12240 - ACS polarimetry of the Vela Pulsar Wind Nebula

Cycle: 18, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
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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) VELAPWN	ACS/WFC	4	10-Jul-2010 01:47:47.0	yes
02	(1) VELAPWN	ACS/WFC	3	10-Jul-2010 01:47:53.0	yes
03	(1) VELAPWN	ACS/WFC	3	10-Jul-2010 01:47:56.0	yes
04	(1) VELAPWN	ACS/WFC	3	10-Jul-2010 01:48:00.0	yes
05	(1) VELAPWN	ACS/WFC	3	10-Jul-2010 01:48:03.0	yes

16 Total Orbits Used

ABSTRACT

Observations of the Vela pulsar region with the Chandra X-ray observatory have revealed the fine structure of its synchrotron pulsar-wind nebula (PWN). Deep radio observations have also shown a large, highly polarized (~70%) radio nebula located further away from the pulsar. However, no firm optical detection of the Vela PWN has been reported yet. The detection of the extended emission in previous observations was hindered by the presence of a bright background due to SNR filaments and field stars. Since the degree of polarization in the optical should be similar to that observed in radio, we propose to use the ACS/WFC imaging polarimetry to detect the highly polarized optical emission from the Vela PWN. By

subtracting the images obtained with different polarizers we will eliminate the very weakly polarized background component and preserve the strongly polarized PWN emission. Polarimetry will allow us to determine the magnetic field structure inside the PWN. This approach has been successfully tested with ASC/WFC polarimetry of the Crab PWN. Detection of the optical nebula, combined with the radio and X-ray data, will establish the properties of the relativistic pulsar wind, including its energetics, magnetic field structure, spatial evolution and interaction with the ambient medium.

OBSERVING DESCRIPTION

The purpose of this proposal is to obtain polarization observations of the Vela synchrotron nebula in 5 visits with ACS/WFC. First visit consists of 4 orbits. During one of the orbits a CR-SPLIT image is obtained with F550M, an almost line-free continuum filter. This exposure will provide an image of the total intensity from the synchrotron nebula, with little contamination from emission-line filaments. The other three orbits obtain CR-SPLIT F606W images crossed with POL0V, POL60V, and POL120V. The "WFC1-2K" aperture is used with F550M, while the "WFC" aperture is used with F606W+POL0V, F606W+POL60V and F606W+POL120V. This should put the object at the same place on the WFC [reference pixel (3096,1024)] for all the four exposures. The remaining visits (2nd through the 5th) consist of 3 orbits each, with polarizing filters only (i.e. no imaging with F550M). The only special requirement is that the position and orientation be the same for each of the three polarizer images taken during each visit, which is needed to extract most reliable polarization information. We intentionally choose to point at RA=08 35 20.86, DEC=-45 10 44.90, i.e. 10" south of the Vela pulsar since optical synchrotron emission is expected to be brighter in this direction. We also request to schedule the visits as close to each other as possible since having similar Roll Angle values for all visits would simplify the analysis of the polarimetric data and provide more accurate results.

Visit

Proposal 12240, Visit 01 Sat Jul 10 05:48:07 GMT 2010

Diagnostic Status: Warning

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Diagnostics

(Visit 01) Warning (Orbit Planner): SAME POS MAY NOT BE APPROPRIATE

(Visit 01) Warning (Orbit Planner): SAME POS MAY NOT BE APPROPRIATE

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(Visit 01) Warning (Orbit Planner): SAME POS MAY NOT BE APPROPRIATE

Fixed Targets

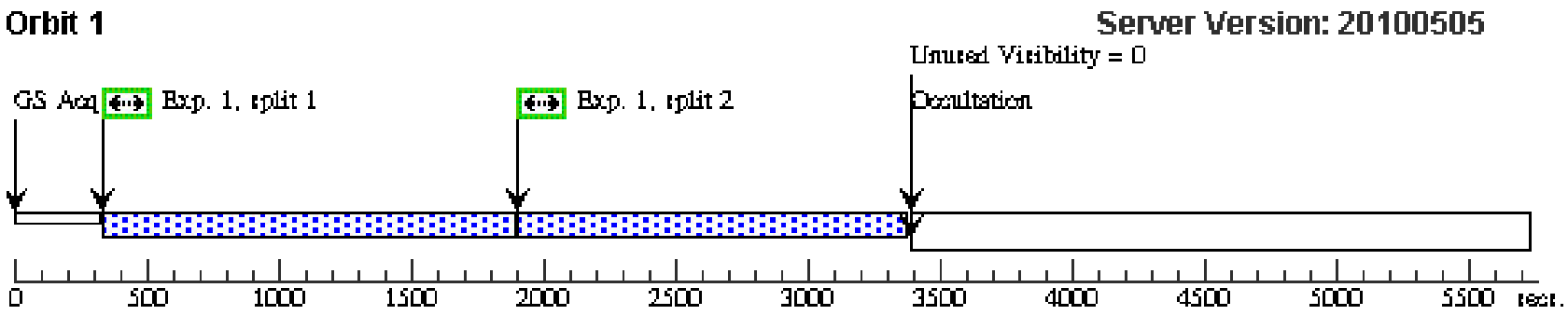
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	VELAPWN	RA: 08 35 20.8600 (128.8369167d) Dec: -45 10 44.90 (-45.17914d) Equinox: J2000		V=(?) V=27 mag arcsec^-2	Reference Frame: ICRS

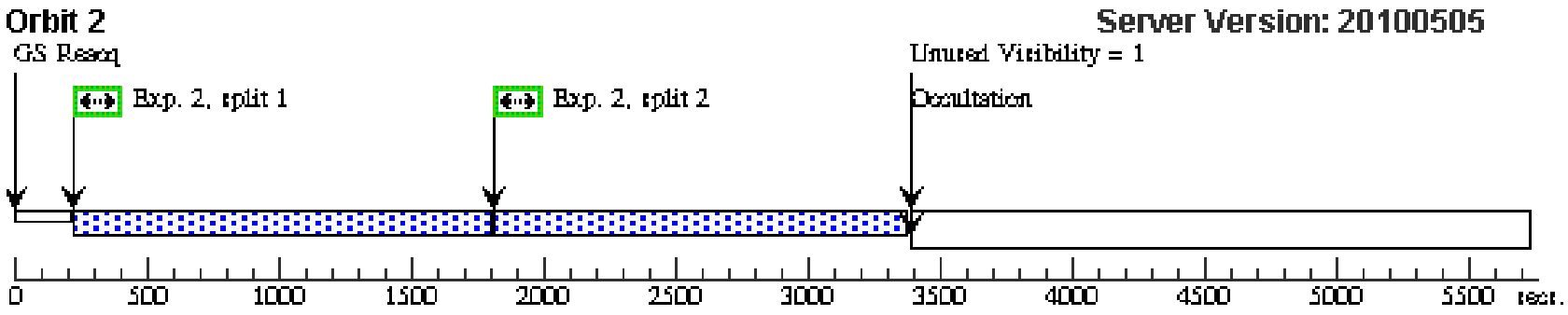
Comments: Our target is an extended source, hence pointing accuracy of ~1 arcsec is sufficient.
We intentionally point 10" south of the Vela pulsar. The target coordinates are based on HST images. We request that the position and orientation of the target be the same for each of the three polarizer images taken during each visit. We also request to schedule the visits as close to each other as possible since having similar Roll Angle values for all visits would simplify the analysis of the polarimetric data and provide more accurate results.

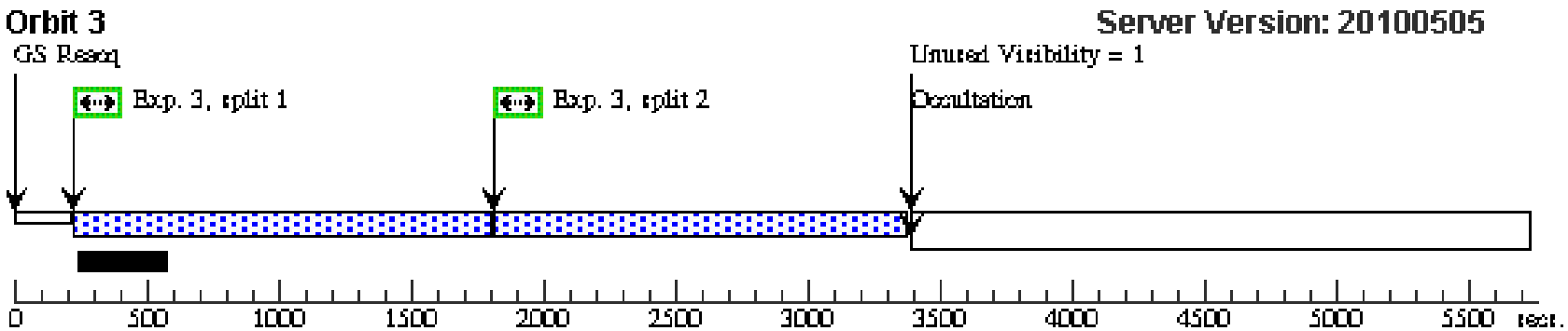
Exposures

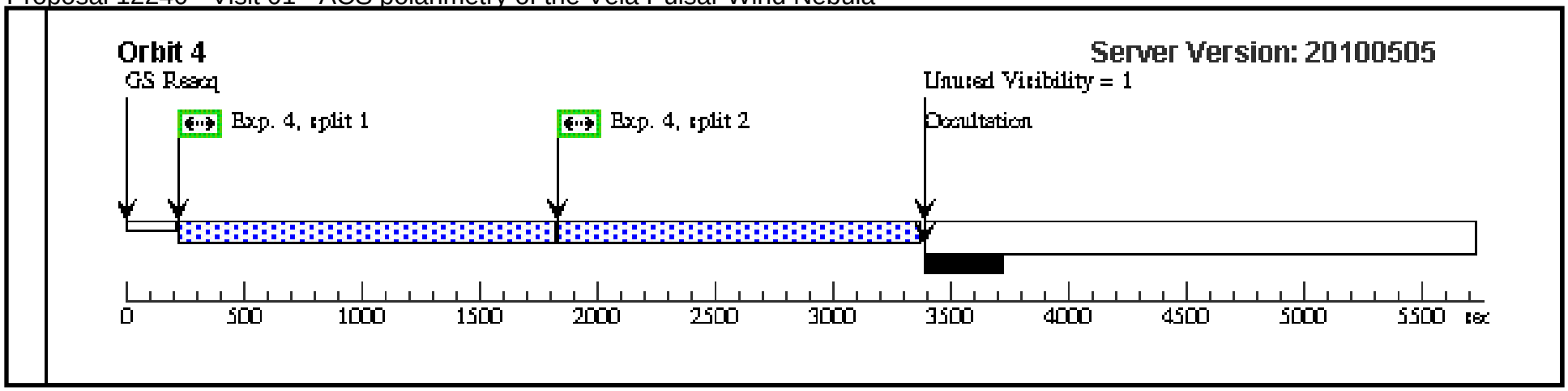
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) VELAPWN	ACS/WFC, ACCUM, WFC	F606W POL0V	CR-SPLIT=2			2333.0 Secs *[==>1299.5 Secs (Split 1)]* *[==>1299.5 Secs (Split 2)]*	***[1]***
2		(1) VELAPWN	ACS/WFC, ACCUM, WFC	F606W POL60V	CR-SPLIT=2	SAME POS AS 1		2333.0 Secs *[==>1386.5 Secs (Split 1)]* *[==>1386.5 Secs (Split 2)]*	***[2]***
3		(1) VELAPWN	ACS/WFC, ACCUM, WFC	F606W POL120V	CR-SPLIT=2	SAME POS AS 1		2333.0 Secs *[==>1386.5 Secs (Split 1)]* *[==>1386.5 Secs (Split 2)]*	***[3]***
4		(1) VELAPWN	ACS/WFC, ACCUM, WFC1-2K	F550M	CR-SPLIT=2	SAME POS AS 1		2333.0 Secs *[==>1362.5 Secs (Split 1)]* *[==>1362.5 Secs (Split 2)]*	***[4]***

Orbit Structure





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Exp. 4, split 2
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3000
3500
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sec

Proposal 12240 - Visit 01 - ACS polarimetry of the Vela Pulsar Wind Nebula

Visit

Proposal 12240, Visit 02 Sat Jul 10 05:48:09 GMT 2010

Diagnostic Status: Warning

Scientific Instruments: ACS/WFC

Special Requirements: ORIENT -2.0D TO 2.0D FROM 01

Diagnostics

(Visit 02) Warning (Orbit Planner): SAME POS MAY NOT BE APPROPRIATE

(Visit 02) Warning (Orbit Planner): SAME POS MAY NOT BE APPROPRIATE

(Visit 02) Warning (Orbit Planner): SAME POS MAY NOT BE APPROPRIATE

(Visit 02) Warning (Orbit Planner): SAME POS MAY NOT BE APPROPRIATE

Fixed Targets

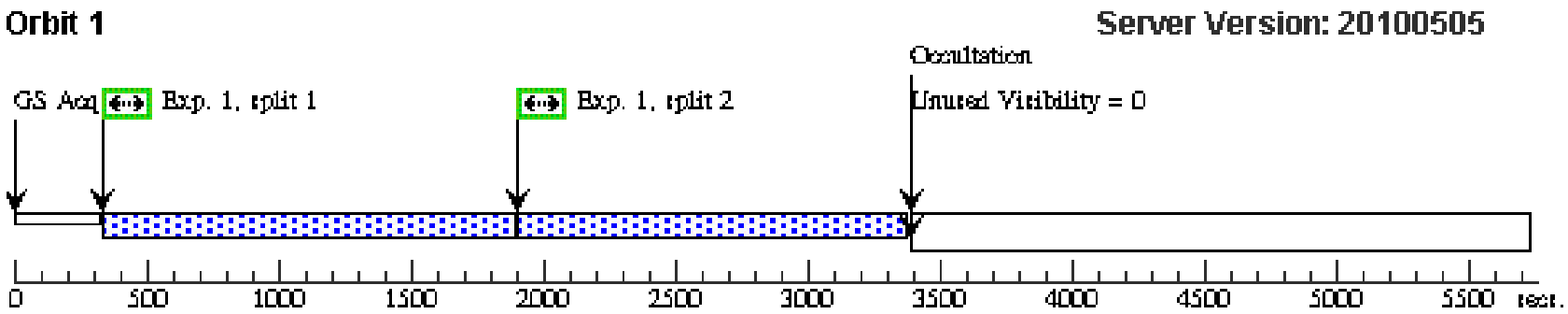
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	VELAPWN	RA: 08 35 20.8600 (128.8369167d) Dec: -45 10 44.90 (-45.17914d) Equinox: J2000		V=(?) V=27 mag arcsec^-2	Reference Frame: ICRS

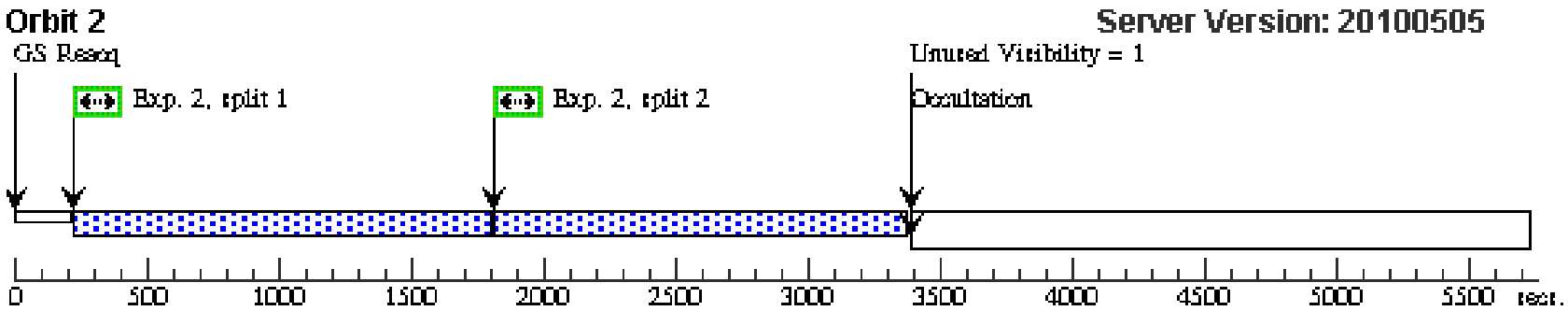
Comments: Our target is an extended source, hence pointing accuracy of ~1 arcsec is sufficient.
We intentionally point 10" south of the Vela pulsar. The target coordinates are based on HST images. We request that the position and orientation of the target be the same for each of the three polarizer images taken during each visit. We also request to schedule the visits as close to each other as possible since having similar Roll Angle values for all visits would simplify the analysis of the polarimetric data and provide more accurate results.

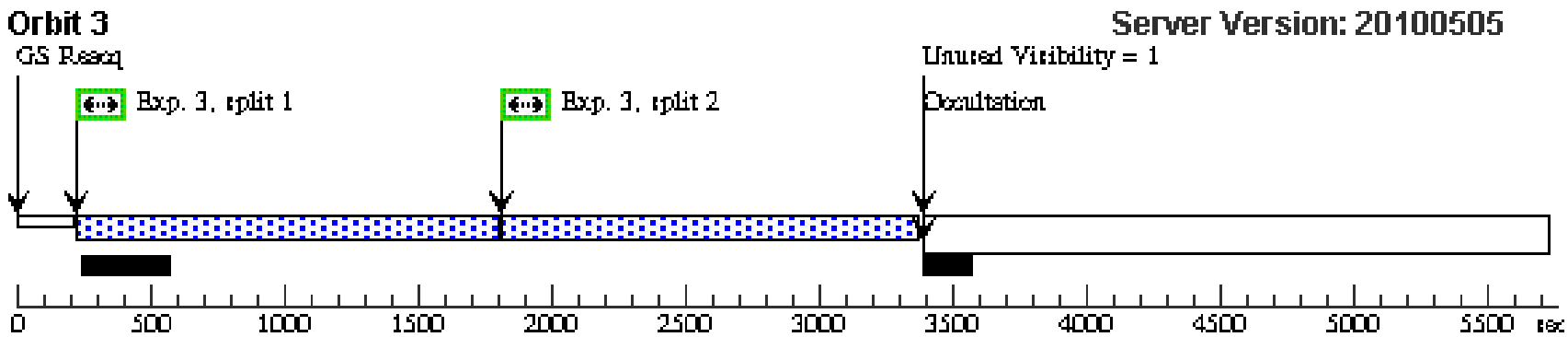
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) VELAPWN	ACS/WFC, ACCUM, WFC	F606W POL0V	CR-SPLIT=2			2333.0 Secs *[==>1299.5 Secs (Split 1)]* *[==>1299.5 Secs (Split 2)]*	***[1]***
2		(1) VELAPWN	ACS/WFC, ACCUM, WFC	F606W POL60V	CR-SPLIT=2	SAME POS AS 1		2333.0 Secs *[==>1386.5 Secs (Split 1)]* *[==>1386.5 Secs (Split 2)]*	***[2]***
3		(1) VELAPWN	ACS/WFC, ACCUM, WFC	F606W POL120V	CR-SPLIT=2	SAME POS AS 1		2333.0 Secs *[==>1386.5 Secs (Split 1)]* *[==>1386.5 Secs (Split 2)]*	***[3]***

Orbit Structure







Visit

Proposal 12240, Visit 03 Sat Jul 10 05:48:10 GMT 2010

Diagnostic Status: Warning

Scientific Instruments: ACS/WFC

Special Requirements: ORIENT -2.0D TO 2.0D FROM 01

Diagnostics

(Visit 03) Warning (Orbit Planner): SAME POS MAY NOT BE APPROPRIATE

(Visit 03) Warning (Orbit Planner): SAME POS MAY NOT BE APPROPRIATE

(Visit 03) Warning (Orbit Planner): SAME POS MAY NOT BE APPROPRIATE

(Visit 03) Warning (Orbit Planner): SAME POS MAY NOT BE APPROPRIATE

Fixed Targets

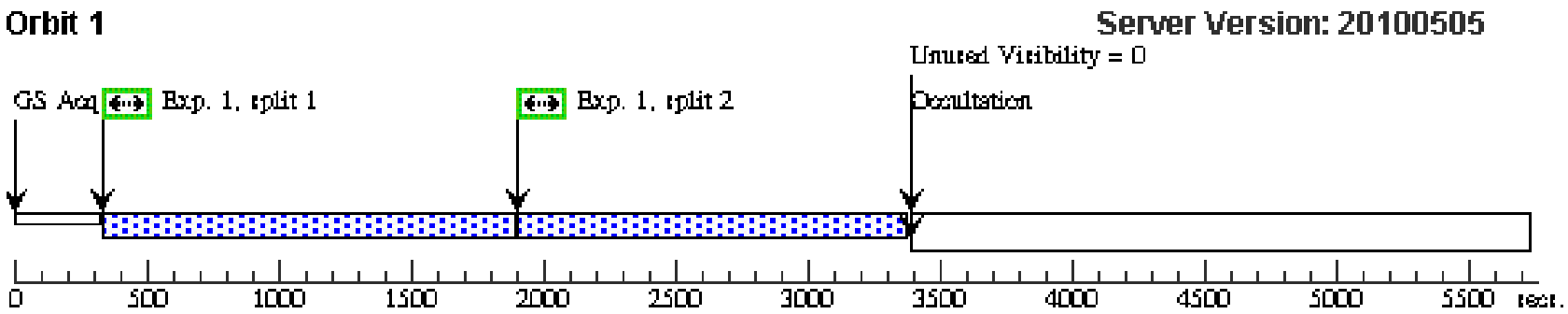
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	VELAPWN	RA: 08 35 20.8600 (128.8369167d) Dec: -45 10 44.90 (-45.17914d) Equinox: J2000		V=(?) V=27 mag arcsec^-2	Reference Frame: ICRS

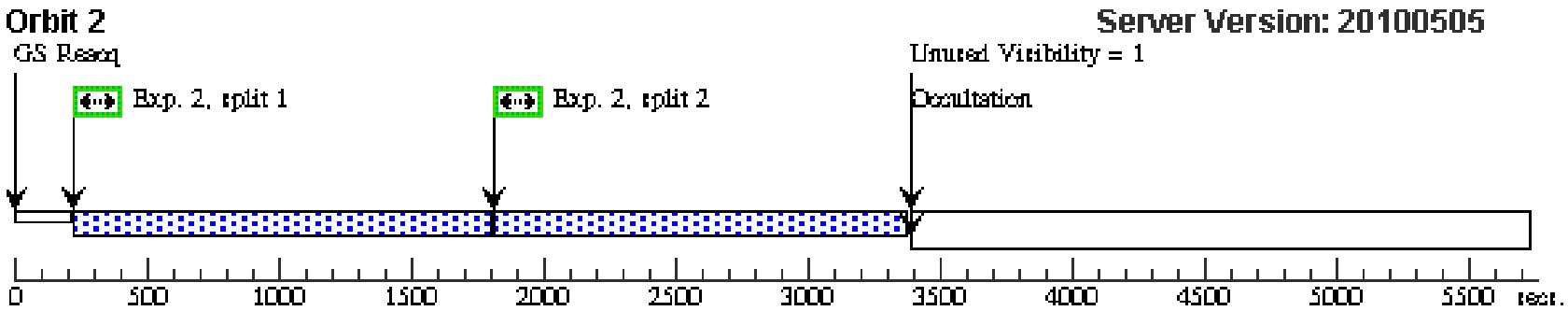
Comments: Our target is an extended source, hence pointing accuracy of ~1 arcsec is sufficient.
We intentionally point 10" south of the Vela pulsar. The target coordinates are based on HST images. We request that the position and orientation of the target be the same for each of the three polarizer images taken during each visit. We also request to schedule the visits as close to each other as possible since having similar Roll Angle values for all visits would simplify the analysis of the polarimetric data and provide more accurate results.

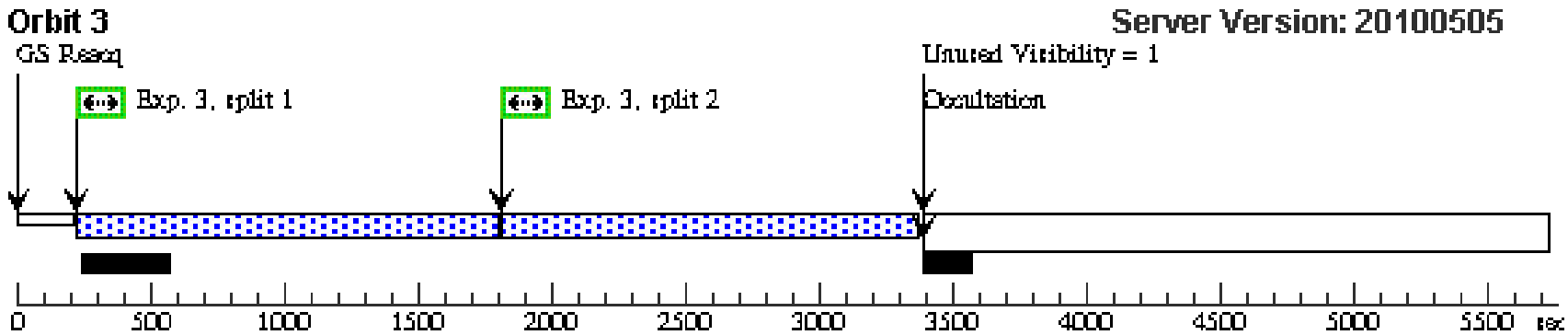
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) VELAPWN	ACS/WFC, ACCUM, WFC	F606W POL0V	CR-SPLIT=2			2333.0 Secs *[==>1299.5 Secs (Split 1)]* *[==>1299.5 Secs (Split 2)]*	***[1]***
2		(1) VELAPWN	ACS/WFC, ACCUM, WFC	F606W POL60V	CR-SPLIT=2	SAME POS AS 1		2333.0 Secs *[==>1386.5 Secs (Split 1)]* *[==>1386.5 Secs (Split 2)]*	***[2]***
3		(1) VELAPWN	ACS/WFC, ACCUM, WFC	F606W POL120V	CR-SPLIT=2	SAME POS AS 1		2333.0 Secs *[==>1386.5 Secs (Split 1)]* *[==>1386.5 Secs (Split 2)]*	***[3]***

Orbit Structure







Proposal 12240 - Visit 03 - ACS polarimetry of the Vela Pulsar Wind Nebula

Visit

Proposal 12240, Visit 04 Sat Jul 10 05:48:10 GMT 2010

Diagnostic Status: Warning

Scientific Instruments: ACS/WFC

Special Requirements: ORIENT -2.0D TO 2.0D FROM 01

Diagnostics

(Visit 04) Warning (Orbit Planner): SAME POS MAY NOT BE APPROPRIATE

(Visit 04) Warning (Orbit Planner): SAME POS MAY NOT BE APPROPRIATE

(Visit 04) Warning (Orbit Planner): SAME POS MAY NOT BE APPROPRIATE

(Visit 04) Warning (Orbit Planner): SAME POS MAY NOT BE APPROPRIATE

Fixed Targets

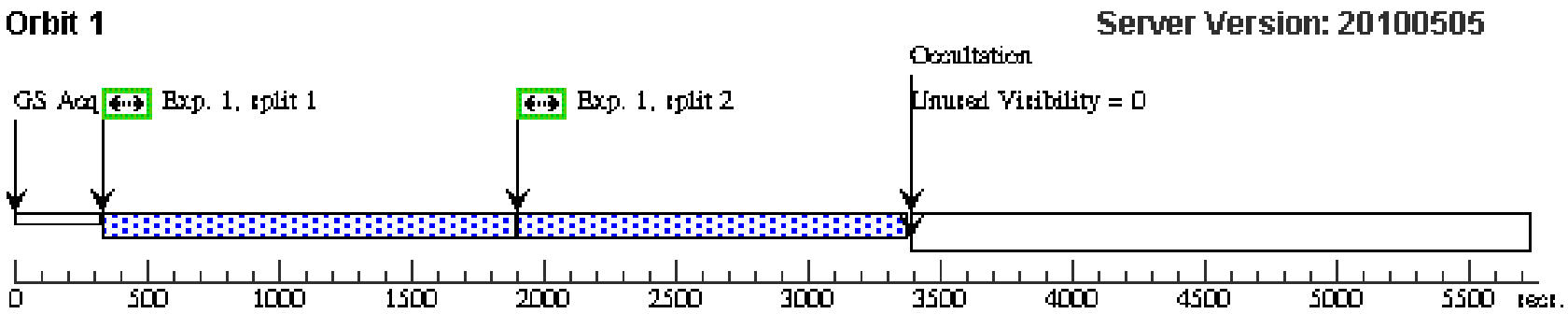
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	VELAPWN	RA: 08 35 20.8600 (128.8369167d) Dec: -45 10 44.90 (-45.17914d) Equinox: J2000		V=(?) V=27 mag arcsec^-2	Reference Frame: ICRS

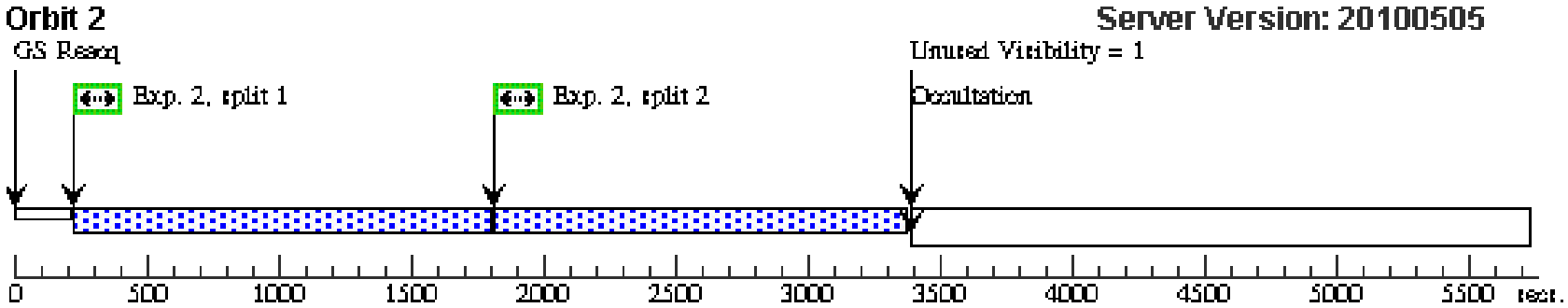
Comments: Our target is an extended source, hence pointing accuracy of ~1 arcsec is sufficient.
We intentionally point 10" south of the Vela pulsar. The target coordinates are based on HST images. We request that the position and orientation of the target be the same for each of the three polarizer images taken during each visit. We also request to schedule the visits as close to each other as possible since having similar Roll Angle values for all visits would simplify the analysis of the polarimetric data and provide more accurate results.

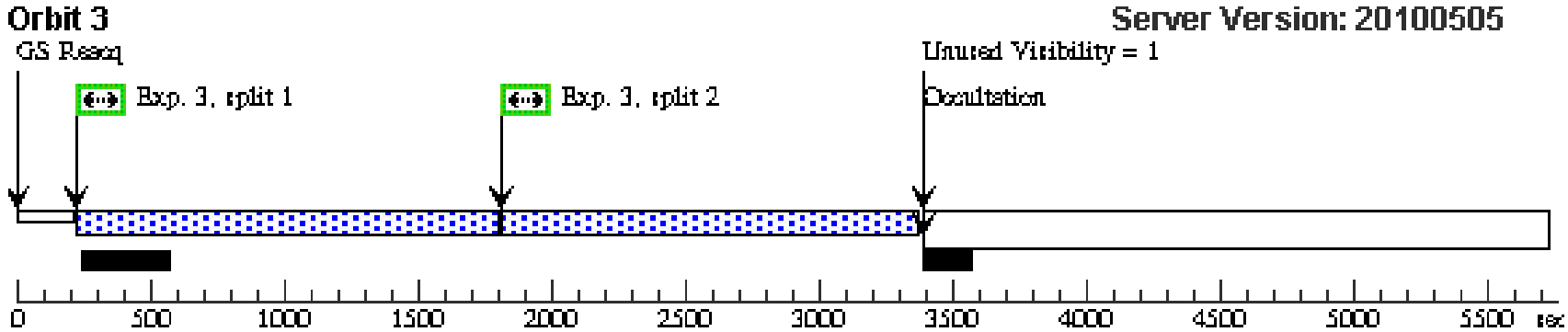
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) VELAPWN	ACS/WFC, ACCUM, WFC	F606W POL0V	CR-SPLIT=2			2333.0 Secs *[==>1299.5 Secs (Split 1)]* *[==>1299.5 Secs (Split 2)]*	***[1]***
2		(1) VELAPWN	ACS/WFC, ACCUM, WFC	F606W POL60V	CR-SPLIT=2	SAME POS AS 1		2333.0 Secs *[==>1386.5 Secs (Split 1)]* *[==>1386.5 Secs (Split 2)]*	***[2]***
3		(1) VELAPWN	ACS/WFC, ACCUM, WFC	F606W POL120V	CR-SPLIT=2	SAME POS AS 1		2333.0 Secs *[==>1386.5 Secs (Split 1)]* *[==>1386.5 Secs (Split 2)]*	***[3]***

Orbit Structure







Proposal 12240 - Visit 04 - ACS polarimetry of the Vela Pulsar Wind Nebula

Visit

Proposal 12240, Visit 05 Sat Jul 10 05:48:11 GMT 2010

Diagnostic Status: Warning

Scientific Instruments: ACS/WFC

Special Requirements: ORIENT -2.0D TO 2.0D FROM 01

Diagnostics

(Visit 05) Warning (Orbit Planner): SAME POS MAY NOT BE APPROPRIATE

(Visit 05) Warning (Orbit Planner): SAME POS MAY NOT BE APPROPRIATE

(Visit 05) Warning (Orbit Planner): SAME POS MAY NOT BE APPROPRIATE

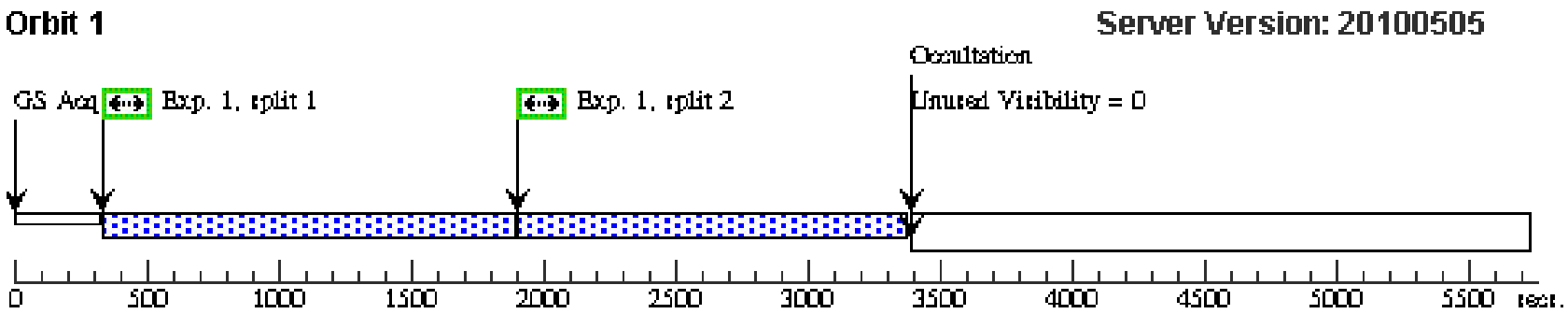
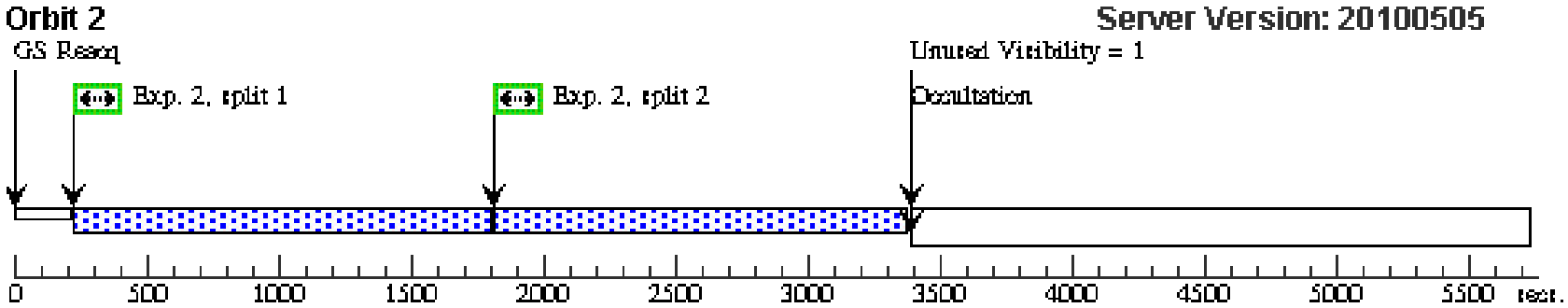
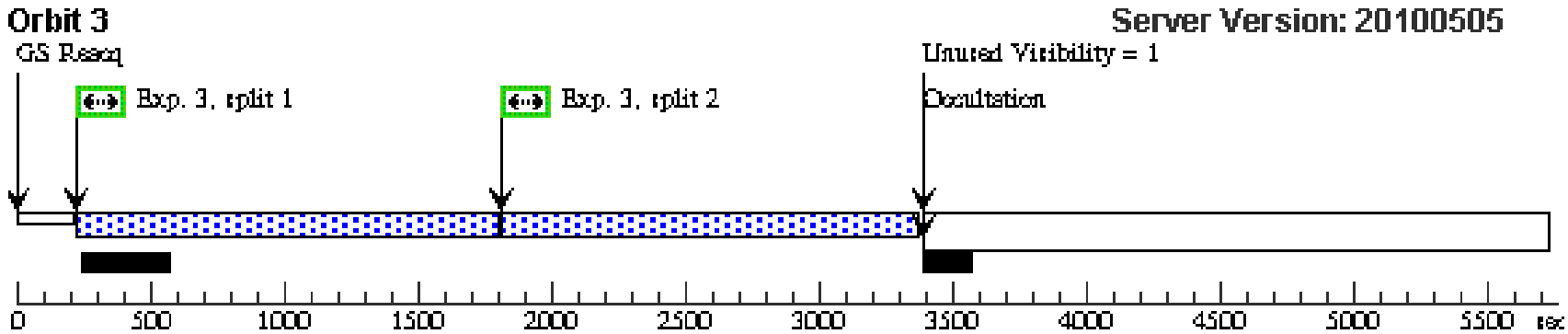
(Visit 05) Warning (Orbit Planner): SAME POS MAY NOT BE APPROPRIATE

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	VELAPWN	RA: 08 35 20.8600 (128.8369167d) Dec: -45 10 44.90 (-45.17914d) Equinox: J2000		V=(?) V=27 mag arcsec^-2	Reference Frame: ICRS

Comments: Our target is an extended source, hence pointing accuracy of ~1 arcsec is sufficient.
We intentionally point 10" south of the Vela pulsar. The target coordinates are based on HST images. We request that the position and orientation of the target be the same for each of the three polarizer images taken during each visit. We also request to schedule the visits as close to each other as possible since having similar Roll Angle values for all visits would simplify the analysis of the polarimetric data and provide more accurate results.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) VELAPWN	ACS/WFC, ACCUM, WFC	F606W POL0V	CR-SPLIT=2			2333.0 Secs *[==>1299.5 Secs (Split 1)]* *[==>1299.5 Secs (Split 2)]*	***[1]***
2		(1) VELAPWN	ACS/WFC, ACCUM, WFC	F606W POL60V	CR-SPLIT=2	SAME POS AS 1		2333.0 Secs *[==>1386.5 Secs (Split 1)]* *[==>1386.5 Secs (Split 2)]*	***[2]***
3		(1) VELAPWN	ACS/WFC, ACCUM, WFC	F606W POL120V	CR-SPLIT=2	SAME POS AS 1		2333.0 Secs *[==>1386.5 Secs (Split 1)]* *[==>1386.5 Secs (Split 2)]*	***[3]***

Orbit Structure