



13775 - Testing EUV Photoevaporation Models in Young Disks

Cycle: 22, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
01	(1) V-CS-CHA CCDFLAT	STIS/CCD STIS/FUV-MAMA STIS/NUV-MAMA	2	20-Jan-2015 15:45:00.0	yes
02	(2) V-SZ-CHA CCDFLAT	STIS/CCD STIS/FUV-MAMA STIS/NUV-MAMA	2	20-Jan-2015 15:45:03.0	yes
03	(3) V-TW-HYA CCDFLAT	STIS/CCD STIS/FUV-MAMA STIS/NUV-MAMA	2	20-Jan-2015 15:45:05.0	yes

6 Total Orbits Used

ABSTRACT

The lifetime of gas in young disks places an upper limit on the timescale for giant planet formation. This lifetime is dictated by the rate at which gas is eroded by photoevaporative winds created by high-energy radiation from the central star. Observations suggest that EUV emission may play an important role in photoevaporation. However, EUV emission cannot be directly observed due to its high opacity. One way to indirectly trace the

EUV is by simultaneously measuring X-ray and FUV/NUV emission to extrapolate the intervening EUV spectrum. Here we apply for 6 orbits with HST to observe 3 T Tauri stars with STIS, which traces the FUV/NUV wavelengths. We will observe these objects simultaneously with SWIFT, which traces the X-ray wavelengths, via our institutional access. When combined, these observations can characterize the EUV spectrum and thus the efficiency of phot evaporation, providing constraints on the disk clearing timescale and the potential for planet formation in disks.

OBSERVING DESCRIPTION

We request 6 orbits and the details for each visit can be found below. For all of our objects we propose to use STIS to cover the FUV and NUV. Given the goal of our project is to observe the shape of the high-energy continuum, we do not need high resolution which would increase our observing time. The low resolution gratings of COS require multiple exposures to avoid gaps in the spectrum, whereas STIS provides the spectral coverage necessary in just one exposure for each of the FUV G140L and NUV G230L gratings. Finally, we include exposures with the optical and near-IR G430L and G750L gratings. Obtaining simultaneous optical and near-IR spectra is crucial in order to measure the extinction precisely and accurately measure the FUV fluxes, as extinction is high in the FUV. We will use the STIS CCD G430L grating (2900-5700 Å) and the CCD G750L grating (5240-10270 Å) to do this. In addition, we will need contemporaneous fringe-flats to correct the spectra beyond 7000 Å where severe fringing occurs. We note that we will need to use the STIS MAMA and the CCD in the same visit and since the CCD observations will take less than 30 minutes (including overheads), this visit structure (which is normally not used) is allowed according to the HST primer. We will require two orbits for each of the targets, in which we will acquire FUV to near-IR spectra after a brief image using the mirror for target acquisition. We successfully observed 3 TTS with this observational setup previously (ID: 11608), and use those spectra to determine exposure times below.

When calculating exposure times in the G750L grating for CS Cha, we assumed the fluxes of the TTS GM Aur from Program 11608, which has a similar spectral type, distance, and AV. For the remaining filters and gratings, we used previously obtained STIS and COS spectra of CS Cha from GO Program 11616. We will acquire the target with a 1s exposure in the F28X50LP filter providing S/N>40. To reach a S/N~5-10 we require 8s for G750L, 35s for G430L, 900s for G230L and 3000s for G140L. We also include a brief CCDFLAT to correct for fringing in the G750L grating. Including overheads, all but the G140L exposure are completed in the first orbit and the second orbit is devoted to obtaining the FUV spectrum. We increased some exposure times in Orbit 1 in order to fill the orbital visibility and improve S/N without saturation.

TW Hya has been observed before with HST and is too bright in the FUV to observe with the G140L grating, so for this object, we will observe in the FUV with the E140M echelle grating. We have used this sequence of gratings and exposure times in a previous program successfully (GO 11608) and therefore use the same observing plan here. We will observe with the G750L, G430L and G230L gratings in the first orbit, in addition to an

initial FUV observation using the E140M grating. The second orbit will be used to complete the FUV exposure.

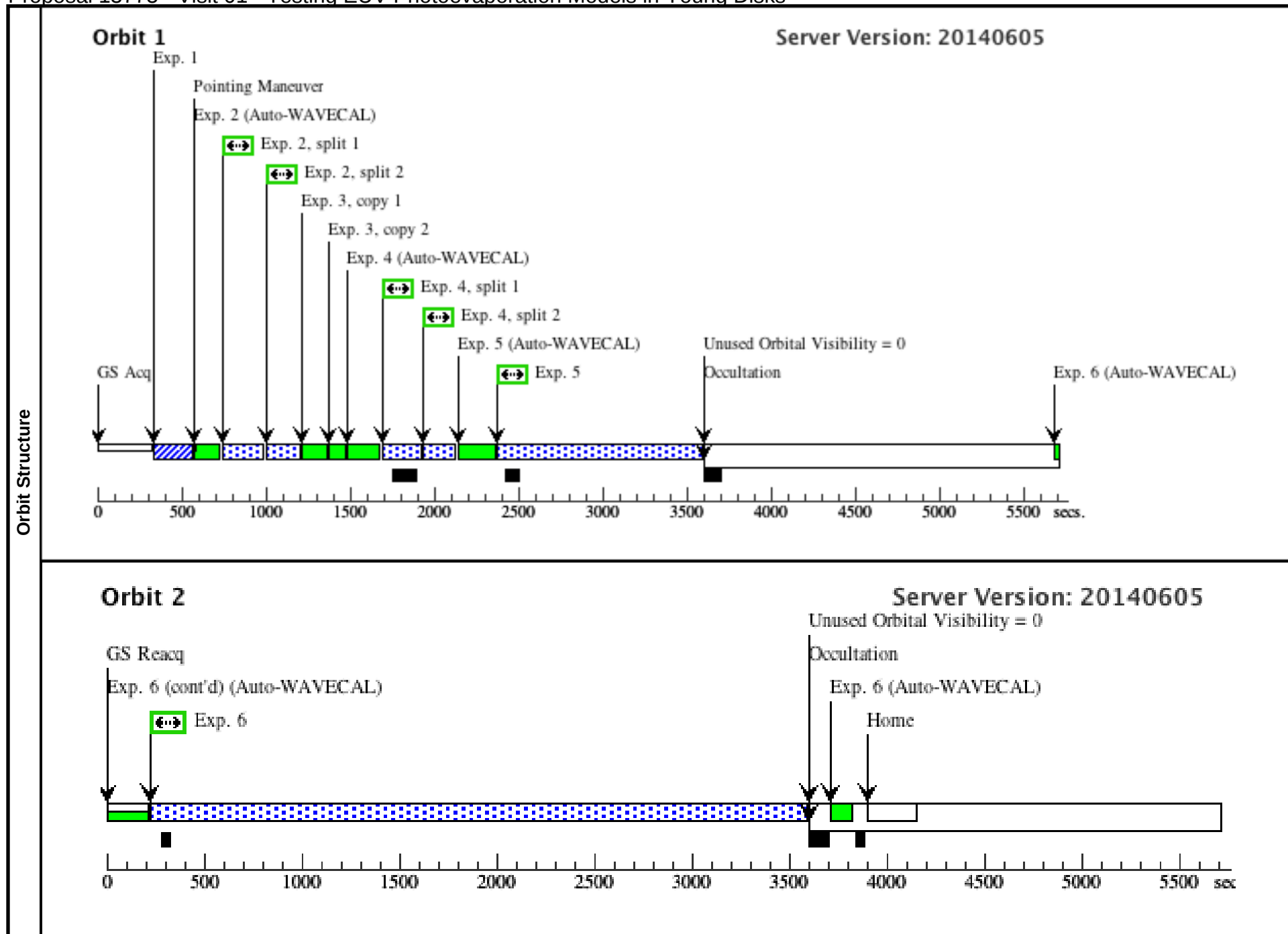
SZ Cha is an earlier spectral type than the others at K0, so we use archival STIS spectra of CV Cha, which is a G9 TTS with similar AV, to calculate exposure times. We estimate that we will need 4s in the F28X50OII filter, 1s in G750L, 1s in G430L, 900s for G230L and 3200s for G140L. We have low resolution FUV prism spectra of SZ Cha taken with the Advanced Camera for Surveys and use this to confirm that it does not exceed the brightness limits for the MAMA detector.

In order to coordinate these HST observations with X-ray observations using SWIFT, we request that they be completed between January 5 and May 8, 2015. We will be using SWIFT as part of the University of Michigan's time allocation which occurs between January 1 and June 30, 2015. The additional restrictions occur because the objects are too close to the sun for SWIFT between May 9 and the end of June.

Notes: CS Cha is flagged by the Bright Object Checker in the NUV and FUV gratings; however, we have used previously obtained spectra of CS Cha when calculating exposure times, so we confirm that it is safe to observe. TW Hya was also flagged as a concern, but we have used the same exposure times during previous observations and did not exceed the brightness limits.

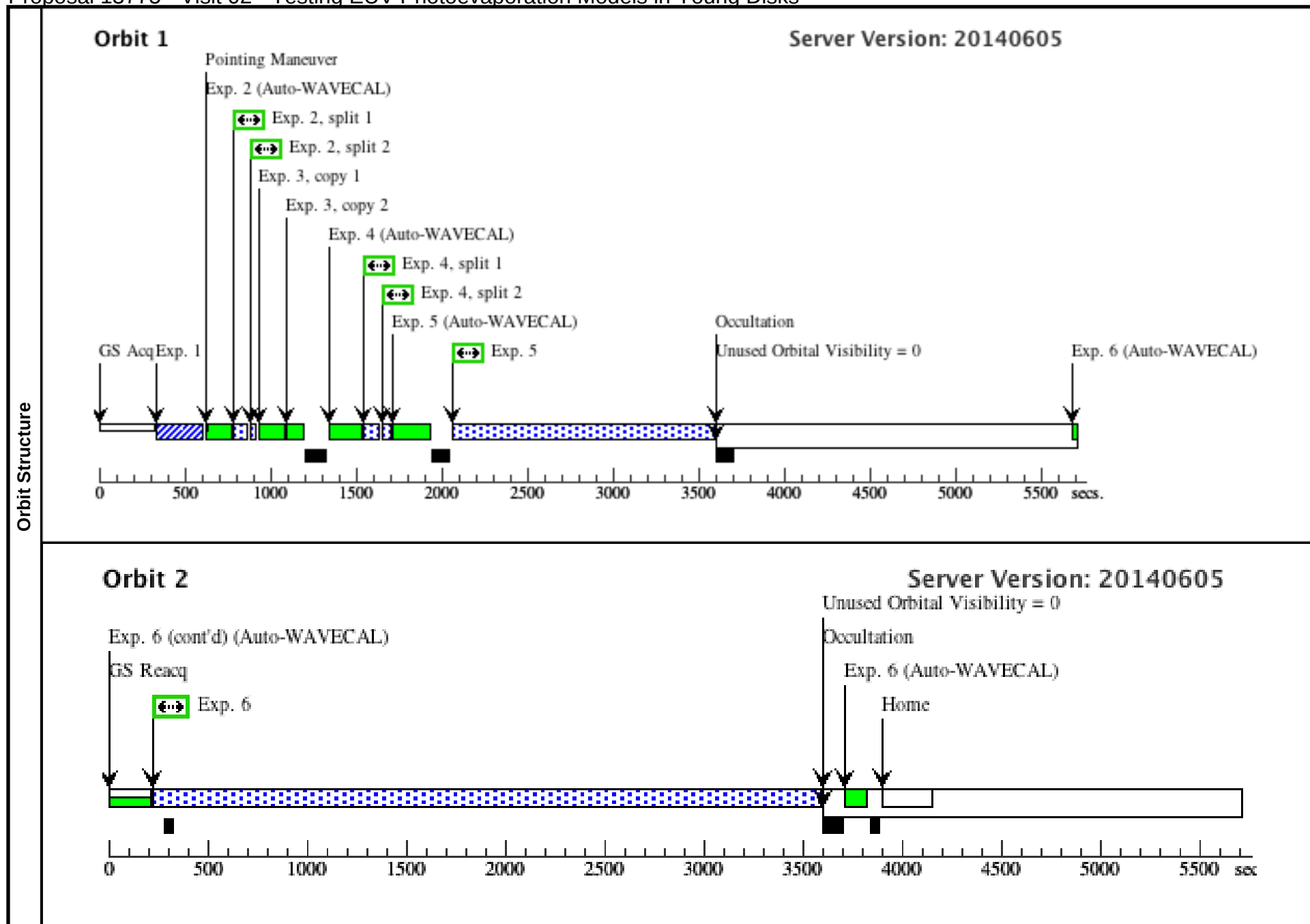
Proposal 13775 - Visit 01 - Testing EUV Photoevaporation Models in Young Disks

Visit	Proposal 13775, Visit 01, implementation Tue Jan 20 20:45:07 GMT 2015									
	Diagnostic Status: No Diagnostics Scientific Instruments: STIS/CCD, STIS/FUV-MAMA, STIS/NUV-MAMA Special Requirements: BETWEEN 04-JAN-2015:00:00:00 AND 10-MAY-2015:00:00:00									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	V-CS-CHA	RA: 11 02 24.9120 (165.6038000d) Dec: -77 33 35.72 (-77.55992d) Equinox: J2000 <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i>		V=11.69	Reference Frame: ICRS				
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(1) V-CS-CHA	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			1 Secs (1 Secs) [==>]	
	2		(1) V-CS-CHA	STIS/CCD, ACCUM, 52X2	G750L 7751 A	CR-SPLIT=2			8 Secs (328 Secs) [==>164.0 Secs (Split 1)] [==>164.0 Secs (Split 2)]	[1]
	3		CCDFLAT	STIS/CCD, ACCUM, 0.3X0.09	G750L 7751 A				[==>(Copy 1)] [==>(Copy 2)]	[1]
	4	(623198)	(1) V-CS-CHA	STIS/CCD, ACCUM, 52X2	G430L 4300 A	CR-SPLIT=2			35 Secs (303 Secs) [==>151.5 Secs (Split 1)] [==>151.5 Secs (Split 2)]	[1]
	5	(623208)	(1) V-CS-CHA	STIS/NUV-MAMA, ACCUM, 52X2	G230L 2376 A				1230 Secs (1178 Secs) [==>1178.0 Secs]	[1]
	6	(621841)	(1) V-CS-CHA	STIS/FUV-MAMA, ACCUM, 52X2	G140L 1425 A				3000 Secs (3315 Secs) [==>3315.0 Secs]	[2]



Proposal 13775 - Visit 02 - Testing EUV Photoevaporation Models in Young Disks

Visit	Proposal 13775, Visit 02, implementation Tue Jan 20 20:45:07 GMT 2015 Diagnostic Status: No Diagnostics Scientific Instruments: STIS/CCD, STIS/FUV-MAMA, STIS/NUV-MAMA Special Requirements: BETWEEN 04-JAN-2015:00:00:00 AND 09-MAY-2015:00:00:00									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(2)	V-SZ-CHA	RA: 10 58 16.7740 (164.5698917d) Dec: -77 17 17.06 (-77.28807d) Equinox: J2000 <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i>		V=12.68	Reference Frame: ICRS				
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(623100)	(2) V-SZ-CHA	STIS/CCD, ACQ, F28X500II	MIRROR	ACQTYPE=POINT			4 Secs (4 Secs)	
									[==>]	[1]
	2	(623187)	(2) V-SZ-CHA	STIS/CCD, ACCUM, 52X2	G750L 7751 A	CR-SPLIT=2			1 Secs (2 Secs)	
									[==>1 Secs (Split 1)]	
									[==>1 Secs (Split 2)]	[1]
	3		CCDFLAT	STIS/CCD, ACCUM, 0.3X0.09	G750L 7751 A				[==>(Copy 1)]	
									[==>(Copy 2)]	[1]
	4	(623192)	(2) V-SZ-CHA	STIS/CCD, ACCUM, 52X2	G430L 4300 A	CR-SPLIT=2			63 Secs (20 Secs)	
									[==>10 Secs (Split 1)]	
									[==>10 Secs (Split 2)]	[1]
	5	(623137)	(2) V-SZ-CHA	STIS/NUV-MAMA, ACCUM, 52X2	G230L 2376 A				900 Secs (1491 Secs)	
									[==>1491 Secs]	[1]
	6	(623138)	(2) V-SZ-CHA	STIS/FUV-MAMA, ACCUM, 52X2	G140L 1425 A				3000 Secs (3315 Secs)	
									[==>3315.0 Secs]	[2]



Proposal 13775 - Visit 03 - Testing EUV Photoevaporation Models in Young Disks

Visit	Proposal 13775, Visit 03, implementation								Tue Jan 20 20:45:08 GMT 2015	
	Diagnostic Status: No Diagnostics									
	Scientific Instruments: STIS/CCD, STIS/FUV-MAMA, STIS/NUV-MAMA									
	Special Requirements: BETWEEN 04-JAN-2015:00:00:00 AND 09-MAY-2015:00:00:00									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(3)	V-TW-HYA	RA: 11 01 51.9067 (165.4662779d) Dec: -34 42 17.03 (-34.70473d) Equinox: J2000		V=10.5	Reference Frame: ICRS				
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.									
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(3) V-TW-HYA	STIS/CCD, ACQ, F28X500II	MIRROR	ACQTYPE=POINT			30 Secs (30 Secs)	
									[==>]	[1]
	2		(3) V-TW-HYA	STIS/CCD, ACCUM, 52X2	G750L 7751 A	CR-SPLIT=2			1 Secs (1 Secs)	
									[==>(Split 1)]	
									[==>(Split 2)]	[1]
	3		CCDFLAT	STIS/CCD, ACCUM, 0.3X0.09	G750L 7751 A				[==>(Copy 1)]	
									[==>(Copy 2)]	[1]
	4		(3) V-TW-HYA	STIS/CCD, ACCUM, 52X2	G430L 4300 A	CR-SPLIT=2			20 Secs (20 Secs)	
									[==>(Split 1)]	
									[==>(Split 2)]	[1]
	5	(623145)	(3) V-TW-HYA	STIS/NUV-MAMA, ACCUM, 52X2	G230L 2376 A				150 Secs (150 Secs)	
									[==>]	[1]
6	(623144)	(3) V-TW-HYA	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A				3100 Secs (485 Secs)		
								[==>485.0 Secs]	[1]	
7	(623144)	(3) V-TW-HYA	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A				3100 Secs (3005 Secs)		
								[==>3005.0 Secs]	[2]	

