10900 - Optical polarimetry of PSR B0540-69 and its synchrotron nebula.

Cycle: 15, 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) OBJ-054011-691955	WFPC2	3	12-Sep-2007 21:00:57.0	yes
02	(1) OBJ-054011-691955	WFPC2	1	12-Sep-2007 21:01:02.0	yes
03	(1) OBJ-054011-691955	WFPC2	1	12-Sep-2007 21:01:04.0	yes
04	(1) OBJ-054011-691955	WFPC2	1	12-Sep-2007 21:01:06.0	yes

6 Total Orbits Used

ABSTRACT

Polarization measurements of pulsars and of their synchrotron nebulae are uniquely able to provide deep insights into the highly magnetized relativistic environment of young rotating neutron stars. Apart from the radio band, pulsar polarization is best measured in the optical, for the rare cases of detectable optical emission. One of the brightest pulsars together with Crab (PSR B0531+21) and Vela (PSR B0833-45), for which optical polarization measurements support the newly developed two-pole caustic model (TPC), is PSR B0540-69 in the Large Magellanic Clouds, often referred as the Crab Twin for their overall similarities in both age and energetics. Together with the Crab, PSR B0540-69 is also the only pulsar embedded in a synchrotron nebula visible at optical wavelengths. We plan to observe PSR B0540-69 and its compact nebula (4 arcsec diameter) with the Advanced Camera for Surveys (ACS) and the Wide Field Channel (WFC) detector using UV and visual polarization filters. Thanks to the superb angular resolution of ACS, these observations will allow us to spectacularly resolve the pulsar from its nebular background, providing the first firm measure of the pulsar polarization which will be crucial to assess, on a broader sample, the validity of the TPC model with respect to other pulsars magnetosphere models. These observations will also provide the first detailed polarization map of the nebula, including the jet and the torus seen in our previous WFPC2 images.

OBSERVING DESCRIPTION

We plan to perform deep, high resolution, polarization observations of the LMC pulsar PSR 0540-69 and its surrounding, compact, plerion with the ACS/HRC and the 606W filter. Shorter exposures with no polarized optics will be taken as well to compare the polarized and unpolarized maps of the plerion. Observations are split into three different visits, one visit of two orbits each.

Visit

Proposal 10900, Visit 01, completed Thu Sep 13 01:01:08 GMT 2007

Diagnostic Status: No Diagnostics

Scientific Instruments: WFPC2

Special Requirements: PCS MODE FINE

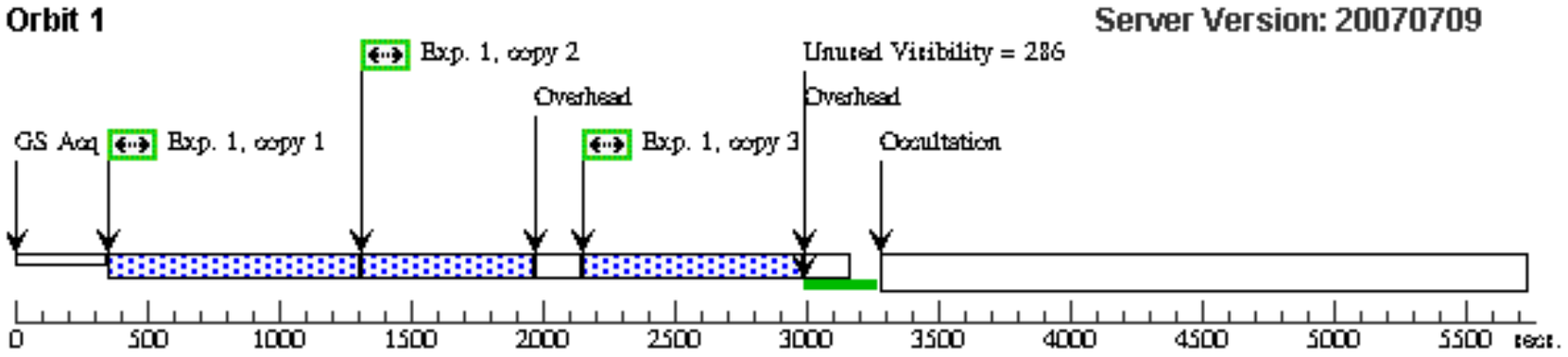
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	OBJ-054011-691955	RA: 05 40 11.0480 (85.0460333d) Dec: -69 19 55.18 (-69.33199d) Equinox: J2000		V=22.5+/-0.1	Reference Frame: ICRS

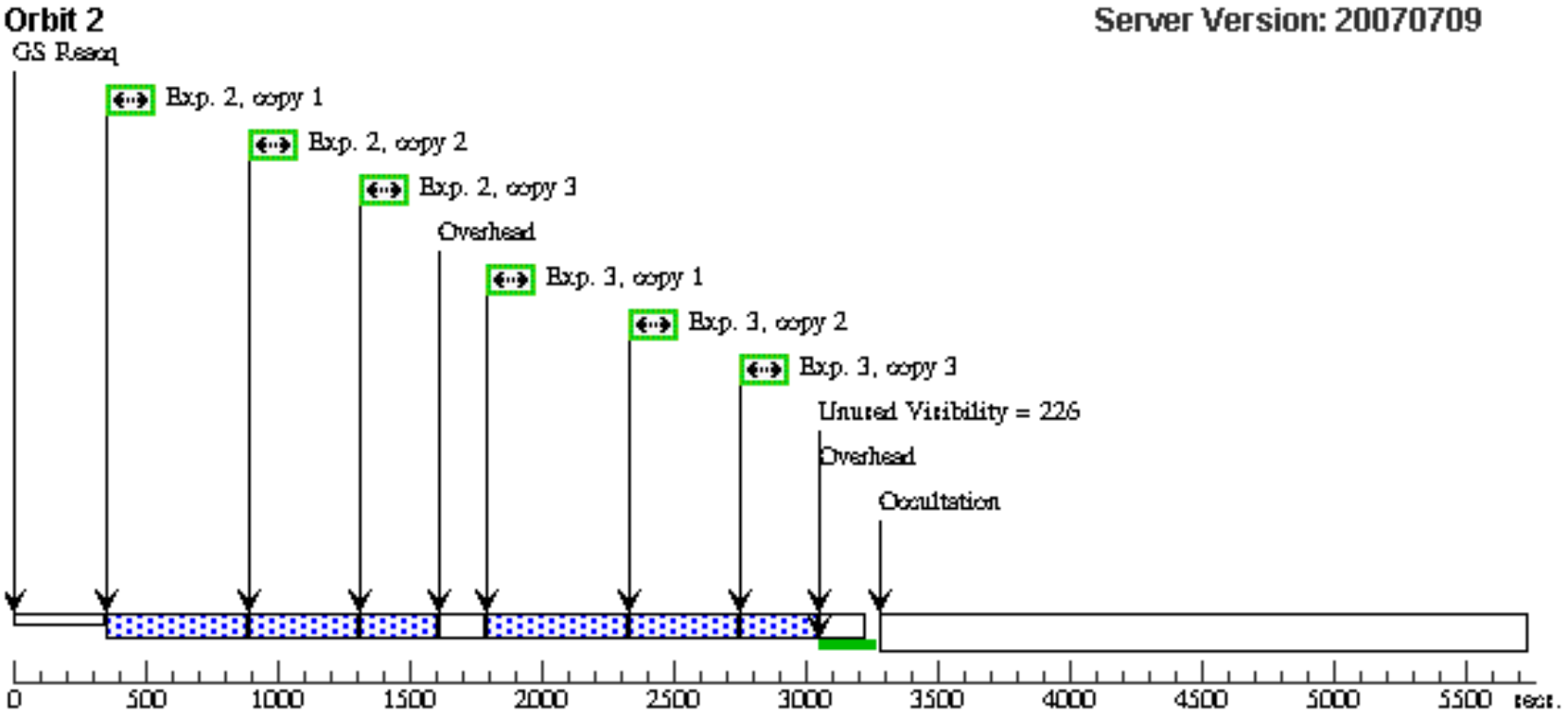
Exposures

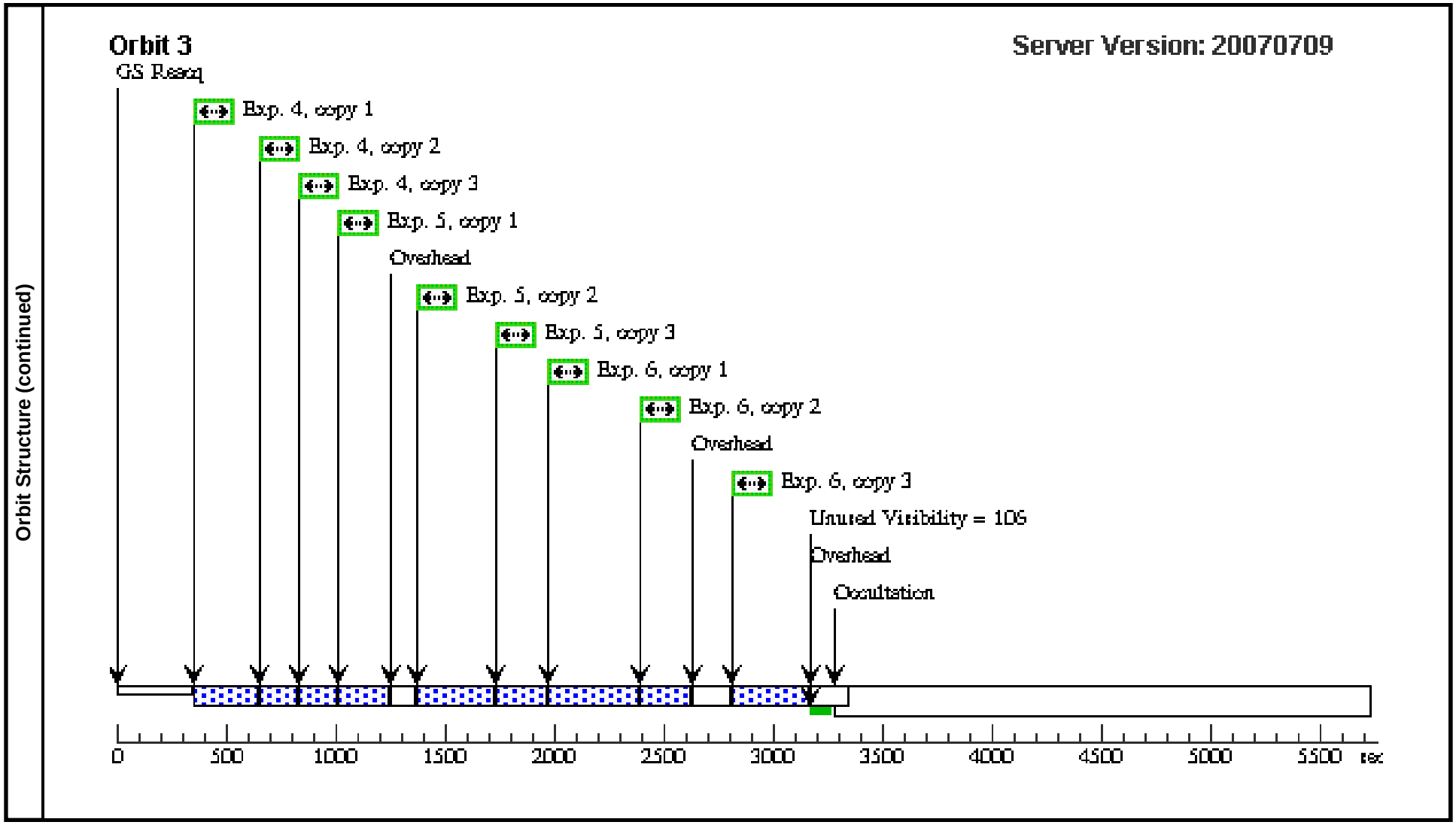
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) OBJ-054011-691955	WFPC2, IMAGE, PC1-FIX	F606W POLQ				600.0 Secs X 3 *[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]*	***[1]***
2		(1) OBJ-054011-691955	WFPC2, IMAGE, PC1-FIX	F336W				230.0 Secs X 3 *[==>260.0 Secs (Copy 1)]* *[==>260.0 Secs (Copy 2)]* *[==>260.0 Secs (Copy 3)]*	***[2]***
3		(1) OBJ-054011-691955	WFPC2, IMAGE, PC1-FIX	F450W				220.0 Secs X 3 *[==>260.0 Secs (Copy 1)]* *[==>260.0 Secs (Copy 2)]* *[==>260.0 Secs (Copy 3)]*	***[2]***
4		(1) OBJ-054011-691955	WFPC2, IMAGE, PC1-FIX	F555W				100.0 Secs X 3 *[==>100.0 Secs (Copy 1)]* *[==>100.0 Secs (Copy 2)]* *[==>100.0 Secs (Copy 3)]*	***[3]***
5		(1) OBJ-054011-691955	WFPC2, IMAGE, PC1-FIX	F675W				140.0 Secs X 3 *[==>140.0 Secs (Copy 1)]* *[==>140.0 Secs (Copy 2)]* *[==>140.0 Secs (Copy 3)]*	***[3]***
6		(1) OBJ-054011-691955	WFPC2, IMAGE, PC1-FIX	F814W				200.0 Secs X 3 *[==>200.0 Secs (Copy 1)]* *[==>200.0 Secs (Copy 2)]* *[==>200.0 Secs (Copy 3)]*	***[3]***

Orbit Structure



Orbit Structure (continued)




Orbit Structure (continued)
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Exp. 5, copy 1
Overhead
Exp. 5, copy 2
Exp. 5, copy 3
Exp. 6, copy 1
Exp. 6, copy 2
Overhead
Exp. 6, copy 3
Unused Visibility = 106
Overhead
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 10900, Visit 02, completed Thu Sep 13 01:01:10 GMT 2007

Diagnostic Status: No Diagnostics

Scientific Instruments: WFPC2

Special Requirements: PCS MODE FINE; ORIENT 45.0D TO 45.0D FROM 01

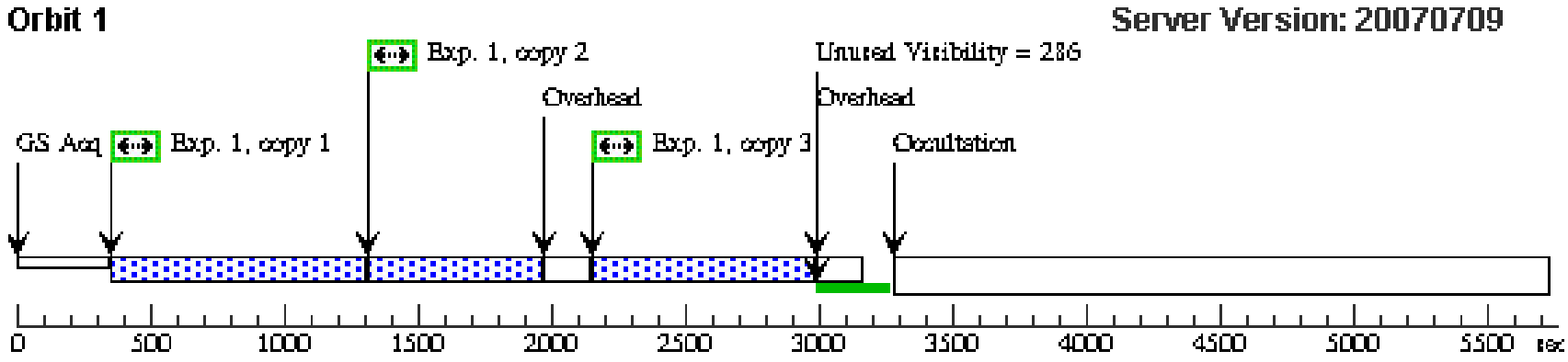
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	OBJ-054011-691955	RA: 05 40 11.0480 (85.0460333d) Dec: -69 19 55.18 (-69.33199d) Equinox: J2000		V=22.5+/-0.1	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) OBJ-054011-691955	WFPC2, IMAGE, PC1-FIX	F606W POLQ				600.0 Secs X 3 *[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]*	*[1]*

Orbit Structure



Visit

Proposal 10900, Visit 03, implementation Thu Sep 13 01:01:10 GMT 2007

Diagnostic Status: No Diagnostics

Scientific Instruments: WFPC2

Special Requirements: PCS MODE FINE; ORIENT 270.0D TO 270.0 D

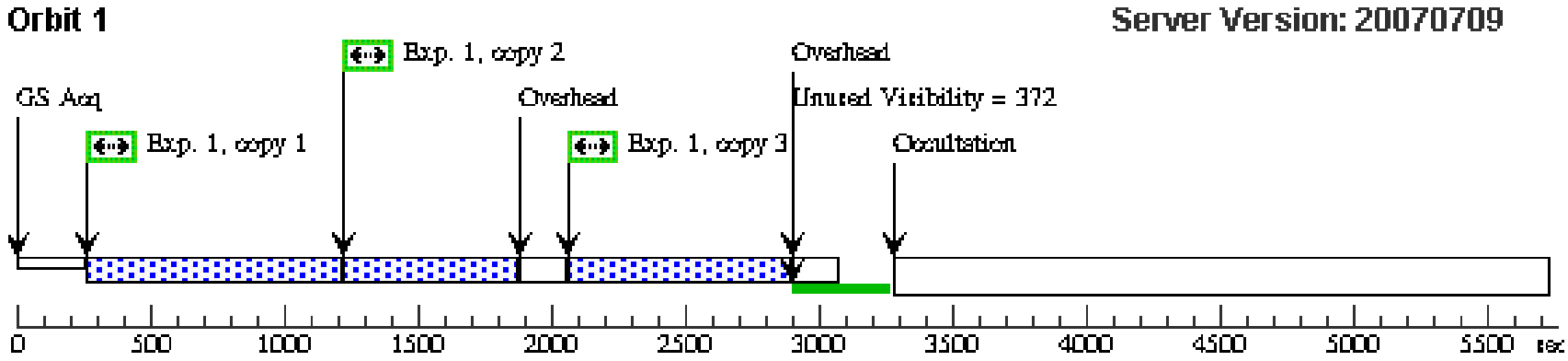
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	OBJ-054011-691955	RA: 05 40 11.0480 (85.0460333d) Dec: -69 19 55.18 (-69.33199d) Equinox: J2000		V=22.5+/-0.1	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) OBJ-054011-691955	WFPC2, IMAGE, PC1-FIX	F606W POLQ		GS ACQ SCENARIO SINGLE		600.0 Secs X 3 *[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]*	***[1]***

Orbit Structure



Visit

Proposal 10900, Visit 04, implementation Thu Sep 13 01:01:11 GMT 2007

Diagnostic Status: No Diagnostics

Scientific Instruments: WFPC2

Special Requirements: PCS MODE FINE; ORIENT 315.0D TO 315.0 D

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	OBJ-054011-691955	RA: 05 40 11.0480 (85.0460333d) Dec: -69 19 55.18 (-69.33199d) Equinox: J2000		V=22.5+/-0.1	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) OBJ-054011-691955	WFPC2, IMAGE, PC1-FIX	F606W POLQ				600.0 Secs X 3 *[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]*	*[1]*

Orbit Structure