10914 - HST Observations of Astrophysically Important Visual Binaries

Cycle: 15, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

Visit	*Targets*	*Configurations*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) PROCYON	WFPC2	1	15-Jun-2006 21:14:15.0	yes
02	(2) MU-CAS	WFPC2	1	15-Jun-2006 21:14:22.0	yes

2 Total Orbits Used

ABSTRACT

This is a continuation of a project begun in Cycle 7 and continued up through Cycle 14. The program consists of annual FGS or WFPC2 observations of three visual binary stars that will yield fundamental astrophysical results, once their orbits and masses are determined.

Our targets are the following: (1) Procyon (P = 40.9 yr), for which our first WFPC2 images yielded an extremely accurate angular separation of the bright F star and its much fainter white-dwarf companion. Combined with ground-based astrometry of the bright star, our observation significantly revised downward the derived masses, and brought Procyon A into much better agreement with theoretical evolutionary masses for the first time. With the continued monitoring proposed here, we will obtain masses to an accuracy of better than 1%, providing a testbed for theories of both Sun-like stars and white dwarfs. (2) G 107-70, a close double white dwarf (P = 18.5 yr) that promises to add two accurate masses to the tiny handful of white-dwarf masses that are directly known from dynamical measurements. (3) Mu Cas (P = 20.8 yr), a famous nearby metal-deficient G dwarf for which accurate masses will lead to the stars' helium contents, with cosmological implications. For all three stars, we will also be setting increasingly stringent limits on the presence of planetary-mass bodies in the systems.

OBSERVING DESCRIPTION

In Cycle 15 we will obtain direct images with WFPC2 of Procyon and Mu Cas. The WFPC2 filters have
been chosen appropriately for each target. We will devote one orbit of dithered imaging to each of the two targets.

Visit

Proposal 10914, Visit 01 Fri Jun 16 01:14:26 GMT 2006

Diagnostic Status: No Diagnostics

Scientific Instruments: WFPC2

Special Requirements: ORIENT 288.0D TO 315.2 D; ORIENT 328.8D TO 45.2 D; BETWEEN 15-OCT-2006:00:00:00 AND 05-DEC-2006:00:00:00

Comments: ORIENT requirement is done so that companion star will not lie near diffraction spikes or bleeding columns from the very bright primary star.

Fixed Targets

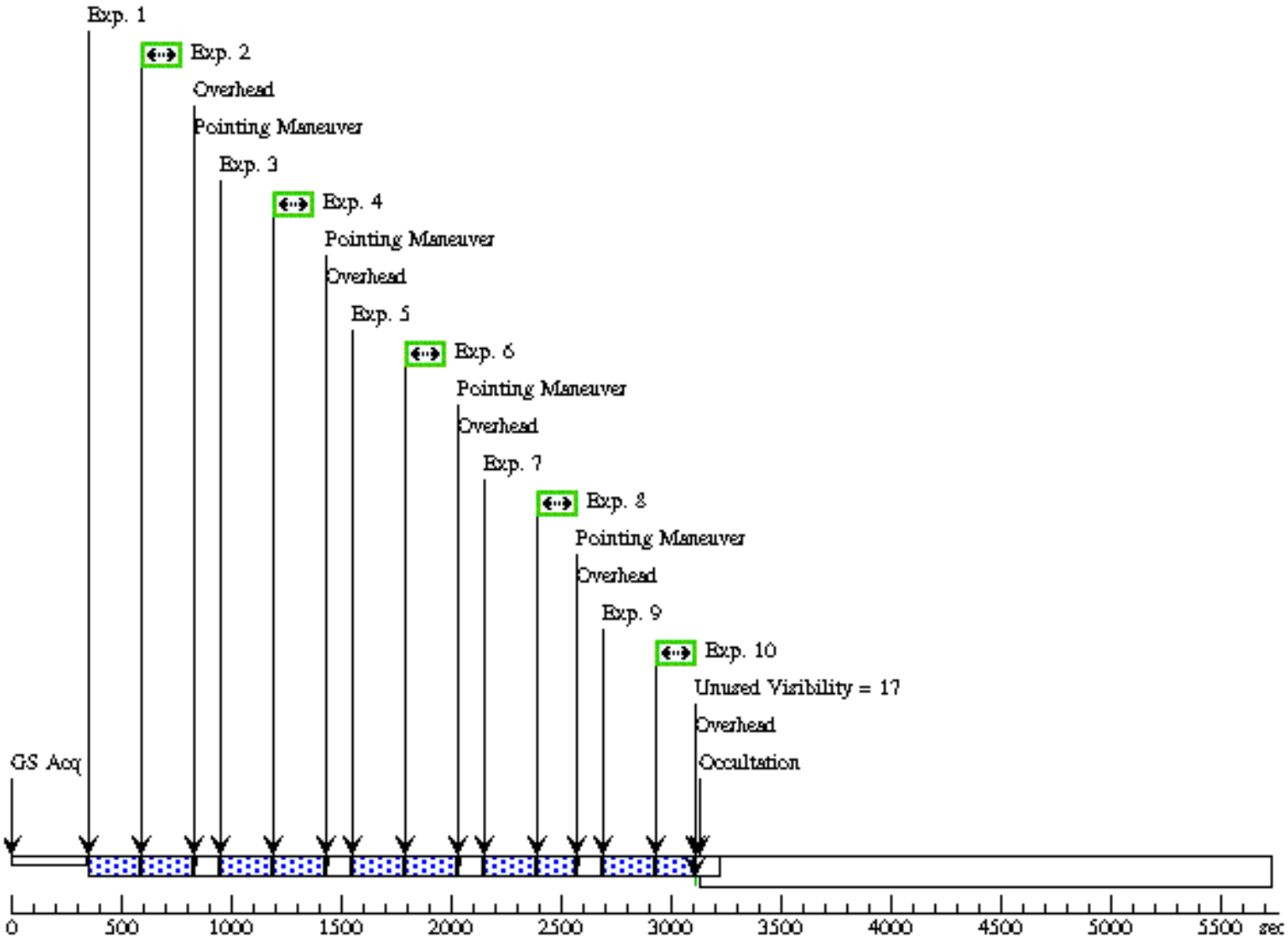
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	PROCYON	RA: 07 39 18.3700 (114.8265417d)	Proper Motion RA: -0.04755s/yr	V=0.36+/-0.0	Reference Frame: ICRS
	Alt Name1: ALPHA-CMI	Dec: +05 13 35.50 (5.22653d)	Proper Motion Dec: -1.0229"/yr	B-V = 0.42	
	Alt Name2: HR2943	Equinox: J2000	Parallax: 0.283"		
			Epoch of Position: 1995.18		

Comments: Coords are for center of gravity of binary. Accuracy confirmed by 2000 Nov 28 WFPC2 observations. 6/14/06: updated to ICRS system using galex website.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	10	(1) PROCYON	WFPC2, IMAGE, PC1	F218W	ATD-GAIN=15	POS TARG 0,0		0.11 Secs	
								[==>]	***[1]***
2	20	(1) PROCYON	WFPC2, IMAGE, PC1	F218W	ATD-GAIN=15; CLOCKS=YES	SAME POS AS 1		200.0 Secs	
								[==>]	***[1]***
3	30	(1) PROCYON	WFPC2, IMAGE, PC1	F218W	ATD-GAIN=15	POS TARG -0.659,-0.659		0.11 Secs	
								[==>]	***[1]***
4	40	(1) PROCYON	WFPC2, IMAGE, PC1	F218W	ATD-GAIN=15; CLOCKS=YES	SAME POS AS 3		200.0 Secs	
								[==>]	***[1]***
5	50	(1) PROCYON	WFPC2, IMAGE, PC1	F218W	ATD-GAIN=15	POS TARG -0.421,-0.375		0.11 Secs	
								[==>]	***[1]***
6	60	(1) PROCYON	WFPC2, IMAGE, PC1	F218W	ATD-GAIN=15; CLOCKS=YES	SAME POS AS 5		200.0 Secs	
								[==>]	***[1]***
7	70	(1) PROCYON	WFPC2, IMAGE, PC1	F218W	ATD-GAIN=15	POS TARG -0.318,-0.477		0.11 Secs	
								[==>]	***[1]***
8	80	(1) PROCYON	WFPC2, IMAGE, PC1	F218W	ATD-GAIN=15; CLOCKS=YES	SAME POS AS 7		200.0 Secs	
								[==>160.0 Secs]	***[1]***
9	90	(1) PROCYON	WFPC2, IMAGE, PC1	F218W	ATD-GAIN=15	POS TARG -0.568,-0.273		0.11 Secs	
								[==>]	***[1]***
10	100	(1) PROCYON	WFPC2, IMAGE, PC1	F218W	ATD-GAIN=15; CLOCKS=YES	SAME POS AS 9		160.0 Secs	
								[==>]	***[1]***

Orbit Structure



Visit

Proposal 10914, Visit 02 Fri Jun 16 01:14:26 GMT 2006

Diagnostic Status: No Diagnostics

Scientific Instruments: WFPC2

Special Requirements: ORIENT 164.0D TO 222.0 D; ORIENT 254.0D TO 312.0 D; ORIENT 344.0D TO 42.0 D; ORIENT 74.0D TO 132.0 D; BETWEEN 25-SEP-2006:00:00:00 AND 01-DEC-2006:00:00:00

Comments: ORIENT requirement is done so that companion star will not lie near diffraction spikes of primary star.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	MU-CAS	RA: 01 08 16.3700 (17.0682083d)	Proper Motion RA: 0.3972s/yr	V=5.15+/-0.0	Reference Frame: ICRS
	Alt Name1: HR321	Dec: +54 55 13.20 (54.92033d)	Proper Motion Dec: -1.596"/yr	B-V = 0.70	
	Alt Name2: HD6582	Equinox: J2000	Parallax: 0.134"		
			Epoch of Position: 2000.0		

Comments: Coordinate accuracy confirmed by 2000-01 WFPC2 observations. 6/14/06: updated to ICRS system using galex website.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	1	(2) MU-CAS	WFPC2, IMAGE, PC1	F953N	ATD-GAIN=15; CLOCKS=YES	POS TARG 0,0		1.0 Secs X 3 *[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]*	***[1]***
2	2	(2) MU-CAS	WFPC2, IMAGE, PC1	F953N	ATD-GAIN=15; CLOCKS=YES	POS TARG -0.659,-0.659		1.0 Secs X 3 *[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]*	***[1]***
3	3	(2) MU-CAS	WFPC2, IMAGE, PC1	F953N	ATD-GAIN=15; CLOCKS=YES	POS TARG -0.318,-0.477		1.0 Secs X 3 *[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]*	***[1]***
4	4	(2) MU-CAS	WFPC2, IMAGE, PC1	F953N	ATD-GAIN=15; CLOCKS=YES	POS TARG -0.568,-0.273		1.0 Secs X 4 *[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]*	***[1]***
Comments: Here we take one extra exposure to use up the orbit									
5	5	(2) MU-CAS	WFPC2, IMAGE, PC1	F953N	ATD-GAIN=15; CLOCKS=YES	POS TARG -0.421,-0.375		1.0 Secs X 4 *[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]*	***[1]***
Comments: Here we take one extra exposure to use up the orbit									

Orbit Structure