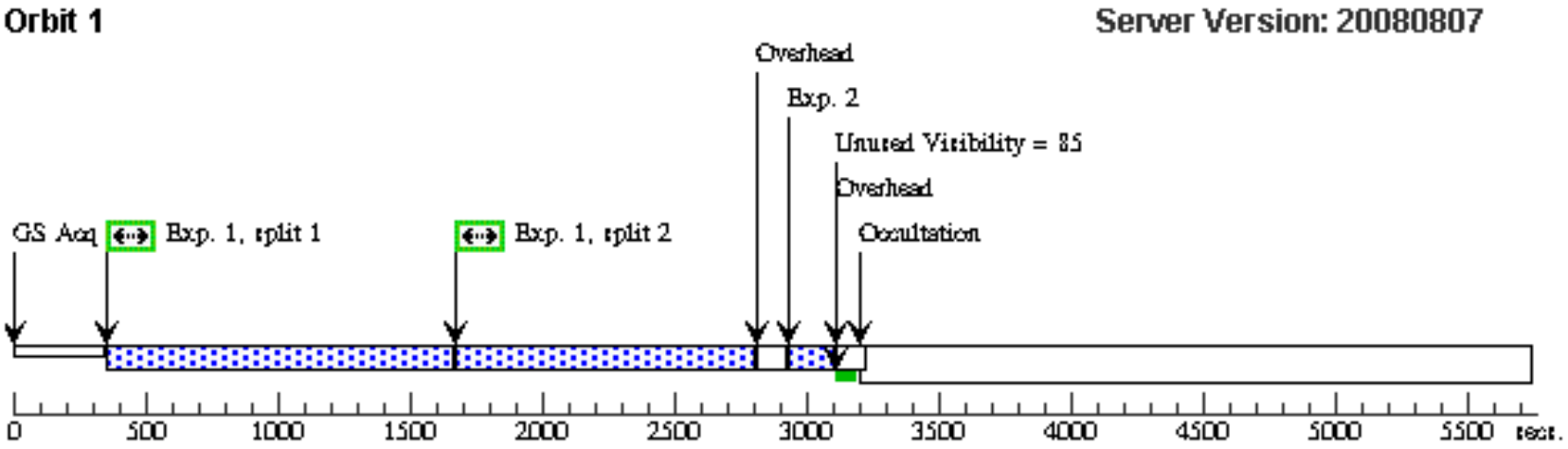
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) V-V1331-CYG	WFPC2, IMAGE, WF3	F606W	CLOCKS=YES; ATD-GAIN=7; CR-SPLIT=0.5; CR-TOLERANCE=0			2300 Secs *[==>1100.0 Secs (Split 1)]* *[==>1100.0 Secs (Split 2)]*	***[1]***
Comments: STAR WILL BE SATURATED.									
2		(1) V-V1331-CYG	WFPC2, IMAGE, WF3	F606W	CLOCKS=YES; ATD-GAIN=15; CR-SPLIT=NO			3 Secs *[==>]*	***[1]***
3		(1) V-V1331-CYG	WFPC2, IMAGE, WF3	F814W	CLOCKS=YES; ATD-GAIN=7; CR-SPLIT=0.5; CR-TOLERANCE=0			2300 Secs *[==>1100.0 Secs (Split 1)]* *[==>1100.0 Secs (Split 2)]*	***[2]***
Comments: STAR WILL BE SATURATED.									
4		(1) V-V1331-CYG	WFPC2, IMAGE, WF3	F814W	CLOCKS=YES; ATD-GAIN=15; CR-SPLIT=NO			3 Secs *[==>]*	***[2]***
5		(1) V-V1331-CYG	WFPC2, IMAGE, WF3	F450W	CLOCKS=YES; ATD-GAIN=7; CR-SPLIT=NO			2300 Secs *[==>2300.0 Secs]*	***[3]***
Comments: STAR WILL BE SATURATED.									
6		(1) V-V1331-CYG	WFPC2, IMAGE, WF3	F450W	CLOCKS=YES; ATD-GAIN=15; CR-SPLIT=NO			7 Secs *[==>]*	***[3]***

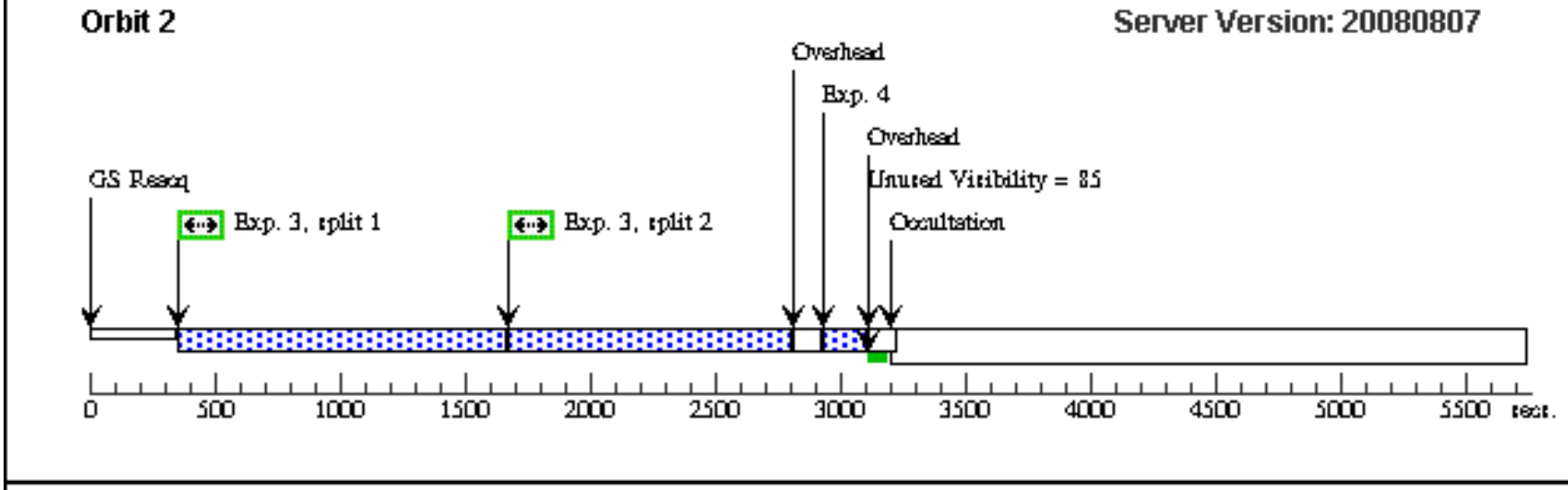
Exposures (continued)

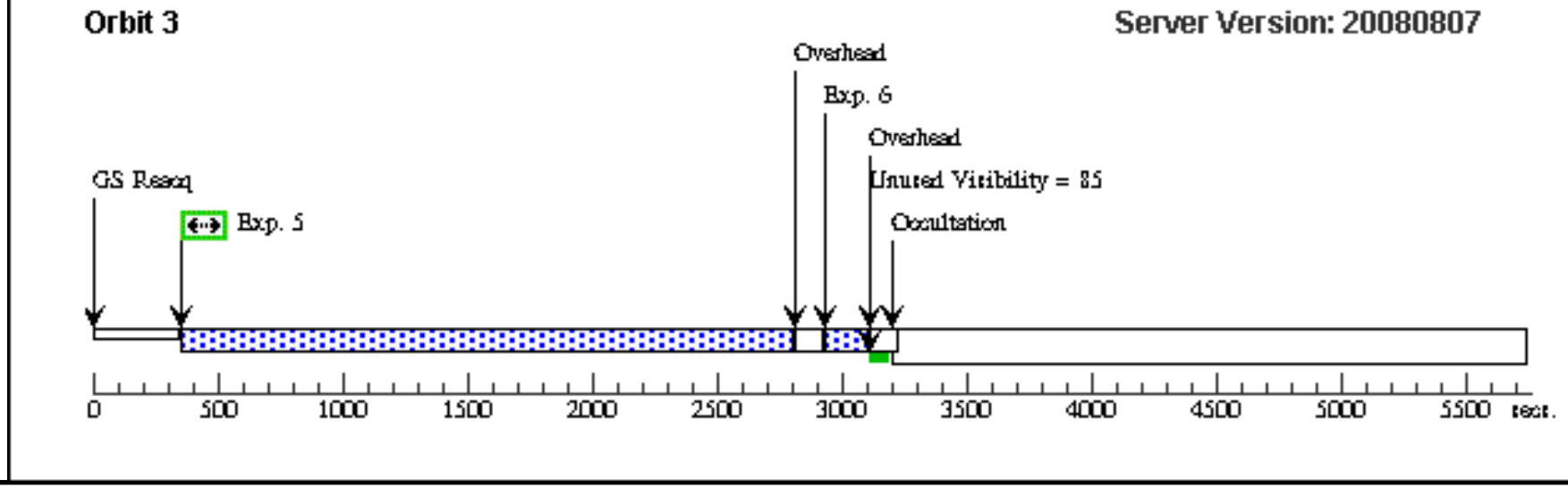
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
7		(1) V-V1331-CYG	WFPC2, IMAGE, WF3	F450W	CLOCKS=YES; ATD-GAIN=7; CR-SPLIT=NO			2300 Secs *[==>2300.0 Secs]*	 ***[4]***
Comments: STAR WILL BE SATURATED.									
8		(1) V-V1331-CYG	WFPC2, IMAGE, WF3	F450W	CLOCKS=YES; ATD-GAIN=15; CR-SPLIT=NO			7 Secs *[==>]*	 ***[4]***

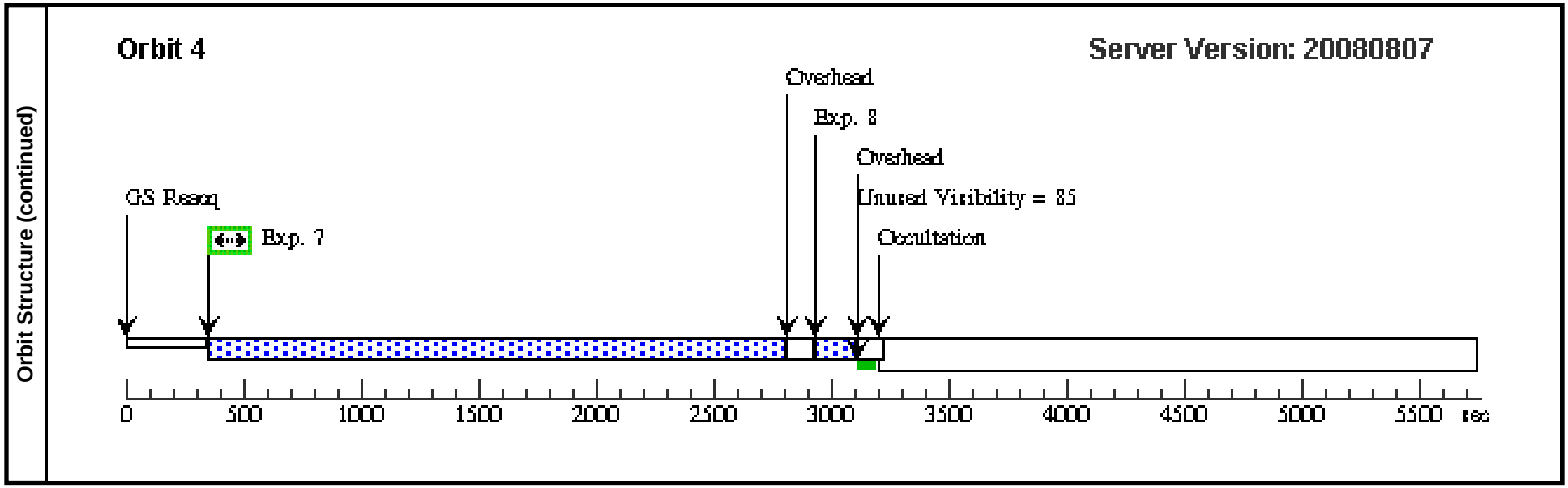
Orbit Structure



Orbit Structure (continued)






Orbit Structure (continued)
Orbit 4
Server Version: 20080807
Overhead
Exp. 8
Overhead
Unused Visibility = 85
GS Reacq
Exp. 7
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec