



13673 - The Metallicity Dependence of the Initial Mass Function

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) QJ0033-1 ANY	ACS/WFC WFC3/UVIS	3	15-Jul-2014 21:04:09.0	yes
02	(2) QJ0033-2 ANY	ACS/WFC WFC3/UVIS	3	15-Jul-2014 21:04:13.0	yes

6 Total Orbits Used

ABSTRACT

We propose to measure the metallicity dependence of the initial mass function (IMF), through a high-precision study of the stellar luminosity function in a remote halo field of the Small Magellanic Cloud (SMC). In a previous HST investigation of an $[\text{Fe}/\text{H}] = -1.1$ SMC halo field, we

achieved one of the most accurate measurements of the stellar IMF to date. Based on resolved photometry of 10,000 stars, we demonstrated that the IMF over a mass of $M = 0.37$ to $0.93 M_{\text{sun}}$ is a single power law with slope $\alpha = -1.90$ ($dN/dM = M^{\alpha}$; 3-sigma uncertainty of $+0.15, -0.10$). Comparing our measurement directly to high-precision local studies of the stellar IMF for stars with the same mass range but $[\text{Fe}/\text{H}] = 0$ provides firm new evidence that the IMF is flattening at low metallicities.

Using 6 orbits on HST, we propose to now compare our IMF from the Kalirai et al. (2013) study to a new SMC halo field with a very similar set of general properties (e.g., density, star formation history, distance, binary fraction), yet one that is 3 times more metal-poor at $[\text{Fe}/\text{H}] = -1.6$. This new field has been carefully chosen from a large ground-based imaging and VLT multiobject spectroscopic survey as the most metal-poor population that is well characterized in the Magellenic Clouds. Using both the ACS and WFC3 instruments simultaneously on HST, we will measure ~ 3000 stars along the unevolved main-sequence of this population from $F606W = 23 - 28.1$. Over a mass range of $M = 0.40$ to $0.90 M_{\text{sun}}$, these measurements will provide a controlled experiment to determine the power-law slope of the IMF to an accuracy of 0.20, and yield a sensitive characterization of its metallicity dependence.

OBSERVING DESCRIPTION

Visits 1 and 2 each target one field in the SMC halo with ACS (primary) and WFC3 (parallel). Each visit has 3 orbits in it, consisting of 6 exposures in F606W and 4 exposures in F814W in both camera. All exposures are dithered. The two fields in each respective visit are offset and placed in locations of the SMC halo that overlap our ground based spectroscopy and avoid obvious bright stars. The same orientation should be used in both visits.

Proposal 13673 - Visit 01 - The Metallicity Dependence of the Initial Mass Function

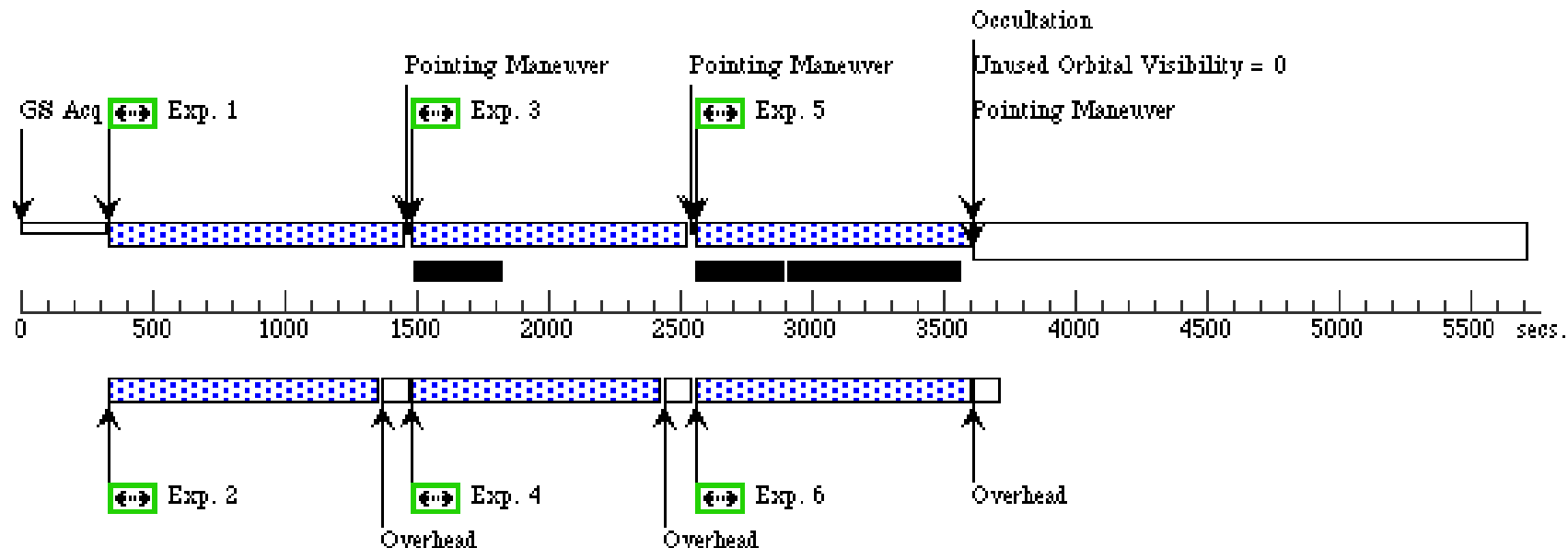
Visit	Proposal 13673, Visit 01 Wed Jul 16 01:04:15 GMT 2014				
	Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS, ACS/WFC Special Requirements: ORIENT 323D TO 335 D; ORIENT 237D TO 258 D; ORIENT 143D TO 179 D				
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes
	(1)	QJ0033-1	RA: 00 33 41.0000 (8.4208333d) Dec: -70 26 30.00 (-70.44167d) Equinox: J2000		V=23
					Reference Frame: ICRS

Proposal 13673 - Visit 01 - The Metallicity Dependence of the Initial Mass Function

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(1) QJ0033-1	ACS/WFC, ACCUM, WFCENTER	F606W	CR-SPLIT=NO	POS TARG -0.3128 67,-0.848667	Prime + Parallel Group 1-2 in Visit 01	915 Secs (915 Secs) [==>]	[1]
	2		ANY	WFC3/UVIS, ACCUM, UVIS-CENTER	F606W	CR-SPLIT=NO		Prime + Parallel Group 1-2 in Visit 01	995 Secs (995 Secs) [==>]	[1]
	3		(1) QJ0033-1	ACS/WFC, ACCUM, WFCENTER	F606W	CR-SPLIT=NO	POS TARG 0.10703 3,-0.814667	Prime + Parallel Group 3-4 in Visit 01	915 Secs (915 Secs) [==>]	[1]
	4		ANY	WFC3/UVIS, ACCUM, UVIS-CENTER	F606W	CR-SPLIT=NO		Prime + Parallel Group 3-4 in Visit 01	945 Secs (945 Secs) [==>]	[1]
	5		(1) QJ0033-1	ACS/WFC, ACCUM, WFCENTER	F606W	CR-SPLIT=NO	POS TARG 0.05763 33,-0.596367	Prime + Parallel Group 5-6 in Visit 01	915 Secs (915 Secs) [==>]	[1]
	6		ANY	WFC3/UVIS, ACCUM, UVIS-CENTER	F606W	CR-SPLIT=NO		Prime + Parallel Group 5-6 in Visit 01	1040 Secs (1040 Secs) [==>]	[1]
	7		(1) QJ0033-1	ACS/WFC, ACCUM, WFCENTER	F606W	CR-SPLIT=NO	POS TARG -0.1152 67,-3.659767	Prime + Parallel Group 7-8 in Visit 01	975 Secs (975 Secs) [==>]	[2]
	8		ANY	WFC3/UVIS, ACCUM, UVIS-CENTER	F606W	CR-SPLIT=NO		Prime + Parallel Group 7-8 in Visit 01	1010 Secs (1010 Secs) [==>]	[2]
	9		(1) QJ0033-1	ACS/WFC, ACCUM, WFCENTER	F606W	CR-SPLIT=NO	POS TARG 0.35403 3,-3.720667	Prime + Parallel Group 9-10 in Visit 01	975 Secs (975 Secs) [==>]	[2]
	10		ANY	WFC3/UVIS, ACCUM, UVIS-CENTER	F606W	CR-SPLIT=NO		Prime + Parallel Group 9-10 in Visit 01	1010 Secs (1010 Secs) [==>]	[2]
	11		(1) QJ0033-1	ACS/WFC, ACCUM, WFCENTER	F606W	CR-SPLIT=NO	POS TARG 0.47803 3,-3.488667	Prime + Parallel Group 11-12 in Visit 01	975 Secs (975 Secs) [==>]	[2]
	12		ANY	WFC3/UVIS, ACCUM, UVIS-CENTER	F606W	CR-SPLIT=NO		Prime + Parallel Group 11-12 in Visit 01	1100 Secs (1100 Secs) [==>]	[2]
	13		(1) QJ0033-1	ACS/WFC, ACCUM, WFCENTER	F814W	CR-SPLIT=NO	POS TARG -0.3128 67,-0.848667	Prime + Parallel Group 13-14 in Visit 01	720 Secs (720 Secs) [==>]	[3]
	14		ANY	WFC3/UVIS, ACCUM, UVIS-CENTER	F814W	CR-SPLIT=NO		Prime + Parallel Group 13-14 in Visit 01	800 Secs (800 Secs) [==>]	[3]
	15		(1) QJ0033-1	ACS/WFC, ACCUM, WFCENTER	F814W	CR-SPLIT=NO	POS TARG 0.10703 3,-0.814667	Prime + Parallel Group 15-16 in Visit 01	670 Secs (670 Secs) [==>]	[3]
	16		ANY	WFC3/UVIS, ACCUM, UVIS-CENTER	F814W	CR-SPLIT=NO		Prime + Parallel Group 15-16 in Visit 01	700 Secs (700 Secs) [==>]	[3]
	17		(1) QJ0033-1	ACS/WFC, ACCUM, WFCENTER	F814W	CR-SPLIT=NO	POS TARG 0.05763 33,-3.596367	Prime + Parallel Group 17-18 in Visit 01	670 Secs (670 Secs) [==>]	[3]
	18		ANY	WFC3/UVIS, ACCUM, UVIS-CENTER	F814W	CR-SPLIT=NO		Prime + Parallel Group 17-18 in Visit 01	700 Secs (700 Secs) [==>]	[3]
	19		(1) QJ0033-1	ACS/WFC, ACCUM, WFCENTER	F814W	CR-SPLIT=NO	POS TARG -0.1152 67,-3.659767	Prime + Parallel Group 19-20 in Visit 01	620 Secs (620 Secs) [==>]	[3]
	20		ANY	WFC3/UVIS, ACCUM, UVIS-CENTER	F814W	CR-SPLIT=NO		Prime + Parallel Group 19-20 in Visit 01	700 Secs (700 Secs) [==>]	[3]

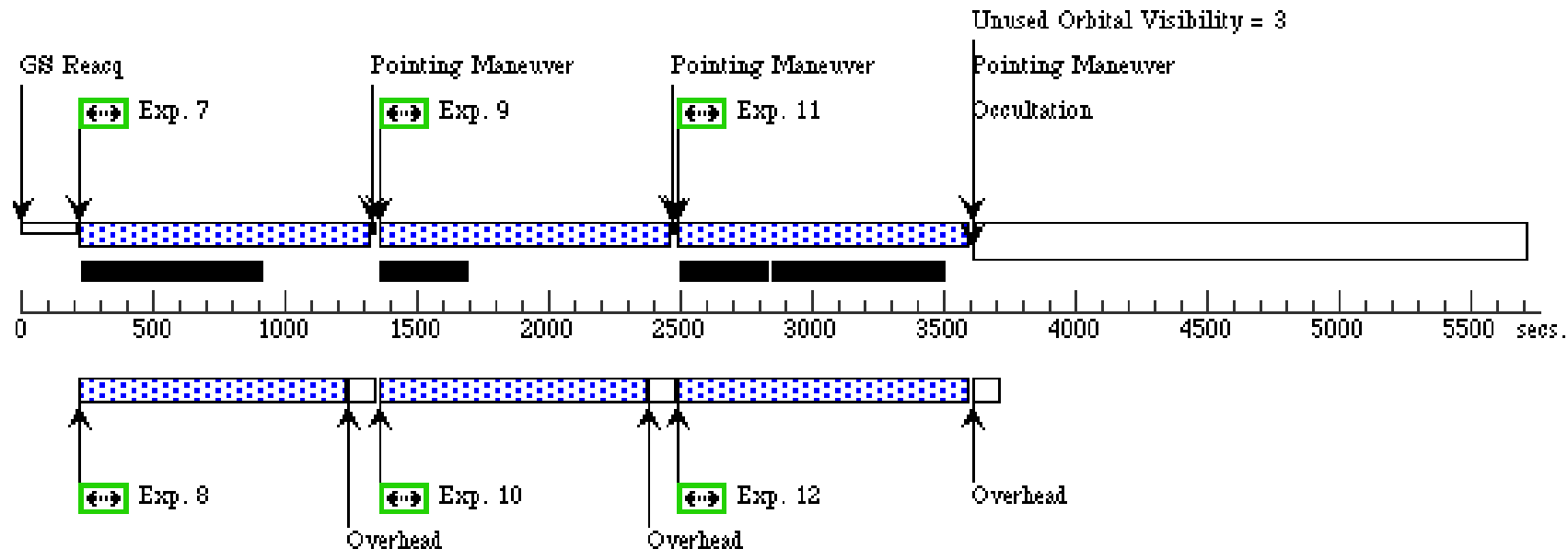
Orbit 1

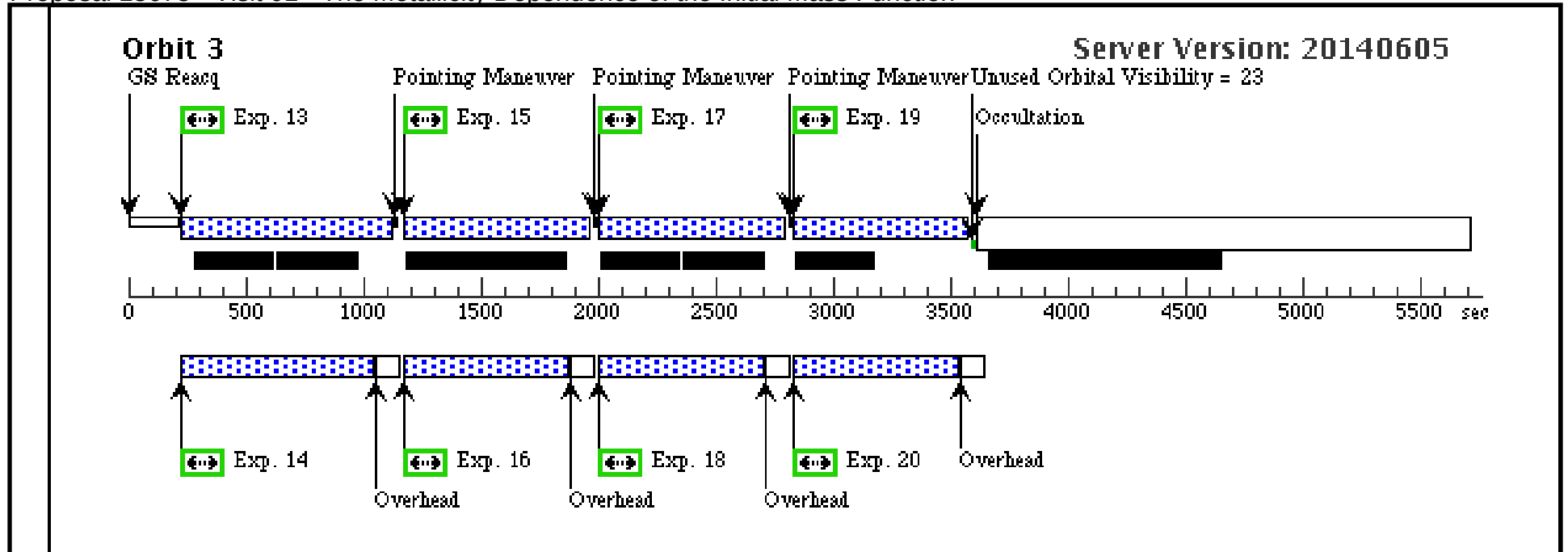
Server Version: 20140605



Orbit 2

Server Version: 20140605





Proposal 13673 - Visit 02 - The Metallicity Dependence of the Initial Mass Function

Visit	Proposal 13673, Visit 02					Wed Jul 16 01:04:15 GMT 2014				
	Diagnostic Status: No Diagnostics									
	Scientific Instruments: WFC3/UVIS, ACS/WFC									
	Special Requirements: SAME ORIENT AS 01									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections		Fluxes		Miscellaneous		
	(2)	QJ0033-2	RA: 00 33 55.0000 (8.4791667d) Dec: -70 30 7.00 (-70.50194d) Equinox: J2000			V=23		Reference Frame: ICRS		

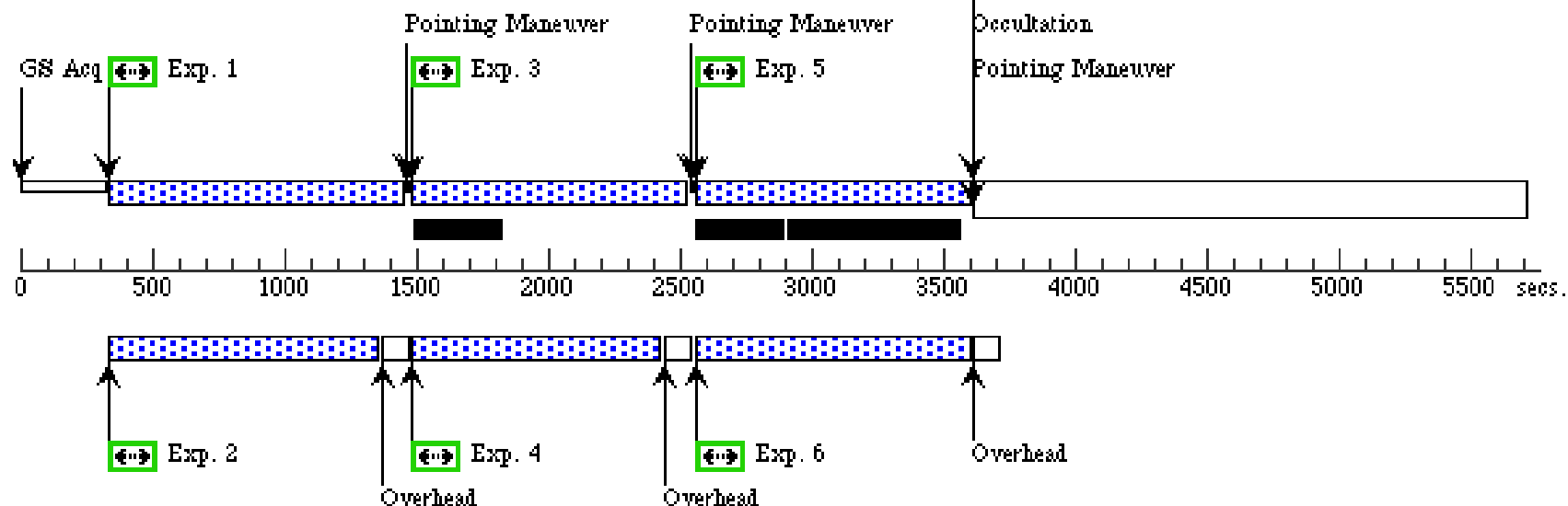
Proposal 13673 - Visit 02 - The Metallicity Dependence of the Initial Mass Function

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(2) QJ0033-2	ACS/WFC, ACCUM, WFCENTER	F606W	CR-SPLIT=NO	POS TARG -0.3128 67,-0.848667	Prime + Parallel Group 1-2 in Visit 02	915 Secs (915 Secs) [==>]	[1]
	2		ANY	WFC3/UVIS, ACCUM, UVIS-CENTER	F606W	CR-SPLIT=NO		Prime + Parallel Group 1-2 in Visit 02	995 Secs (995 Secs) [==>]	[1]
	3		(2) QJ0033-2	ACS/WFC, ACCUM, WFCENTER	F606W	CR-SPLIT=NO	POS TARG 0.10703 3,-0.814667	Prime + Parallel Group 3-4 in Visit 02	915 Secs (915 Secs) [==>]	[1]
	4		ANY	WFC3/UVIS, ACCUM, UVIS-CENTER	F606W	CR-SPLIT=NO		Prime + Parallel Group 3-4 in Visit 02	945 Secs (945 Secs) [==>]	[1]
	5		(2) QJ0033-2	ACS/WFC, ACCUM, WFCENTER	F606W	CR-SPLIT=NO	POS TARG 0.05763 33,-0.596367	Prime + Parallel Group 5-6 in Visit 02	915 Secs (915 Secs) [==>]	[1]
	6		ANY	WFC3/UVIS, ACCUM, UVIS-CENTER	F606W	CR-SPLIT=NO		Prime + Parallel Group 5-6 in Visit 02	1040 Secs (1040 Secs) [==>]	[1]
	7		(2) QJ0033-2	ACS/WFC, ACCUM, WFCENTER	F606W	CR-SPLIT=NO	POS TARG -0.1152 67,-3.659767	Prime + Parallel Group 7-8 in Visit 02	975 Secs (975 Secs) [==>]	[2]
	8		ANY	WFC3/UVIS, ACCUM, UVIS-CENTER	F606W	CR-SPLIT=NO		Prime + Parallel Group 7-8 in Visit 02	1010 Secs (1010 Secs) [==>]	[2]
	9		(2) QJ0033-2	ACS/WFC, ACCUM, WFCENTER	F606W	CR-SPLIT=NO	POS TARG 0.35403 3,-3.720667	Prime + Parallel Group 9-10 in Visit 02	975 Secs (975 Secs) [==>]	[2]
	10		ANY	WFC3/UVIS, ACCUM, UVIS-CENTER	F606W	CR-SPLIT=NO		Prime + Parallel Group 9-10 in Visit 02	1010 Secs (1010 Secs) [==>]	[2]
	11		(2) QJ0033-2	ACS/WFC, ACCUM, WFCENTER	F606W	CR-SPLIT=NO	POS TARG 0.47803 3,-3.488667	Prime + Parallel Group 11-12 in Visit 02	975 Secs (975 Secs) [==>]	[2]
	12		ANY	WFC3/UVIS, ACCUM, UVIS-CENTER	F606W	CR-SPLIT=NO		Prime + Parallel Group 11-12 in Visit 02	1100 Secs (1100 Secs) [==>]	[2]
	13		(2) QJ0033-2	ACS/WFC, ACCUM, WFCENTER	F814W	CR-SPLIT=NO	POS TARG -0.3128 67,-0.848667	Prime + Parallel Group 13-14 in Visit 02	720 Secs (720 Secs) [==>]	[3]
	14		ANY	WFC3/UVIS, ACCUM, UVIS-CENTER	F814W	CR-SPLIT=NO		Prime + Parallel Group 13-14 in Visit 02	800 Secs (800 Secs) [==>]	[3]
	15		(2) QJ0033-2	ACS/WFC, ACCUM, WFCENTER	F814W	CR-SPLIT=NO	POS TARG 0.10703 3,-0.814667	Prime + Parallel Group 15-16 in Visit 02	670 Secs (670 Secs) [==>]	[3]
	16		ANY	WFC3/UVIS, ACCUM, UVIS-CENTER	F814W	CR-SPLIT=NO		Prime + Parallel Group 15-16 in Visit 02	700 Secs (700 Secs) [==>]	[3]
	17		(2) QJ0033-2	ACS/WFC, ACCUM, WFCENTER	F814W	CR-SPLIT=NO	POS TARG 0.05763 33,-3.596367	Prime + Parallel Group 17-18 in Visit 02	670 Secs (670 Secs) [==>]	[3]
	18		ANY	WFC3/UVIS, ACCUM, UVIS-CENTER	F814W	CR-SPLIT=NO		Prime + Parallel Group 17-18 in Visit 02	700 Secs (700 Secs) [==>]	[3]
	19		(2) QJ0033-2	ACS/WFC, ACCUM, WFCENTER	F814W	CR-SPLIT=NO	POS TARG -0.1152 67,-3.659767	Prime + Parallel Group 19-20 in Visit 02	620 Secs (620 Secs) [==>]	[3]
	20		ANY	WFC3/UVIS, ACCUM, UVIS-CENTER	F814W	CR-SPLIT=NO		Prime + Parallel Group 19-20 in Visit 02	700 Secs (700 Secs) [==>]	[3]

Orbit 1

Server Version: 20140605

Unused Orbital Visibility = 0



Orbit 2

Server Version: 20140605

Unused Orbital Visibility = 3

