12217 - Spectroscopy of faint T dwarf calibrators: understanding the substellar mass function and the coolest brown dwarfs

Cycle: 18, 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) CL-MELOTTE-22-PLZJ-93	WFC3/IR	1	06-Oct-2010 21:14:08.0	yes
02	(2) CL-MELOTTE-22-PLZJ-100	WFC3/IR	1	06-Oct-2010 21:14:13.0	yes
03	(3) MAYRIT-520267	WFC3/IR	1	06-Oct-2010 21:14:17.0	yes
04	(4) BZR99-S-ORI-73	WFC3/IR	1	06-Oct-2010 21:14:20.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
05	(5) 01593371-0022046	WFC3/IR	1	06-Oct-2010 21:14:24.0	yes
06	(6) 09030762+0757108	WFC3/IR	1	06-Oct-2010 21:14:27.0	yes
56	(6) 09030762+0757108	WFC3/IR	1	06-Oct-2010 21:14:30.0	yes

7 Total Orbits Used

ABSTRACT

More than 100 methane brown dwarfs, or T dwarfs, have now been discovered in the local field with 2MASS, SLOAN and UKIDSS, opening up a new area of physics describing objects at 450-1400 K. However, very few calibrator objects exist with well established ages and metallicities. A very surprising result from the UKIDSS sample (supported by 2MASS and SLOAN) is that the substellar mass function in the local field appears to decline to lower masses, in marked contrast to the rising initial mass function (IMF) observed in young clusters. Given that such a difference between the present day IMF and the Galactic time-averaged IMF is unlikely, it is very possible that the apparently falling IMF is an artifact of serious errors in either T model atmospheres or the evolutionary isochrones. We propose WFC3 spectroscopy of 4 faint T dwarf calibrators with well established ages and metallicities in the Pleiades and Sigma Ori clusters, and 2 faint field T dwarfs from UKIDSS for comparison. These spectra will constitute vital calibration data for T dwarf atmospheres with a wide range of surface gravities, which will be used to test and improve the model atmospheres. They will also aid preparation for future spectroscopy of the much larger numbers of field T dwarfs to soon be found by VISTA and WISE. These new surveys will permit a more precise measurement of the mass function and detection of even cooler objects.

OBSERVING DESCRIPTION

This project takes slitless WFC3 spectroscopy of 6 brown dwarfs with the G141 grism. One brown dwarf is observed in each of the 6 orbits, in a single visit.

Visit

Proposal 12217, Visit 01, scheduling Thu Oct 07 01:14:34 GMT 2010

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 128.0D TO 133.9 D; ORIENT 138.0D TO 146.8 D

Comments: Observation of Target 2.
The ORIENT ranges are carefully selected to prevent overlap of spectra of stars and galaxies in the field.
We want the spectrum to be dispersed towards either Position Angle=263.5 to 269.4 on the sky or PA=273.5 to 282.3 degrees.
Calculation is ORIENT=PA+225-0.5+360, where 225 is the WFC3 IR +X instrument orientation and the -0.5 degrees allows for the slight tilt of the spectra with respect to the X-axis.

The scheduling window is narrow (about 3 days) so if this is too tight I would suggest reducing the exposure time slightly (e.g. to SAMP=12 per sub-exposure) so that the visit is easier to schedule.

There is a fairly bright star located 24 arcsec west of the target but we believe that the 1st order WFC3 spectra will only be 21 arcsec long so there should be no overlap. The zero order image of the bright star should also not overlap.

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.384 Line Spacing=5.165	Coordinate Frame=POS-TARG Pattern Orientation=151.798 Angle Between Sides=14.087 Center Pattern=false		(2)

Fixed Targets

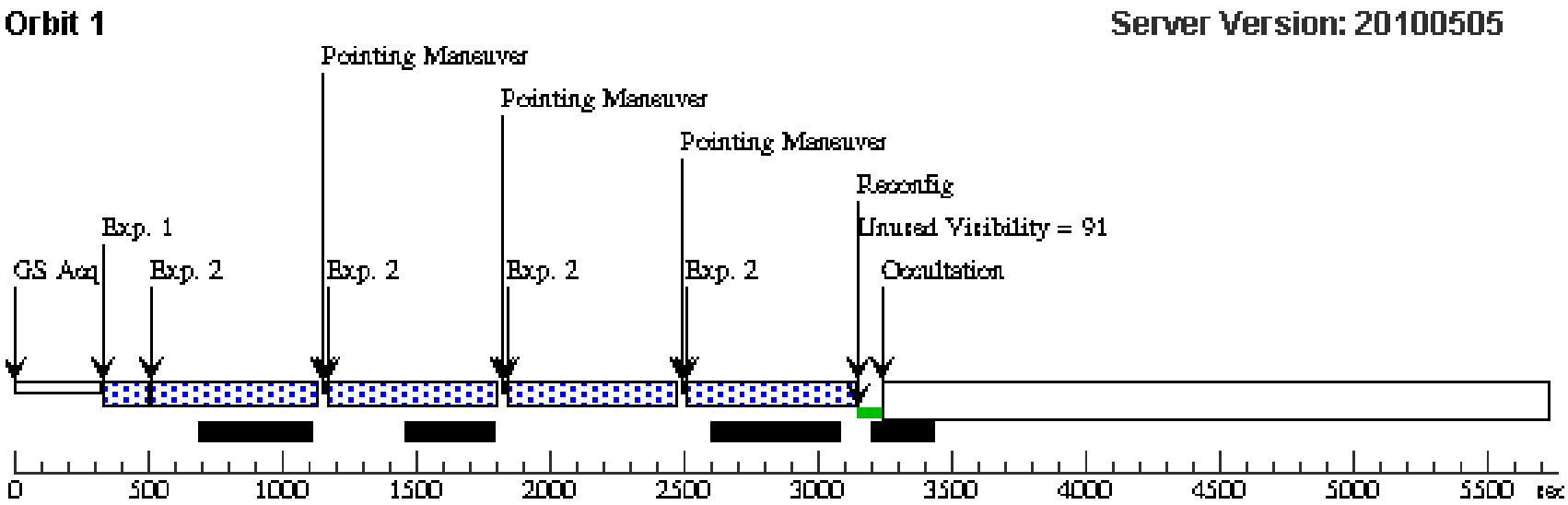
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	CL-MELOTTE-22-PLZJ-93	RA: 03 55 13.0000 (58.8041667d) Dec: +24 36 15.80 (24.60439d) Equinox: J2000		V=30+/-2 J = 20.0 H = 20.0 (Vega mag)	Reference Frame: ICRS

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	Image 1	(1) CL-MELOTTE-22-PLZJ-93	WFC3/IR, MULTIACCUM, G141-REF	F140W	NSAMP=15; SAMP-SEQ=SPARS10			*[==>]*	***[1]***
2	Dispersed Image	(1) CL-MELOTTE-22-PLZJ-93	WFC3/IR, MULTIACCUM, IR	G141	NSAMP=13; SAMP-SEQ=SPARS50		Pattern 1, Exps 2-2 (1)	*[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***

Orbit Structure



Visit

Proposal 12217, Visit 02, scheduling Thu Oct 07 01:14:35 GMT 2010

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 157.2D TO 160.0 D; ORIENT 163.5D TO 173.7 D

Comments: Observation of Target 2.
The ORIENT ranges are carefully selected to prevent overlap of spectra of stars and galaxies in the field.
For this target a galaxy close by significantly restricted the range of possible angles, as noted in the Phase I proposal.
We want the spectrum to be dispersed towards either Position Angle=292.7 to 295.5 on the sky or PA=299.0 to 309.2 degrees.
Calculation is ORIENT=PA+225-0.5, where 225 is the WFC3 IR +X instrument orientation and the -0.5 degrees allows for the slight tilt of the spectra with respect to the X-axis.

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.384 Line Spacing=5.165	Coordinate Frame=POS-TARG Pattern Orientation=151.798 Angle Between Sides=14.087 Center Pattern=false		(2)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	CL-MELOTTE-22-PLZJ-100	RA: 03 47 19.1900 (56.8299583d) Dec: +25 50 53.30 (25.84814d) Equinox: J2000		V=30+/-2 J = 20.3 Z = 23.6 H~20.3 (Vega mags)	Reference Frame: ICRS

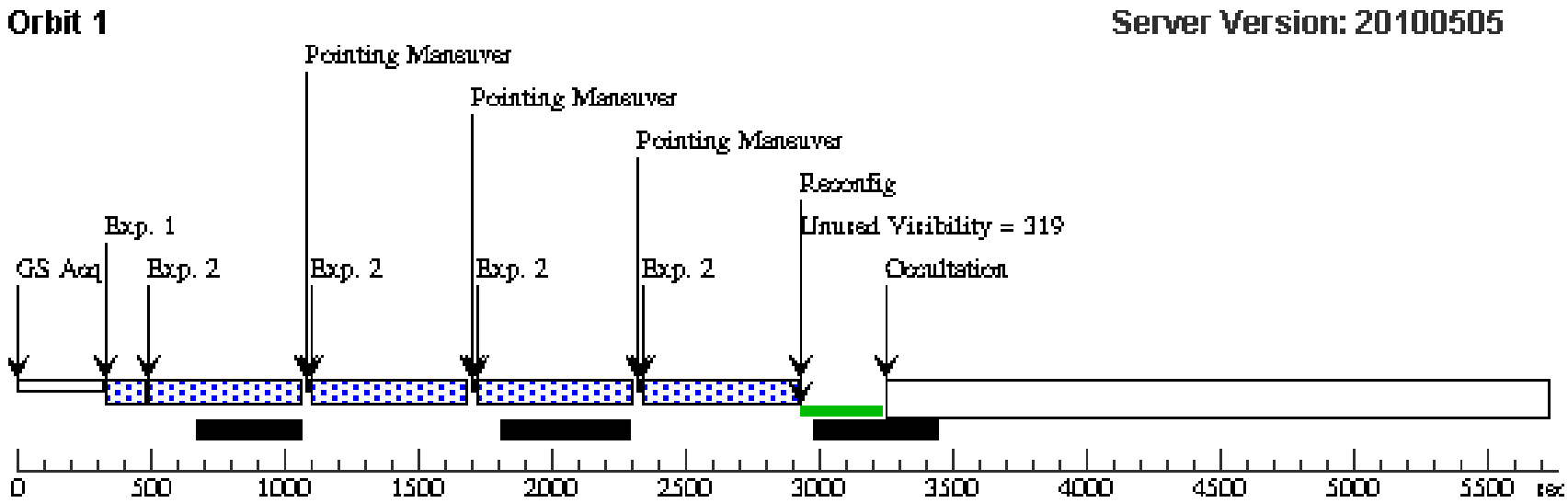
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	Image 1	(2) CL-MELOTTE-22-PLZJ-100	WFC3/IR, MULTIACCUM, G141-REF	F140W	NSAMP=13; SAMP-SEQ=SPARS10			*[==>]*	***[1]***
2	Dispersed Image	(2) CL-MELOTTE-22-PLZJ-100	WFC3/IR, MULTIACCUM, IR	G141	NSAMP=12; SAMP-SEQ=SPARS50		Pattern 1, Exps 2-2 (1)	*[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***

Comments: The time on source had to be reduced for this target from the usual 4x603 sec (NSAMP=13) to 4x553 sec (NSAMP=12) in order to allow the visit to be scheduled, owing to the restrictions on the ORIENT angle.

Orbit Structure



Visit

Proposal 12217, Visit 03, completed Thu Oct 07 01:14:35 GMT 2010

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 30.0D TO 42.0 D; ORIENT 47.0D TO 56.0 D; ORIENT 61.0D TO 109.0 D; ORIENT 114.0D TO 185.0 D; ORIENT 190.0D TO 192.0 D; ORIENT 199.0D TO 203.0 D; ORIENT 209.0D TO 222.0 D; ORIENT 227.0D TO 235.0 D; ORIENT 241.0D TO 289.0 D; ORIENT 294.0D TO 357.0 D

Comments: Observation of Target 3.
The ORIENT ranges are carefully selected to prevent overlap of spectra of stars and galaxies in the field.

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.384 Line Spacing=5.165	Coordinate Frame=POS-TARG Pattern Orientation=151.798 Angle Between Sides=14.087 Center Pattern=false		(2)

Fixed Targets

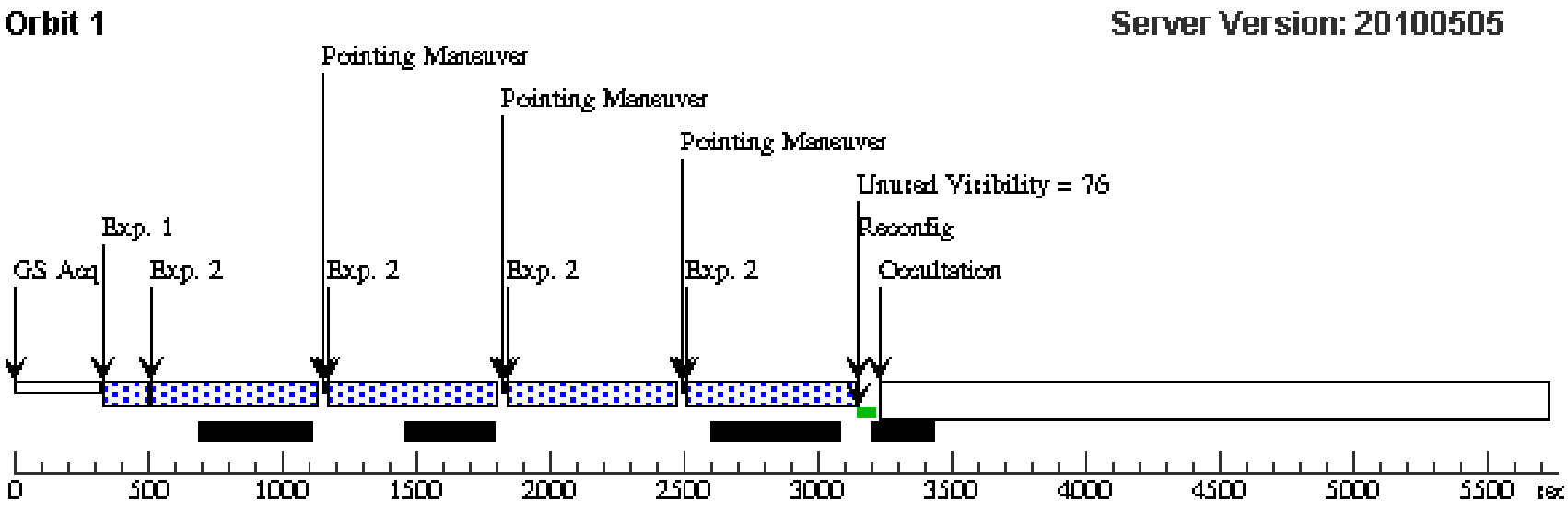
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	MAYRIT-520267	RA: 05 38 10.1000 (84.5420833d) Dec: -02 36 26.00 (-2.60722d) Equinox: J2000		V=30+/-2 J = 20.3 H = 20.4 (Vega mags)	Reference Frame: ICRS

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	Image 1	(3) MAYRIT-520267	WFC3/IR, MULTIACCUM, G141-REF	F140W	NSAMP=15; SAMP-SEQ=SPARS10			*[==>]*	***[1]***
2	Dispersed Image	(3) MAYRIT-520267	WFC3/IR, MULTIACCUM, IR	G141	NSAMP=13; SAMP-SEQ=SPARS50		Pattern 1, Exps 2-2 (1)	*[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***

Orbit Structure



Visit

Proposal 12217, Visit 04, scheduling Thu Oct 07 01:14:36 GMT 2010

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 222.5D TO 245.0 D; ORIENT 42.5D TO 65.0 D; ORIENT 272.5D TO 289.5 D; ORIENT 92.5D TO 109.5 D

Comments: Observation of Target 4.
The ORIENT ranges are carefully selected to prevent overlap of spectra of stars and galaxies in the field.

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.384 Line Spacing=5.165	Coordinate Frame=POS-TARG Pattern Orientation=151.798 Angle Between Sides=14.087 Center Pattern=false		(2)

Fixed Targets

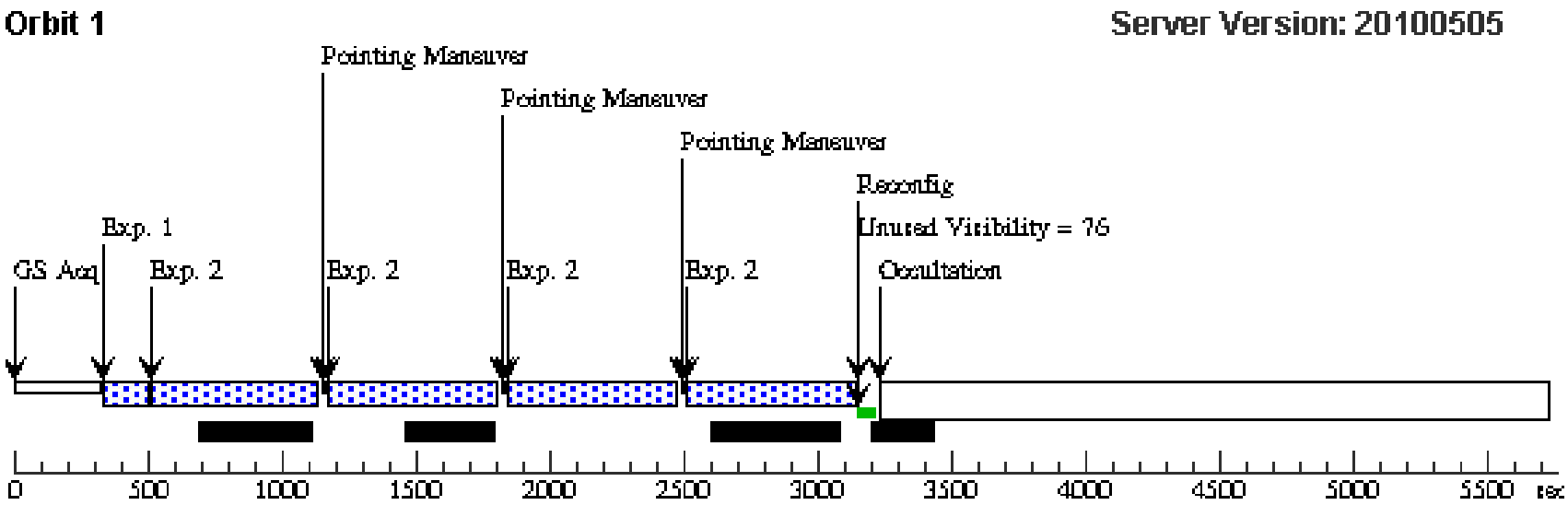
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	BZR99-S-ORI-73	RA: 05 38 14.4900 (84.5603750d) Dec: -02 45 11.80 (-2.75328d) Equinox: J2000		V=31+/-2 J = 20.9 H = 20.8 (Vega mags)	Reference Frame: ICRS

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	Image 1	(4) BZR99-S-ORI-73	WFC3/IR, MULTIACCUM, G141-REF	F140W	NSAMP=15; SAMP-SEQ=SPARS10			*[==>]*	***[1]***
2	Dispersed Image	(4) BZR99-S-ORI-73	WFC3/IR, MULTIACCUM, IR	G141	NSAMP=13; SAMP-SEQ=SPARS50		Pattern 1, Exps 2-2 (1)	*[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***

Orbit Structure



Visit

Proposal 12217, Visit 05, completed Thu Oct 07 01:14:37 GMT 2010

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 263.0D TO 238.0 D; ORIENT 245.0D TO 256.0 D

Comments: Observation of Target 5.
The ORIENT ranges are carefully selected to prevent overlap of spectra of 2 stars in the field.

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.384 Line Spacing=5.165	Coordinate Frame=POS-TARG Pattern Orientation=151.798 Angle Between Sides=14.087 Center Pattern=false		(2)

Fixed Targets

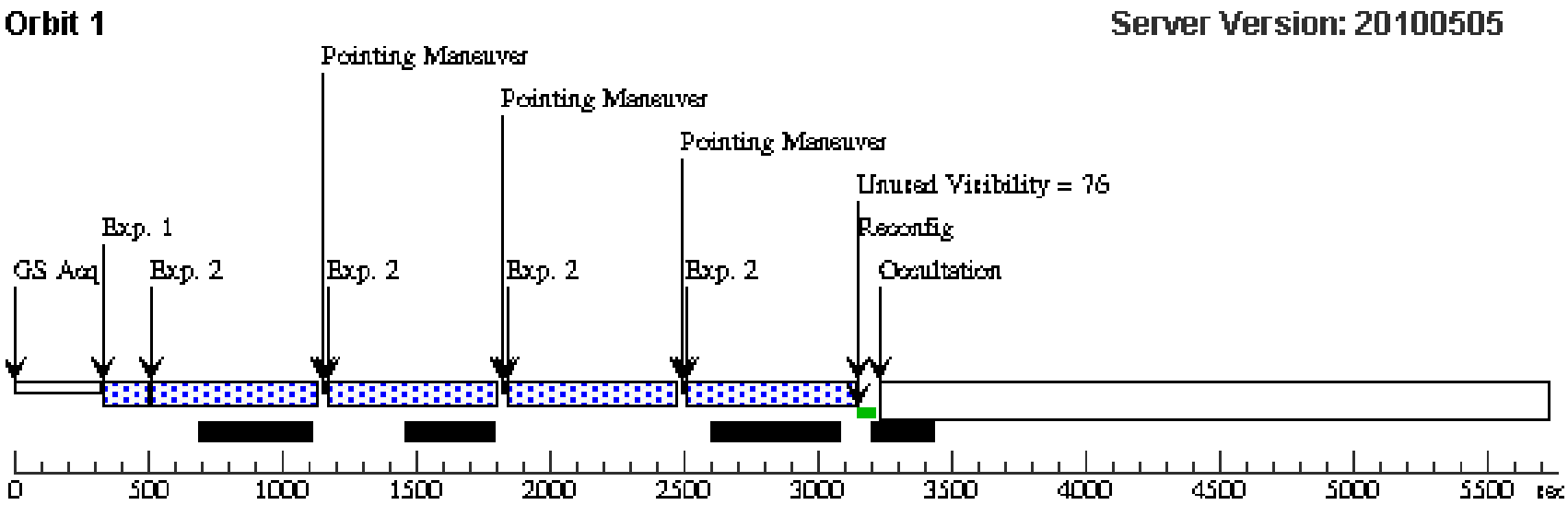
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(5)	01593371-0022046	RA: 01 59 33.7100 (29.8904583d) Dec: -00 22 4.60 (-.36794d) Equinox: J2000		V=29+/-2 J = 19.1 H = 19.7 (Vega mags)	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the 2MASS database.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	Image 1	(5) 01593371-0022046	WFC3/IR, MULTIACCUM, G141-REF	F140W	NSAMP=15; SAMP-SEQ=SPARS10			*[==>]*	***[1]***
2	Dispersed Image	(5) 01593371-0022046	WFC3/IR, MULTIACCUM, IR	G141	NSAMP=13; SAMP-SEQ=SPARS50		Pattern 1, Exps 2-2 (1)	*[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***

Orbit Structure



Visit

Proposal 12217, Visit 06, scheduling Thu Oct 07 01:14:37 GMT 2010

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 355.0D TO 8.0 D; ORIENT 15.0D TO 84.0 D; ORIENT 104.0D TO 124.0 D; ORIENT 140.0D TO 150.0 D; ORIENT 156.0D TO 198.0 D; ORIENT 207.0D TO 280.0 D; ORIENT 295.0D TO 349.0 D

Comments: Observation of Target 6.
The ORIENT ranges are carefully selected to prevent overlap of spectra of several stars in the field.

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.384 Line Spacing=5.165	Coordinate Frame=POS-TARG Pattern Orientation=151.798 Angle Between Sides=14.087 Center Pattern=false		(2)

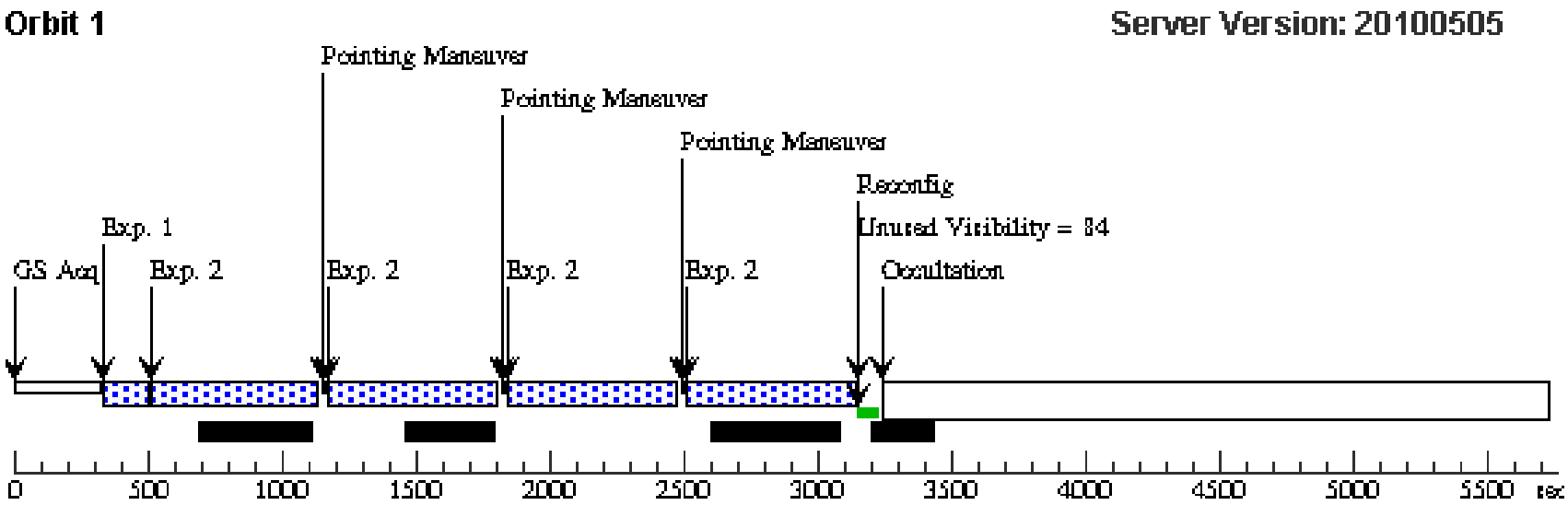
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(6)	09030762+0757108	RA: 09 03 7.6200 (135.7817500d) Dec: +07 57 10.80 (7.95300d) Equinox: J2000		V=29+/-2 J = 19.0 H = 19.5 (Vega mags)	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	Image 1	(6) 09030762+0757108	WFC3/IR, MULTIACCUM, G141-REF	F140W	NSAMP=15; SAMP-SEQ=SPARS10			*[==>]*	***[1]***
2	Dispersed Image	(6) 09030762+0757108	WFC3/IR, MULTIACCUM, IR	G141	NSAMP=13; SAMP-SEQ=SPARS50		Pattern 1, Exps 2-2 (1)	*[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***

Orbit Structure



Visit

Proposal 12217, Visit 56 Thu Oct 07 01:14:38 GMT 2010

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 355.0D TO 8.0 D; ORIENT 15.0D TO 84.0 D; ORIENT 104.0D TO 124.0 D; ORIENT 140.0D TO 150.0 D; ORIENT 156.0D TO 198.0 D; ORIENT 207.0D TO 280.0 D; ORIENT 295.0D TO 349.0 D

Comments: Observation of Target 6.
The ORIENT ranges are carefully selected to prevent overlap of spectra of several stars in the field.
This is a repeat of visit 6 which failed due to a spacecraft problem.

Patterns

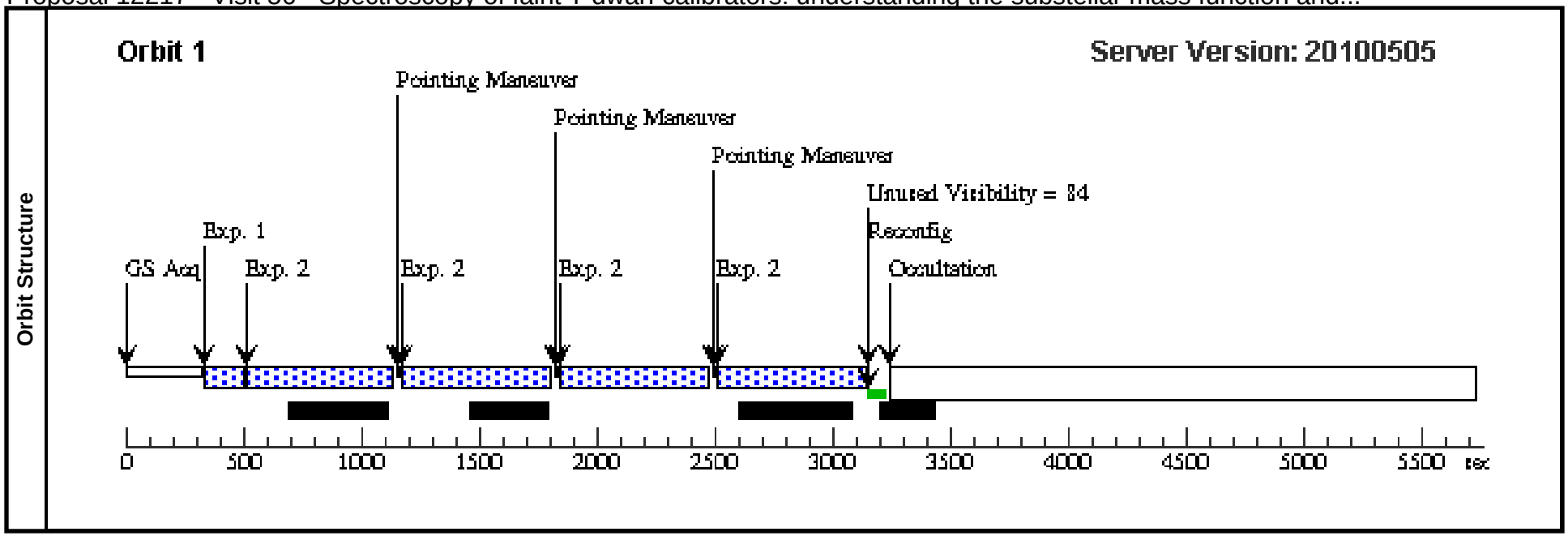
#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.384 Line Spacing=5.165	Coordinate Frame=POS-TARG Pattern Orientation=151.798 Angle Between Sides=14.087 Center Pattern=false		(2)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(6)	09030762+0757108	RA: 09 03 7.6200 (135.7817500d) Dec: +07 57 10.80 (7.95300d) Equinox: J2000		V=29+/-2 J = 19.0 H = 19.5 (Vega mags)	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	Image 1	(6) 09030762+0757108	WFC3/IR, MULTIACCUM, G141-REF	F140W	NSAMP=15; SAMP-SEQ=SPARS10			*[==>]*	***[1]***
2	Dispersed Image	(6) 09030762+0757108	WFC3/IR, MULTIACCUM, IR	G141	NSAMP=13; SAMP-SEQ=SPARS50		Pattern 1, Exps 2-2 (1)	*[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***


Orbit Structure
Orbit 1
Server Version: 20100505
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Unused Visibility = 84
Exp. 1
Reconfig
GS Acq
Exp. 2
Exp. 2
Exp. 2
Exp. 2
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec