



10114 - Lyman_alpha FUV observations of the Sun in time and effects on planetary atmospheres

Cycle: 13, 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>
10	(1) HD129333	ACS/HRC ACS/SBC	1	17-Oct-2005 21:00:44.0	yes
20	(2) HD72905	ACS/HRC ACS/SBC	1	17-Oct-2005 21:00:49.0	yes
30	(3) HD149661	ACS/HRC ACS/SBC	1	17-Oct-2005 21:00:53.0	yes
40	(4) HD17925	ACS/HRC ACS/SBC	1	17-Oct-2005 21:00:56.0	yes

4 Total Orbits Used

ABSTRACT

The chromospheric H I Ly_α 1215.6 feature is the dominant source of short-wave emission in the Sun and solar-type stars, contributing about 80-90% of the total FUV flux and 30-60% of the total flux between 1 and 1500 Å. Also, this important chromospheric line is the major cooling channel for cool star atmospheres. Accurate Ly_α fluxes are the only missing element of our ongoing "Sun in Time" program. This program studies a sample of single G0-5 V stars with well-known physical properties that serve as proxies for the Sun (and solar-mass stars) over their main sequence lifetimes. One of the major goals of the program is the determination of the spectral irradiance of the early Sun. Our analyses indicate that the strong XUV emissions of the young Sun have played a crucial role in the developing planetary system. In particular, the expected strong Ly_α line flux may have greatly influenced the photoionization, photochemical evolution and possible erosion of planetary atmospheres, as well as played a role in the origin and development of life on Earth. The "Sun in Time" data can also be applied to investigate the atmospheric loss of exoplanets around solar-type stars resulting from XUV heating, which can eventually lead to the evaporation of "hot Jupiters". We propose to use HST/STIS-MAMA/E140M to determine accurate FUV and Ly_α fluxes and irradiances for 4 representative solar proxies with ages from 130 Myr to 6.7 Gyr. It is only with HST's high-resolution UV spectroscopy (to correct for ISM absorption) and the small aperture (to eliminate geocoronal emission) that the stellar Ly_α profile can be reliably modeled and its flux measured. The proposed study is of capital importance in reconstructing the evolutionary histories of exoplanets already known and additional planets that missions such as COROT, Kepler, SIM, and Darwin/TPF will discover in the coming years.

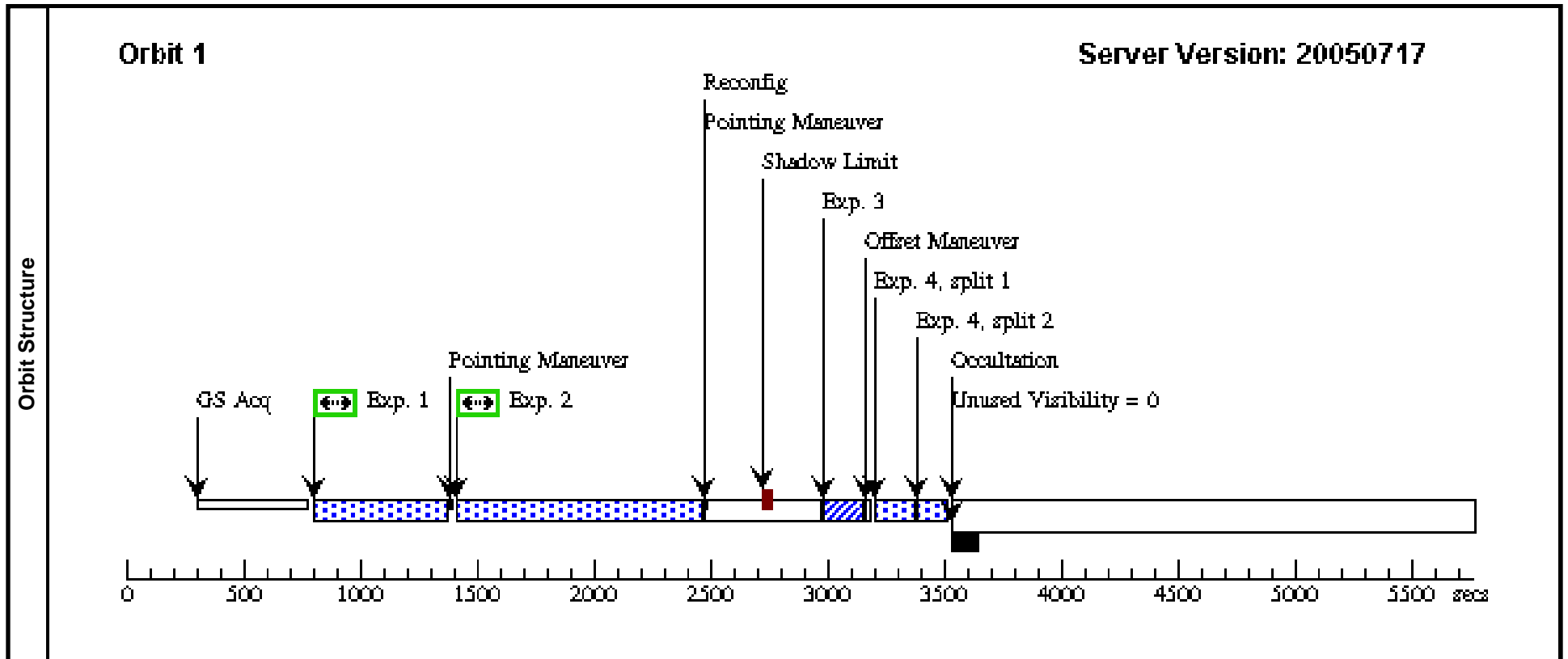
OBSERVING DESCRIPTION

The observations proposed require moderately spectroscopy and photometry in the FUV for a sample of Sun in Time targets, i.e. solar proxies that cover different ages of the Sun across the main sequence (covering ages from 130 Myr to 6.7 Gyr). The strengths of the emission lines vary from star to star, and correlate with the level of chromospheric and coronal activity (decreasing with age). Using chromospheric activity proxies such as CII we have derived rough estimated for the intrinsic strength of the Ly_α feature of the proposed targets as compared to the current Sun: ~15x for EK Dra, ~7x for π1 UMa, ~2.5x for β Com, and ~1x for β Hyi. Note that all targets are expected to have similar HI column densities as derived from the analysis of our ASCA, ROSAT, EUVE and FUSE observations.

Proposal 10114 - Visit 10 - Lyman_alpha FUV observations of the Sun in time and effects on planetary atmospheres

Tue Oct 18 01:00:58 GMT 2005

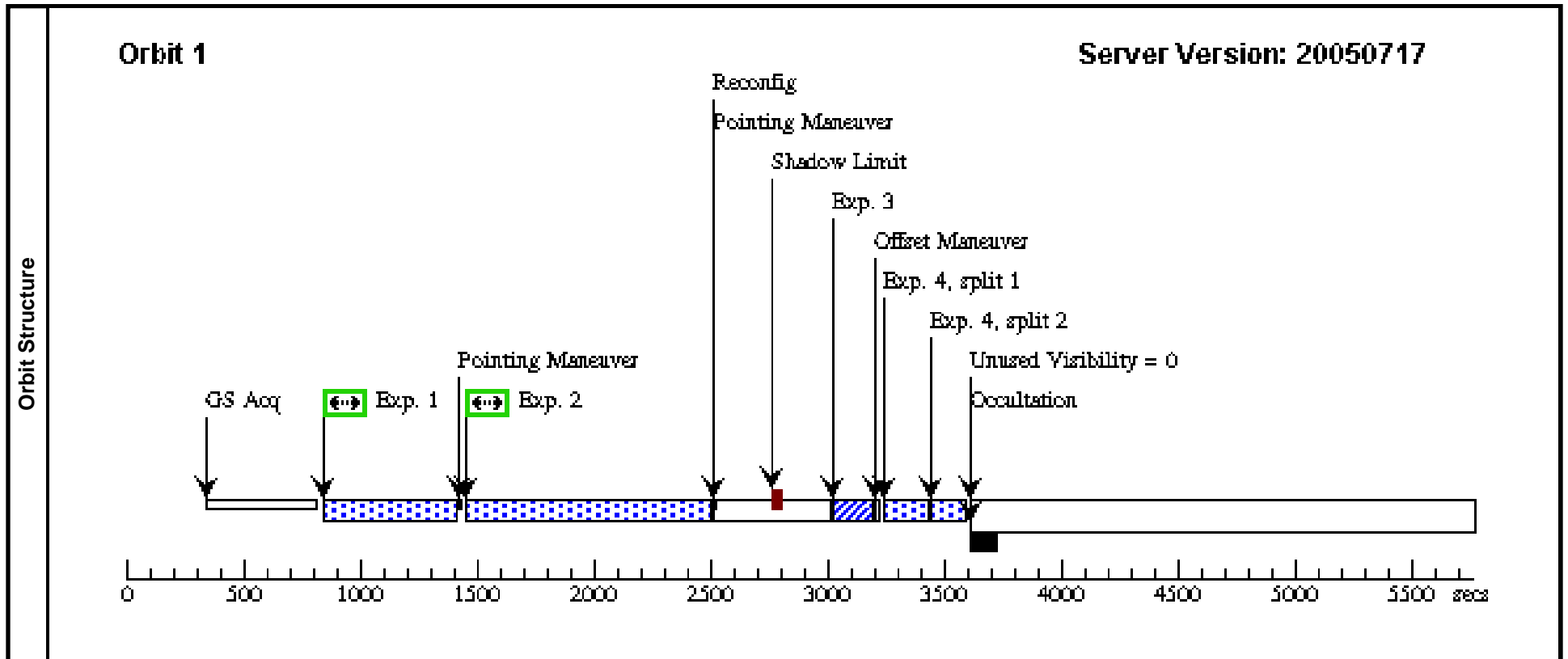
Visit	Proposal 10114, Visit 10 Diagnostic Status: No Diagnostics Scientific Instruments: ACS/SBC, ACS/HRC Special Requirements: (none)									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
	(1)	HD129333 Alt Name1: EK DRA	RA: 14 39 0.4000 (219.7516667d) Dec: +64 17 30.10 (64.29169d) Equinox: J2000 Plate Id: (?)	Proper Motion RA: -0.0213s/yr Proper Motion Dec: -0.01192"/yr Parallax: 0.02946" Epoch of Position: 1991.25	V=7.6+/-0.05	Coordinate Source: HIPPARCOS/TYCHO_CATALOGUE				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1		(1) HD129333	ACS/SBC, ACCUM, SBC	F122M		SHADOW		500.0 Secs [==>]	[1]
	2		(1) HD129333	ACS/SBC, ACCUM, SBC	PR110L		SHADOW		1000.0 Secs [==>]	[1]
	3		(1) HD129333	ACS/HRC, ACQ, HRC-ACQ	F250W				1.0 Secs [==>]	[1]
	4		(1) HD129333	ACS/HRC, ACCUM, HRC-CORON1.8	F814W		USE OFFSET 10114 1		192.0 Secs [==>(Split 1)] [==>(Split 2)]	[1]



Proposal 10114 - Visit 20 - Lyman_alpha FUV observations of the Sun in time and effects on planetary atmospheres

Tue Oct 18 01:00:59 GMT 2005

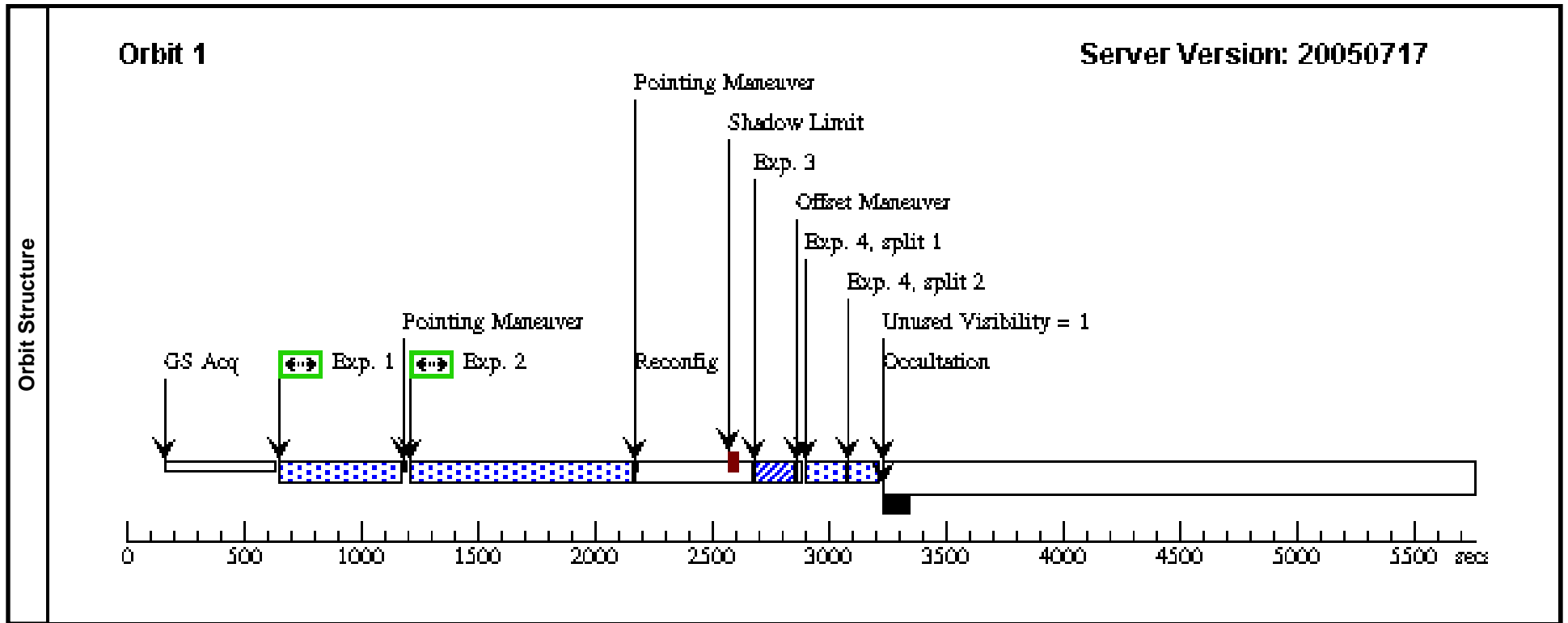
Visit	Proposal 10114, Visit 20 Diagnostic Status: No Diagnostics Scientific Instruments: ACS/SBC, ACS/HRC Special Requirements: (none)									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
	(2)	HD72905 Alt Name1: PI1 UMA	RA: 08 39 11.7400 (129.7989167d) Dec: +65 01 14.50 (65.02069d) Equinox: J2000 Plate Id: (?)	Proper Motion RA: -0.00438s/yr Proper Motion Dec: 0.0879"/yr Parallax: 0.07007" Epoch of Position: 1991.25	V=5.64+/-0.05	Coordinate Source: HIPPARCOS/TYCHO_CATALOGUE				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1		(2) HD72905	ACS/SBC, ACCUM, SBC	F122M		SHADOW		500.0 Secs [==>]	[1]
	2		(2) HD72905	ACS/SBC, ACCUM, SBC	PR110L		SHADOW		1000.0 Secs [==>]	[1]
	3		(2) HD72905	ACS/HRC, ACQ, HRC-ACQ	F250W				0.8 Secs [==>]	[1]
	4		(2) HD72905	ACS/HRC, ACCUM, HRC-CORON1.8	F814W		USE OFFSET 10114 2		234.0 Secs [==>(Split 1)] [==>(Split 2)]	[1]



Proposal 10114 - Visit 30 - Lyman_alpha FUV observations of the Sun in time and effects on planetary atmospheres

Tue Oct 18 01:00:59 GMT 2005

Visit	Proposal 10114, Visit 30 Diagnostic Status: No Diagnostics Scientific Instruments: ACS/SBC, ACS/HRC Special Requirements: (none)									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
	(3)	HD149661 Alt Name1: 12 OPH	RA: 16 36 21.4500 (249.0893750d) Dec: -02 19 28.50 (-2.32458d) Equinox: J2000 Plate Id: (?)	Proper Motion RA: 0.03037s/yr Proper Motion Dec: -0.30764"/yr Parallax: 0.10227" Epoch of Position: 1991.25	V=5.76+/-0.05	Coordinate Source: HIPPARCOS/TYCHO_CATALOGUE				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1		(3) HD149661	ACS/SBC, ACCUM, SBC	F122M		SHADOW		450.0 Secs [==>]	[1]
	2		(3) HD149661	ACS/SBC, ACCUM, SBC	PR110L		SHADOW		900.0 Secs [==>]	[1]
	3		(3) HD149661	ACS/HRC, ACQ, HRC-ACQ	F250W				0.9 Secs [==>]	[1]
	4		(3) HD149661	ACS/HRC, ACCUM, HRC-CORON1.8	F814W	CR-SPLIT=2	USE OFFSET 10114 3		193.0 Secs [==>(Split 1)] [==>(Split 2)]	[1]



Proposal 10114 - Visit 40 - Lyman_alpha FUV observations of the Sun in time and effects on planetary atmospheres

Tue Oct 18 01:01:00 GMT 2005

Visit	Proposal 10114, Visit 40 Diagnostic Status: Warning Scientific Instruments: ACS/SBC, ACS/HRC Special Requirements: (none)									
	(Visit 40) Warning: VISIBILITY OVERRUN									
Diagnostics										
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(4)	HD17925 Alt Name1: EP ERI	RA: 02 52 32.1300 (43.1338750d) Dec: -12 46 11.00 (-12.76972d) Equinox: J2000 Plate Id: (?)	Proper Motion RA: 0.02588s/yr Proper Motion Dec: -0.18954"/yr Parallax: 0.09633" Epoch of Position: 1991.25	V=6.03+/-0.05	Coordinate Source: HIPPARCOS/TYCHO_CATALOGUE				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1		(4) HD17925	ACS/SBC, ACCUM, SBC	F122M		SHADOW		450.0 Secs	
									[==>]	[1]
	2		(4) HD17925	ACS/SBC, ACCUM, SBC	PR110L			SHADOW	900.0 Secs	
									[==>]	[1]
	3		(4) HD17925	ACS/HRC, ACQ, HRC-ACQ	F250W			NEW OBSET FULL ACQ	1.0 Secs	
								[==>]	[1]	
4		(4) HD17925	ACS/HRC, ACCUM, HRC-CORON1.8	F814W			USE OFFSET 10114 4	202.0 Secs		
								[==>(Split 1)]		
								[==>(Split 2)]	[1]	

