12172 - Is the Extraordinary Super Star Cluster NGC 3125-1 an Imposter?

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) NGC3125-1	COS/FUV COS/NUV	2	28-Apr-2011 21:01:03.0	yes
02	(1) NGC3125-1 CCDFLAT	STIS/CCD STIS/FUV-MAMA STIS/NUV-MAMA	2	28-Apr-2011 21:01:12.0	yes

4 Total Orbits Used

ABSTRACT

We propose a short, 4 orbit COS+STIS spectroscopic program to observe the extraordinary super star cluster in the local starburst galaxy NGC 3125. The cluster has the strongest He II 1640 emission ever observed in a starburst region in the local universe. This line is the tell-tale sign of Wolf-Rayet stars, the evolved descendants of very massive O stars. Taken at face value, the anomalous He II 1640 line indciates a Wolf-Rayet population that is very different from other starburst regions. However, previous attempts to interpret the observational data of the super star cluster were hampered by the low resolution of the ultraviolet spectra and the lack of co-spatial panchromatic data. As a result, the suggestion of the extraordinary nature of this super star cluster is still not unambiguous. The proposed program will settle the matter. We will test the upper initial mass function from several

angles: the N V and Si IV stellar wind-lines, the elusive O V line associated with the hottest, most massive stars, and the ionizing radiation as probed by recombination lines. We will determine the dust redening with three independent methods: the SED, the Balmer decrement, and the He II 4686/1640 ratio. The STIS long-slit capabilities will allow us to perform a comparative study with a nearby super star cluster in the host galaxy. The ultraviolet spectrum of the super star cluster may be the missing link between local starbursts and star-forming galaxies at cosmological redshift. The UV spectra of the two classes of objects are rather similar, except for the He II 1640 line, which is much stronger at high redshift. Detailed observations of NGC 3125 may help shed light on understanding the details of star-formation at high redshift.

OBSERVING DESCRIPTION

There are two visits. The first 2-orbit visit will use COS and the G130M grating for an observation of NGC 3125-1. The cluster is almost point-like and has F(1300) = 2e-15, as observed before with STIS. This will make it an easy target acquisition taking about 10 min, including all overheads. The remainder of the first orbit and the full second orbit will then yield close to 5000 s of science exposure time. The resulting S/N per resolution element will be about 10. The second 2-orbit visit will be with STIS using all four low-resolution gratings. This visit will be done at a specific orientation in order to obtain spectra of NGC 3125-1 and NGC 3125-2 simultaneously. The two clusters have a separation of 11arcsec. NGC 3125-2 has not been observed spectroscopically with HST but archival FOC images suggest roughly equal 2200 Å fluxes of the two clusters. We will acquire on NGC 3125-1, as this has previously been demonstrated to be successful. A 20 sec CCD image with the F28x50LP aperture will be taken for the acquisition. The rest of the first orbit and the full second orbit will be filled with G750L, G430L, G230L, and G140L exposures using the 52x2 aperture. Exposure times of 2300 s and 700 s with the G140L and G230L gratings, respectively, will result in S/N = 15. An S/N in excess of 30 will be achieved within less than 5 min with the G430L and G750L. Since the science exposure times for the CCD spectroscopy are short, we request that they be combined with the MAMA observations in the same visit.

Proposal 12172 - Visit 01 - Is the Extraordinary Super Star Cluster NGC 3125-1 an Imposter?

Visit

Proposal 12172, Visit 01, implementation Fri Apr 29 01:01:18 GMT 2011

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: (none)

Diagnostics

(Visit 01) Warning (Form): If the target coordinates are not known to 0.4" (or better) an ACQ/SEARCH should precede the ACQ/IMAGE.

Fixed Targets

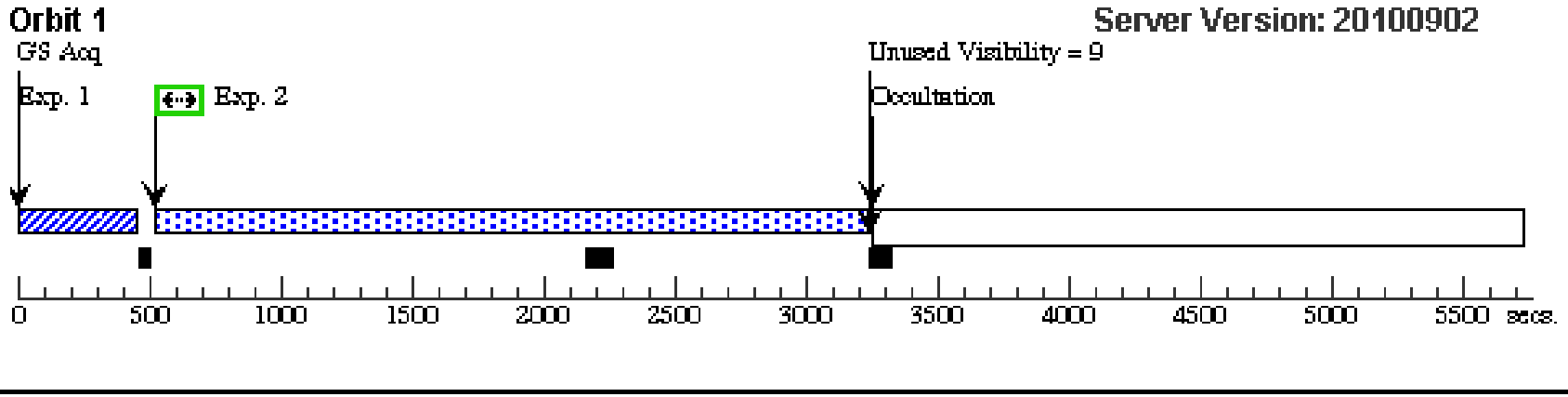
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NGC3125-1	RA: 10 06 33.2800 (151.6386667d) Dec: -29 56 6.80 (-29.93522d) Equinox: J2000	Radial Velocity: 1113 km/sec	V=13.0+/-0.5 F(1300) = 2e-15	Reference Frame: ICRS

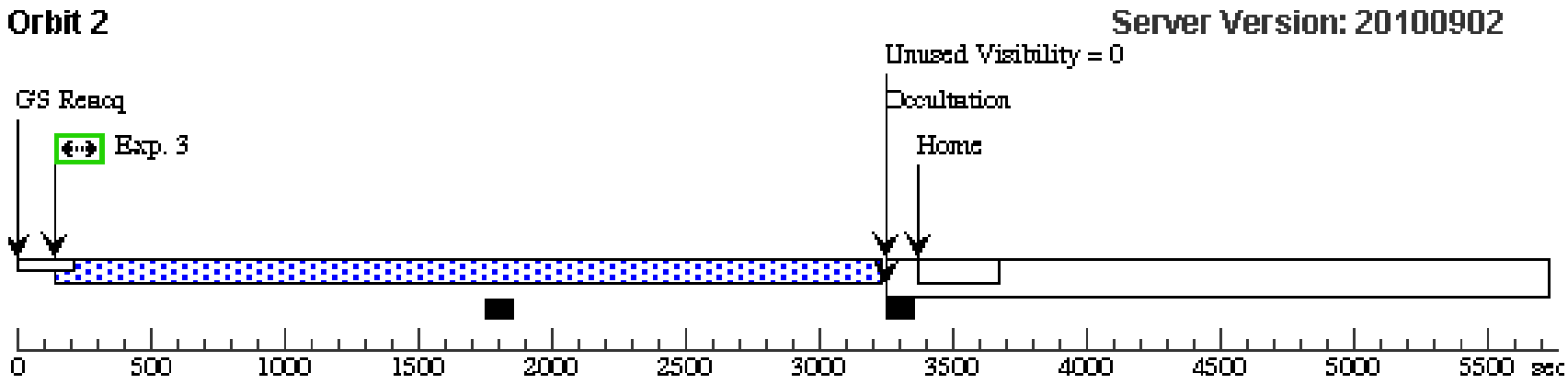
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) NGC3125-1	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				30 Secs *[==>]*	 ***[1]***
2		(1) NGC3125-1	COS/FUV, TIME-TAG, PSA	G130M 1300 A	BUFFER-TIME=1500; FP-POS=3			2549 Secs *[==>]*	 ***[1]***
3		(1) NGC3125-1	COS/FUV, TIME-TAG, PSA	G130M 1318 A	BUFFER-TIME=1500; FP-POS=3			2971 Secs *[==>]*	 ***[2]***

Orbit Structure





Visit

Proposal 12172, Visit 02, implementation Fri Apr 29 01:01:19 GMT 2011

Diagnostic Status: Warning

Scientific Instruments: STIS/CCD, STIS/FUV-MAMA, STIS/NUV-MAMA

Special Requirements: ORIENT 349D TO 350 D

Diagnostics

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

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

Fixed Targets

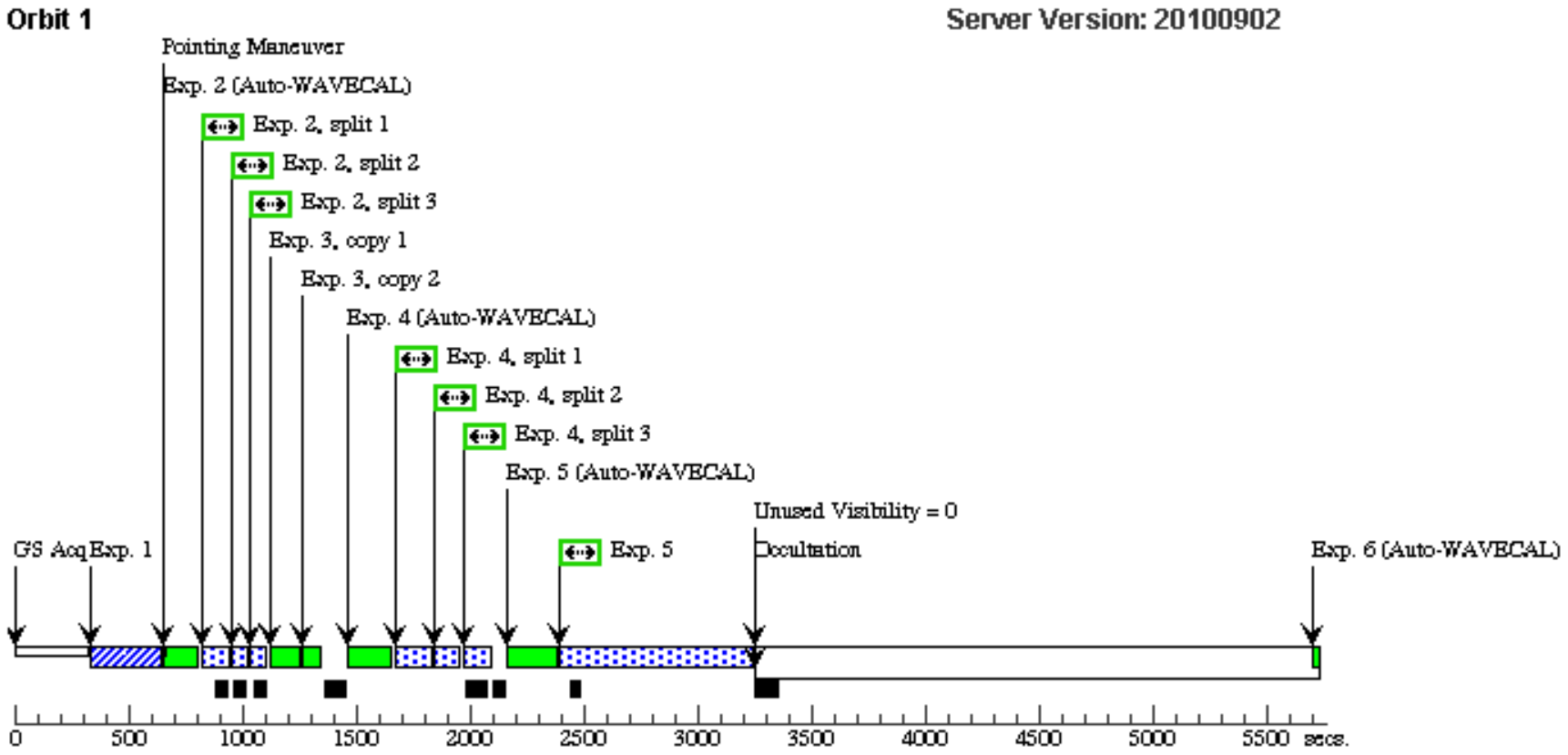
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NGC3125-1	RA: 10 06 33.2800 (151.6386667d) Dec: -29 56 6.80 (-29.93522d) Equinox: J2000	Radial Velocity: 1113 km/sec	V=13.0+/-0.5 F(1300) = 2e-15	Reference Frame: ICRS

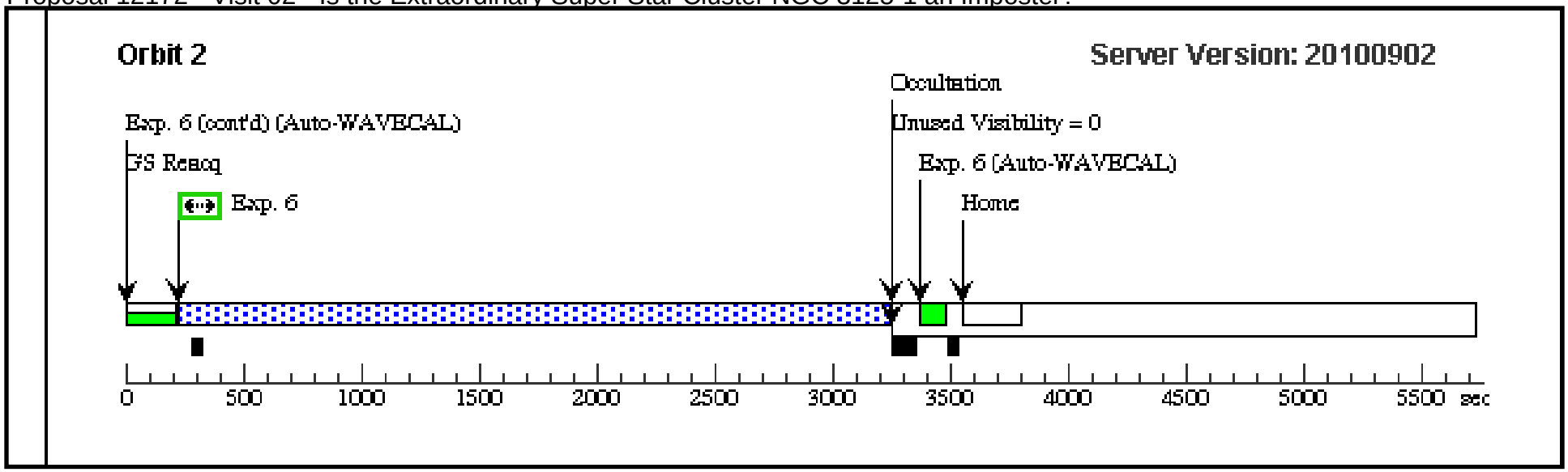
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) NGC3125-1	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			20 Secs	
								[==>]	***[1]***
2		(1) NGC3125-1	STIS/CCD, ACCUM, 52X2	G750L 7751 A	CR-SPLIT=3	POS TARG null,6.5		120 Secs *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]*	***[1]***
3		CCDFLAT	STIS/CCD, ACCUM, 0.2X0.2	G750L 7751 A				*[==>(Copy 1)]* *[==>(Copy 2)]*	***[1]***
4		(1) NGC3125-1	STIS/CCD, ACCUM, 52X2	G430L 4300 A	CR-SPLIT=3	SAME POS AS 2		240 Secs *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]*	***[1]***
5		(1) NGC3125-1	STIS/NUV-MAMA, ACCUM, 52X2	G230L 2376 A		SAME POS AS 2		808 Secs *[==>]*	***[1]***
6		(1) NGC3125-1	STIS/FUV-MAMA, ACCUM, 52X2	G140L 1425 A		SAME POS AS 2		2967 Secs *[==>]*	***[2]***

Orbit Structure




Orbit 2
Server Version: 20100902
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GS Reacq
Exp. 6 (Auto-WAVECAL)
Exp. 6
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