



13681 - Fluctuation spectroscopy with the ACS ramp filters: a new way to measure the IMF in elliptical galaxies

Cycle: 22, Proposal Category: GO
(Availability Mode: SUPPORTED)

INVESTIGATORS

<i>Name</i>	<i>Institution</i>	<i>E-Mail</i>
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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) NGC5128	ACS/WFC	1	31-Jul-2014 21:01:29.0	yes
02	(1) NGC5128	ACS/WFC	1	31-Jul-2014 21:01:30.0	yes
03	(1) NGC5128	ACS/WFC	1	31-Jul-2014 21:01:31.0	yes
04	(1) NGC5128	ACS/WFC	1	31-Jul-2014 21:01:32.0	yes
05	(1) NGC5128	ACS/WFC	1	31-Jul-2014 21:01:32.0	yes
06	(1) NGC5128	ACS/WFC	1	31-Jul-2014 21:01:33.0	yes
07	(1) NGC5128	WFC3/IR	1	31-Jul-2014 21:01:34.0	yes

7 Total Orbits Used

ABSTRACT

Images of old stellar populations show pixel-to-pixel fluctuations due to Poisson variations in the number of giant stars. These surface brightness fluctuations can be used to study the spectra of stars as a function of their luminosity, by obtaining differential spectroscopy of pixels with high and

low fluctuations. If the average number of stars per pixel is sufficiently low, there will be individual pixels that have almost no light from luminous giants, providing sightlines that are dominated by main sequence stars. In this regime the observed spectral response is strongly dependent on the number of cool, low mass stars, and hence the stellar initial mass function (IMF). We propose to observe the nearest elliptical galaxy, Centaurus A, through four narrowband ACS ramp filters tuned to the 0.8 - 0.9 micron range. From the relation between ACS narrowband indices and the amplitude of the surface brightness fluctuation we will be able to obtain quantitative constraints on the IMF from 0.1-1 Solar masses, and distinguish between a Kroupa-like IMF or a bottom-heavy, Salpeter-like IMF, with ~ 5 sigma significance. We have demonstrated the feasibility of the technique used in this proposal in a Cycle 19 program, where we used the same observational strategy to measure the properties of luminous giants in the Virgo galaxy NGC 4472.

OBSERVING DESCRIPTION

We are observing a single target, a field away from the dust lane in the galaxy Centaurus A (NGC 5128), in 4 ACS ramp filters, in the ACS F814W filter, and in 2 WFC3 IR filters.

The aim is that the field is imaged in the RAMP-I aperture for all the ACS filters (including F814W).

A standard 4-exposure box dither pattern is used. The F814W exposures are a total of 2 orbits but they are split over 2 visits. This is deliberate: by comparing the 2 F814W visits we will get valuable information on the errors in cosmic ray rejection, centroiding, etc.

The data can be taken at any ORIENT but it is crucial that all 7 visits are taken at the same ORIENT.

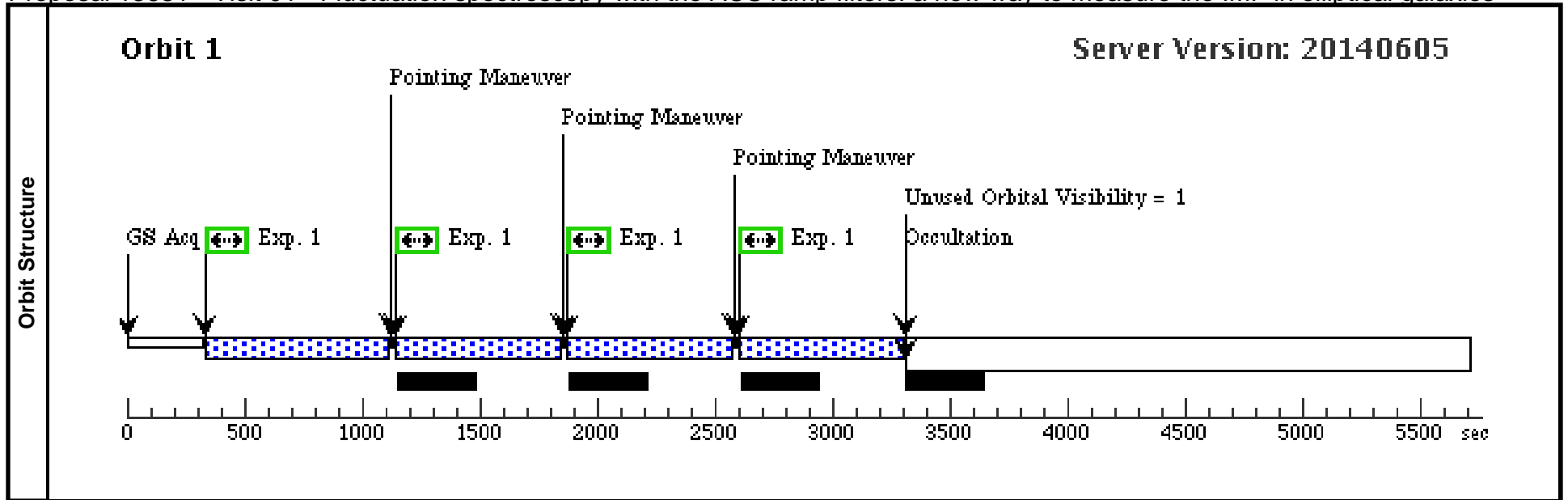
After iterating with Norman Grogin we included a post-flash to the ramp filter observations, with FLASH=25.

For the IR filters, we are using a 4-point dither pattern and observe in F125W and F160W in a single orbit. In the initial submission we used a 2-point pattern; after iterating with Knox Long we changed it to 4-point box pattern. There is no need to dither over the 'blob' - it is more important to have small dithers so there are no relative astrometric distortions between exposures, and it is important to have optimal resolution (i.e. sample the PSF properly).

Proposal 13681 - Visit 01 - Fluctuation spectroscopy with the ACS ramp filters: a new way to measure the IMF in elliptical galaxies

Fri Aug 01 01:01:35 GMT 2014

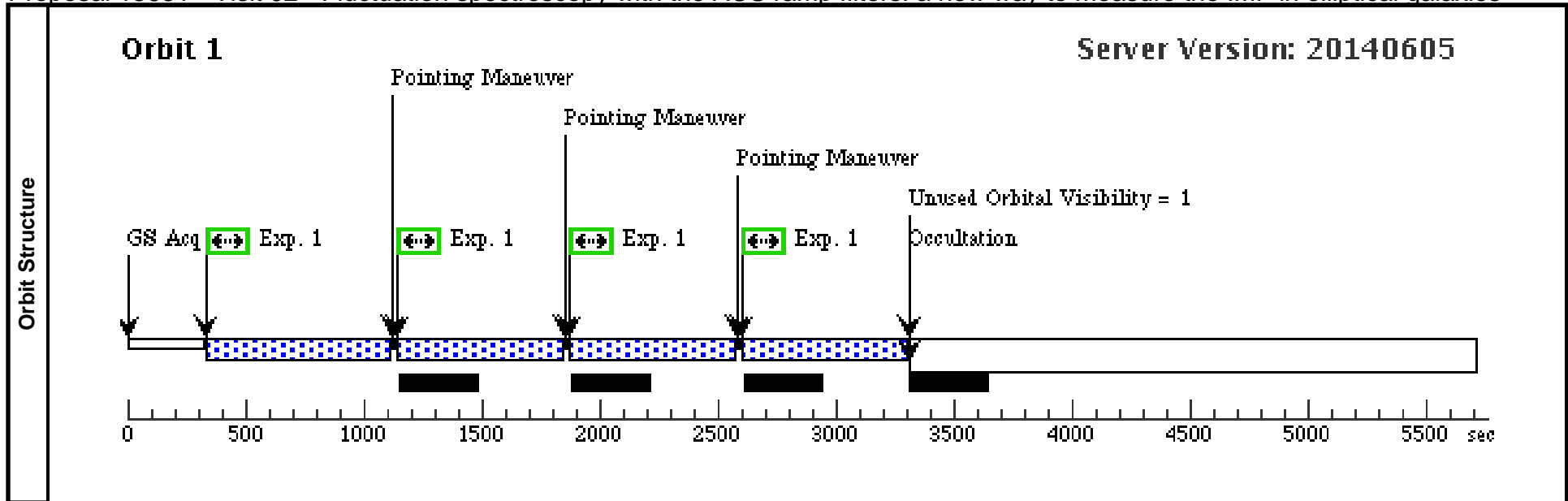
Visit	Proposal 13681, Visit 01, implementation Diagnostic Status: Warning Scientific Instruments: ACS/WFC Special Requirements: (none)										
	(F8218N (01.001)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures.										
Diagnosics											
Patterns	#	Primary Pattern				Secondary Pattern				Exposures	
	(4)	Pattern Type=ACS-WFC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.265 Line Spacing=0.187				Coordinate Frame=POS-TARG Pattern Orientation=20.67 Angle Between Sides=69.05 Center Pattern=false				(1)	
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous		
	(1)	NGC5128	RA: 13 25 37.1000 (201.4045833d) Dec: -42 59 17.00 (-42.98806d) Equinox: J2000				V=6.84		Reference Frame: SIMBAD		
<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i>											
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1	F8218N	(1) NGC5128	ACS/WFC, ACCUM, WFC1-IRAMP	FR853N 8218 A	FLASH=25.0		Pattern 4, Exps 1-1 in Visit 01 (4)	340 Secs (2264 Secs) [==>566.0 Secs (Pattern 1)] [==>566.0 Secs (Pattern 2)] [==>566.0 Secs (Pattern 3)] [==>566.0 Secs (Pattern 4)]		[1]



Proposal 13681 - Visit 02 - Fluctuation spectroscopy with the ACS ramp filters: a new way to measure the IMF in elliptical galaxies

Fri Aug 01 01:01:36 GMT 2014

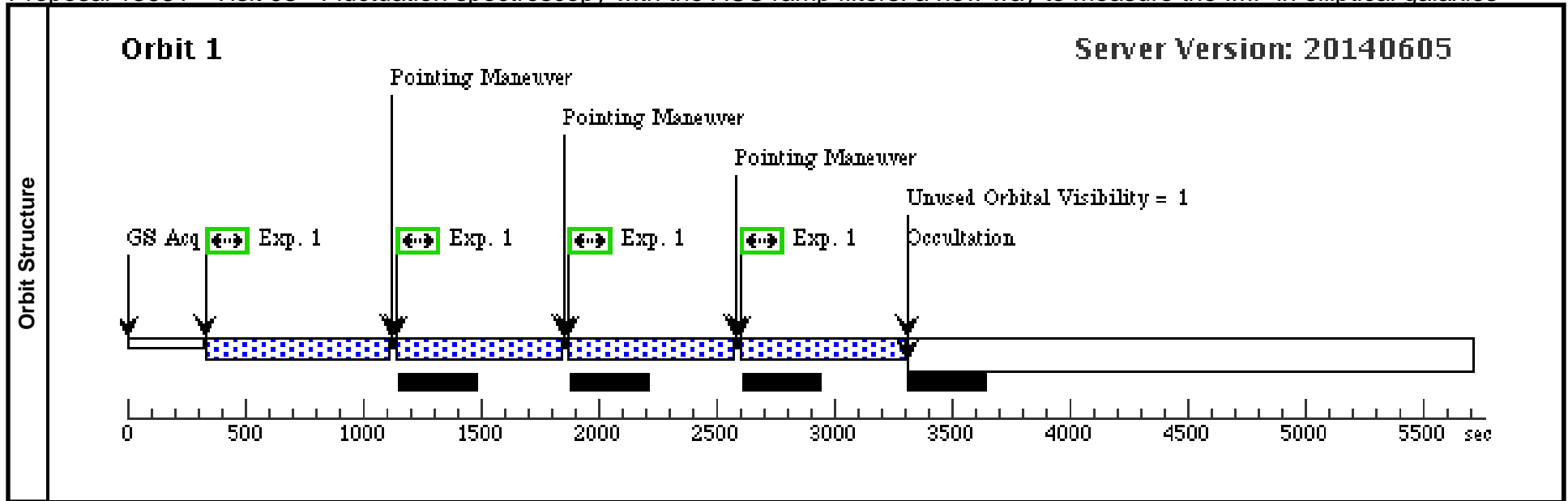
Visit	Proposal 13681, Visit 02, implementation Diagnostic Status: Warning Scientific Instruments: ACS/WFC Special Requirements: SAME ORIENT AS 01										
	(F8354N (02.001)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures.										
Diagnosics											
Patterns	#	Primary Pattern				Secondary Pattern				Exposures	
	(4)	Pattern Type=ACS-WFC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.265 Line Spacing=0.187				Coordinate Frame=POS-TARG Pattern Orientation=20.67 Angle Between Sides=69.05 Center Pattern=false				(1)	
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes	Miscellaneous			
	(1)	NGC5128	RA: 13 25 37.1000 (201.4045833d) Dec: -42 59 17.00 (-42.98806d) Equinox: J2000				V=6.84	Reference Frame: SIMBAD			
<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i>											
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1	F8354N	(1) NGC5128	ACS/WFC, ACCUM, WFC1-IRAMP	FR853N 8354 A	FLASH=25		Pattern 4, Exps 1-1 in Visit 02 (4)	400 Secs (2264 Secs) [==>566.0 Secs (Pattern 1)] [==>566.0 Secs (Pattern 2)] [==>566.0 Secs (Pattern 3)] [==>566.0 Secs (Pattern 4)]		[1]



Proposal 13681 - Visit 03 - Fluctuation spectroscopy with the ACS ramp filters: a new way to measure the IMF in elliptical galaxies

Fri Aug 01 01:01:36 GMT 2014

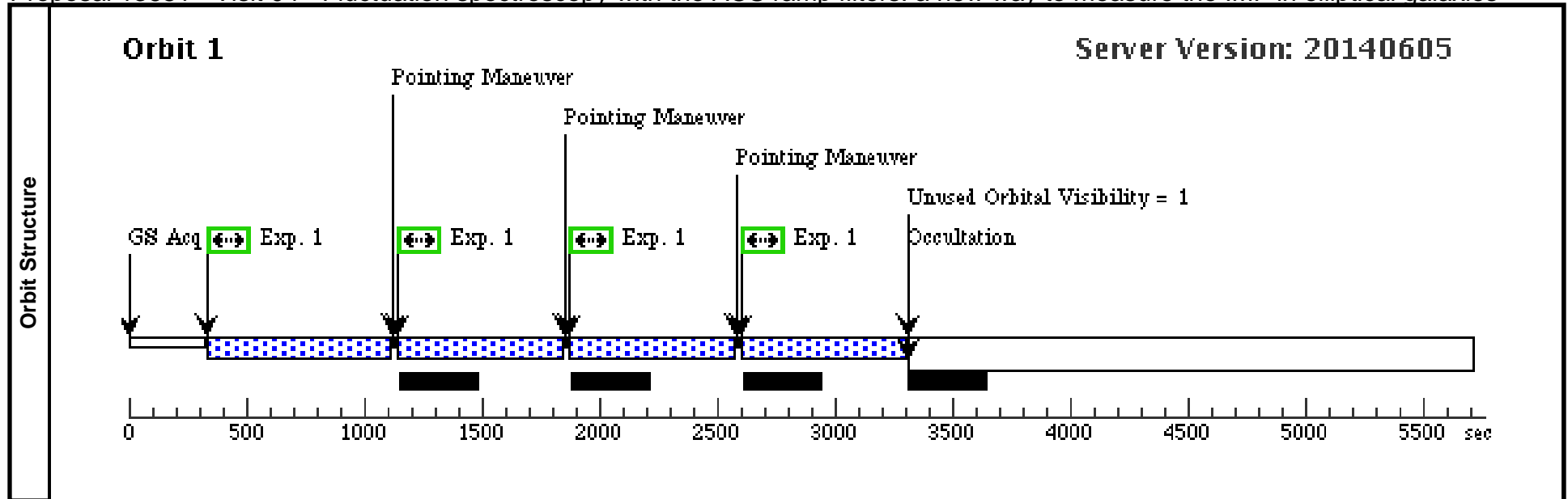
Visit	Proposal 13681, Visit 03, implementation Diagnostic Status: Warning Scientific Instruments: ACS/WFC Special Requirements: SAME ORIENT AS 01										
	Diagnostics	(F8548N (03.001)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures.									
Patterns		#	Primary Pattern				Secondary Pattern				Exposures
	(4)	Pattern Type=ACS-WFC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.265 Line Spacing=0.187				Coordinate Frame=POS-TARG Pattern Orientation=20.67 Angle Between Sides=69.05 Center Pattern=false				(1)	
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes	Miscellaneous			
	(1)	NGC5128	RA: 13 25 37.1000 (201.4045833d) Dec: -42 59 17.00 (-42.98806d) Equinox: J2000				V=6.84	Reference Frame: SIMBAD			
<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i>											
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1	F8548N	(1) NGC5128	ACS/WFC, ACCUM, WFC1-IRAMP	FR853N 8548 A	FLASH=25		Pattern 4, Exps 1-1 in Visit 03 (4)	400 Secs (2264 Secs) [=>566.0 Secs (Pattern 1)] [=>566.0 Secs (Pattern 2)] [=>566.0 Secs (Pattern 3)] [=>566.0 Secs (Pattern 4)]		[1]



Proposal 13681 - Visit 04 - Fluctuation spectroscopy with the ACS ramp filters: a new way to measure the IMF in elliptical galaxies

Fri Aug 01 01:01:36 GMT 2014

Visit	Proposal 13681, Visit 04, implementation Diagnostic Status: Warning Scientific Instruments: ACS/WFC Special Requirements: SAME ORIENT AS 01										
	(F8787N (04.001)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures.										
Diagnosics											
Patterns	#	Primary Pattern				Secondary Pattern				Exposures	
	(4)	Pattern Type=ACS-WFC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.265 Line Spacing=0.187				Coordinate Frame=POS-TARG Pattern Orientation=20.67 Angle Between Sides=69.05 Center Pattern=false				(1)	
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous		
	(1)	NGC5128	RA: 13 25 37.1000 (201.4045833d) Dec: -42 59 17.00 (-42.98806d) Equinox: J2000				V=6.84		Reference Frame: SIMBAD		
<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i>											
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1	F8787N	(1) NGC5128	ACS/WFC, ACCUM, WFC1-IRAMP	FR853N 8787 A	FLASH=25		Pattern 4, Exps 1-1 in Visit 04 (4)	400 Secs (2264 Secs) [=>566.0 Secs (Pattern 1)] [=>566.0 Secs (Pattern 2)] [=>566.0 Secs (Pattern 3)] [=>566.0 Secs (Pattern 4)]		[1]



Proposal 13681 - Visit 05 - Fluctuation spectroscopy with the ACS ramp filters: a new way to measure the IMF in elliptical galaxies

Fri Aug 01 01:01:36 GMT 2014

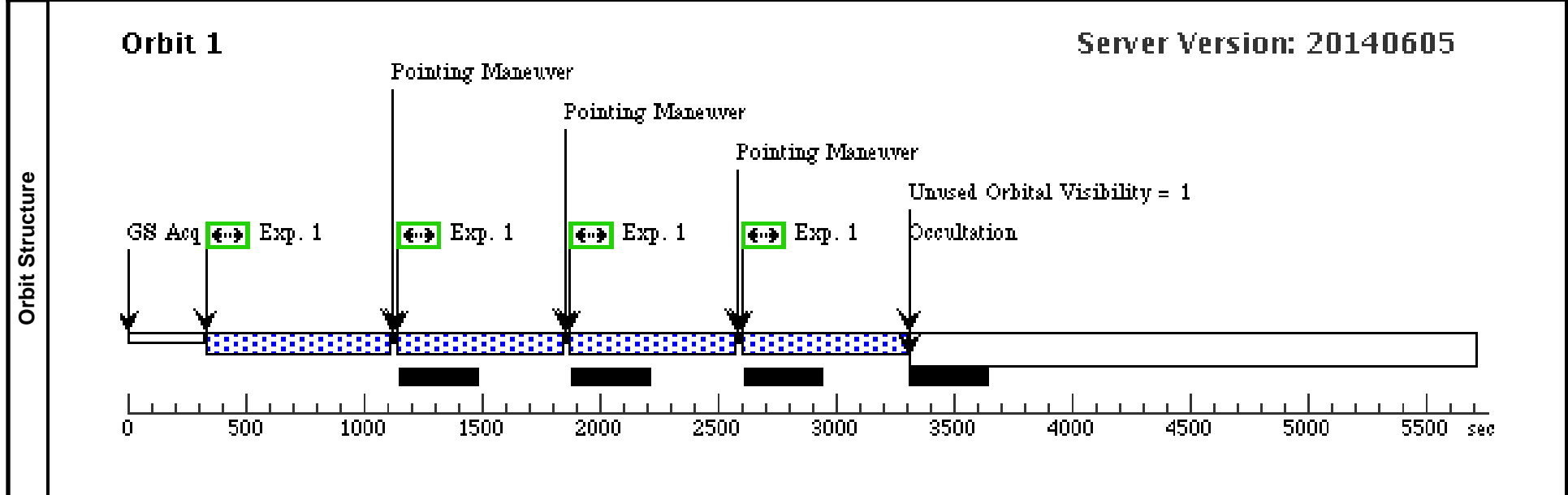
Visit	Proposal 13681, Visit 05, implementation		
	Diagnostic Status: No Diagnostics		
	Scientific Instruments: ACS/WFC		
	Special Requirements: SAME ORIENT AS 01		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
	(4)	Pattern Type=ACS-WFC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.265 Line Spacing=0.187	Coordinate Frame=POS-TARG Pattern Orientation=20.67 Angle Between Sides=69.05 Center Pattern=false	

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	NGC5128	RA: 13 25 37.1000 (201.4045833d) Dec: -42 59 17.00 (-42.98806d) Equinox: J2000		V=6.84	Reference Frame: SIMBAD

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 (Total)/[Actual Dur.]	Orbit
	1	F814W	(1) NGC5128	ACS/WFC, ACCUM, WFC1-IRAMP	F814W				Pattern 4, Exps 1-1 in Visit 05 (4)	400 Secs (2288 Secs) [==>572.0 Secs (Pattern 1)] [==>572.0 Secs (Pattern 2)] [==>572.0 Secs (Pattern 3)] [==>572.0 Secs (Pattern 4)]



Proposal 13681 - Visit 06 - Fluctuation spectroscopy with the ACS ramp filters: a new way to measure the IMF in elliptical galaxies

Fri Aug 01 01:01:36 GMT 2014

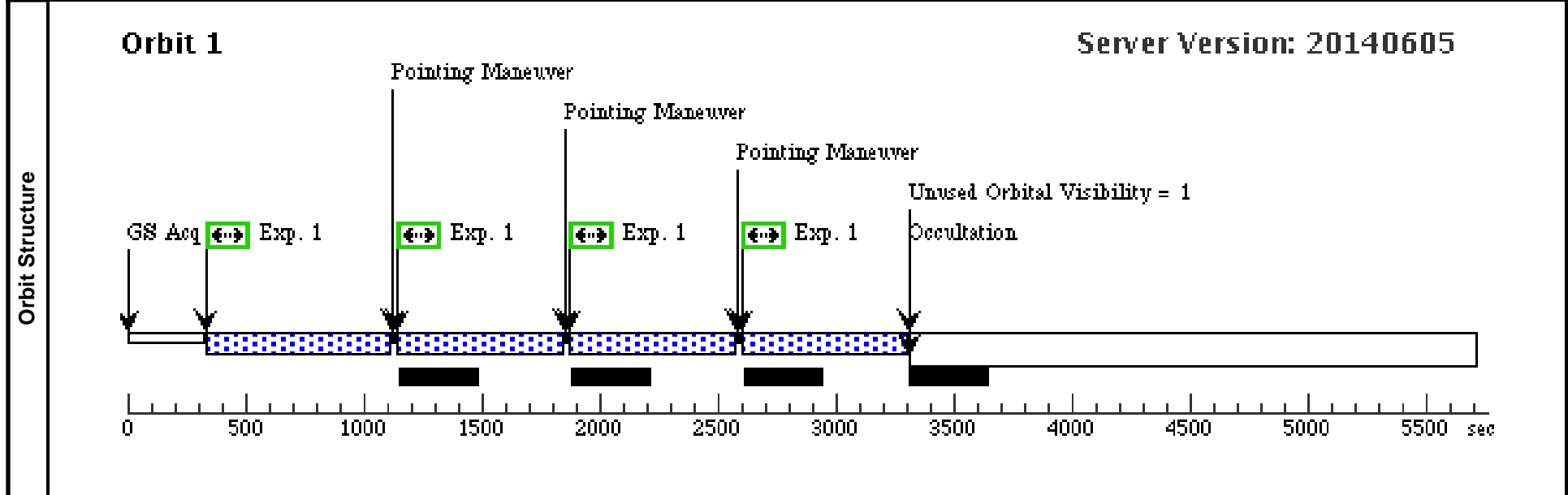
Visit	Proposal 13681, Visit 06, implementation Diagnostic Status: No Diagnostics Scientific Instruments: ACS/WFC Special Requirements: SAME ORIENT AS 01		
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Patterns	#	Primary Pattern	Secondary Pattern	Exposures
	(4)	Pattern Type=ACS-WFC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.265 Line Spacing=0.187	Coordinate Frame=POS-TARG Pattern Orientation=20.67 Angle Between Sides=69.05 Center Pattern=false	(1)

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	NGC5128	RA: 13 25 37.1000 (201.4045833d) Dec: -42 59 17.00 (-42.98806d) Equinox: J2000		V=6.84	Reference Frame: SIMBAD

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 (Total)/[Actual Dur.]	Orbit
	1	F814W	(1) NGC5128	ACS/WFC, ACCUM, WFC1-IRAMP	F814W				Pattern 4, Exps 1-1 i n Visit 06 (4)	400 Secs (2288 Secs) [==>572.0 Secs (Pattern 1)] [==>572.0 Secs (Pattern 2)] [==>572.0 Secs (Pattern 3)] [==>572.0 Secs (Pattern 4)]



Proposal 13681 - Visit 07 - Fluctuation spectroscopy with the ACS ramp filters: a new way to measure the IMF in elliptical galaxies

Fri Aug 01 01:01:36 GMT 2014

Visit	Proposal 13681, Visit 07, implementation Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: SAME ORIENT AS 01									
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures					
		(3)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1-2)				
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	NGC5128	RA: 13 25 37.1000 (201.4045833d) Dec: -42 59 17.00 (-42.98806d) Equinox: J2000		V=6.84	Reference Frame: SIMBAD				
<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i>										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(1) NGC5128	WFC3/IR, MULTIACCUM, IR	F125W	NSAMP=14; SAMP-SEQ=SPAR S25			Pattern 3, Exps 1-2 in Visit 07 (3)	327.938986 Secs (1311.756 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>(Pattern 4)]
2		(1) NGC5128	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=14; SAMP-SEQ=SPAR S25			Pattern 3, Exps 1-2 in Visit 07 (3)	327.938986 Secs (1311.756 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>(Pattern 4)]	[1]

