10554 - Globular Cluster Systems of Elliptical Galaxies in Low Density Environments

Cycle: 14, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

Visit	*Targets*	*Configurations*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) IC2035	ACS/WFC	2	12-May-2005 14:40:34.0	yes
02	(2) NGC3156	ACS/WFC	2	12-May-2005 14:40:39.0	yes
03	(3) NGC1172	ACS/WFC	2	12-May-2005 14:40:47.0	yes
04	(4) NGC3818	ACS/WFC	2	12-May-2005 14:40:51.0	yes
05	(5) NGC3073	ACS/WFC	2	12-May-2005 14:40:55.0	yes
06	(6) NGC1439	ACS/WFC	?	?	yes
07	(7) NGC4033	ACS/WFC	2	12-May-2005 14:41:04.0	yes

Visit	*Targets*	*Configurations*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
08	(8) NGC3377	ACS/WFC	2	12-May-2005 14:41:08.0	yes
09	(9) NGC1426	ACS/WFC	2	12-May-2005 14:41:13.0	yes
10	(10) NGC7173	ACS/WFC	2	12-May-2005 14:41:17.0	yes

ABSTRACT

We propose to use the ACS/WFC to determine colour (metallicity) distributions and luminosity functions for the globular cluster populations in a well-defined sample of elliptical galaxies in low-density environments, and to compare the results with similar samples taken from a rich cluster environment. Low-luminosity ellipticals are now recognized to play a pivotal role in testing hierarchical models of galaxy formation, and their globular cluster populations provide a unique probe of their star formation and metal enrichment history. The data will be used to (i) determine whether the bimodal colour distributions indicative of multiple formation epochs in luminous ellipticals are also prevalent in low-luminosity field ellipticals; (ii) place joint constraints on age and metallicity in systems with more than one population and determine the spread of ages in any one system; (iii) test whether cluster destruction processes (e.g. tidal shocking) are more effective in low-luminosity ellipticals, as predicted from their higher mass densities. ACS observations are essential to eliminate foreground/background contamination and to probe deep into the luminosity function to obtain a good statistical sample of clusters. The TAC has previously awarded HST time to two large surveys of globular cluster systems in rich cluster environments, but there is currently no comparable survey in low-density environments with which to compare these results.

OBSERVING DESCRIPTION

For this project, we wish to reach at least 1 magnitude past the turnover of the globular cluster luminosity function (V=25 for the mean distance of our sample) in order to sample most (>80%) of the clusters in these relatively sparse populations. HST observations are essential in order to isolate clean samples of clusters based on image properties (c.f. Kundu 1999; Larsen & Brodie 2000). A significant advantage of our proposed observations compared with previous archival data is the greatly increased sensitivity of ACS/WFC compared to WFPC2 in the blue part of the spectrum. This enables us to use a filter combination which has maximum sensitivity to metallicity variations within the cluster population. The improved PSF sampling of ACS compared to WFPC2 will also significantly improve image classification for the identification of clusters, and will allow us to

obtain mean structural parameters for comparison with those in luminous ellipticals.
Our choice of filters is based on detailed modelling using synthetic spectra from Vazdekis et al. (1996) for a 12Gyr old population with a range of metallicities from [Fe/H]=-1.7 to [Fe/H]=+0.2 and the ACS exposure time calculator. We find that the F475W-F850LP combination has twice the metallicity sensitivity when compared to the F555W-F814W colours used in most previous HST studies. The slightly larger field of ACS/WFC will also enable us to obtain secure statistical estimates of any remaining background contamination in the cluster samples. This choice of filter system is the same as that used in the ACS Virgo and Fornax Cluster Surveys which will allow us to make a direct comparison with a high local density cluster galaxy sample. Our target galaxies consist of 10 low luminosity ellipticals taken from the Tully (1988) catalogue selected to be in low-density environments with a local density of 1galaxy/Mpc with -18.0 > M_B > -19.5. This sample size is the minimum we require to study the metallicity distributions of globular clusters around low-luminosity ellipticals and their dependance on host galaxy properties and matches the size of our comparison sample in high density environments which we will take from the ACS Virgo Cluster Survey. Because of the sparse cluster populations in these low luminosity systems, it is essential to probe an adequate depth to acquire useful statistical samples of clusters. Our targets have a mean distance of <cz>=1550 km/s aproximately 50% larger than the Virgo and Fornax Cluster Survey samples.
Experience of WFPC2 photometry of these marginally extended globular cluster sources (Kundu 1999; Larsen & Brodie 2000) indicates that a S/N~30 is required to provide accurate colours and > 50% completeness at these limits, corresponding to exposure times of 23 minutes in F475W and 53 minutes in F850LP. We request a four-points line dithering in order to fill in the interchip gap and to remove cosmic rays and hot pixels simultaneously. Including acquisition and readout overheads, we require a total of 105 minutes or 2 orbits for each target giving a total of 20 orbits. This exposure is the minimum required to ensure a significant and reliable sample past the turnover, given the mean distance of our sample and the smaller globular cluster systems of these low luminosity ellipticals. We require fine guidance for accurate source tracking, allowing us to differentiate between stellar/non-stellar sources and to estimate cluster sizes. We will use a proven ACS data reduction procedure (Blakeslee et al. 2003) and we ask that the proprietary data rights period be 12 months.
Assuming a specific frequency S_N~2.5 (Kundu & Whitmore 2001), we expect the globular cluster population within the ACS/WFC field of view down to these magnitude limits to be typically in the range 50-150 clusters. As shown by Ashman, Bird & Zepf (1994), statistical tests for bimodality, such as the KMM mixture-modelling test, work much better when the separation of the peaks is at least 2-3 times their standard deviation. By increasing the expected separation of the peaks from delta(V-I)~0.2mag (Kundu & Whitmore 2001) to delta(g'-z')~0.4 mag, and maintaining the photometric errors at sigma(g'-z')~0.05 , Fig. 3 of Ashman, Bird & Zepf (1994) indicates that significant constraints on bimodality can be achieved even with samples as small as 50 clusters. We will therefore be able to test for bimodality in individual galaxies.

Visit

Proposal 10554, Visit 01 Mon Jun 20 15:23:03 GMT 2005

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=4 Point Spacing=3.011 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.3 Angle Between Sides= Center Pattern=false		(1), (2)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	IC2035	RA: 04 09 1.8000 (62.2575000d) Dec: -45 31 3.30 (-45.51758d) Equinox: J2000 Plate Id: 04FN		V=25.0	Coordinate Source: GUIDE_STAR_CATALOG

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	f475w	(1) IC2035	ACS/WFC, ACCUM, WFC	F475W	CR-SPLIT=NO		Pattern 1-1 (1)	345.0 Secs	
								[==>(Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2	f850lp	(1) IC2035	ACS/WFC, ACCUM, WFC	F850LP	CR-SPLIT=NO		Pattern 2-2 (1)	795.0 Secs	
								[==>749.0 Secs (Pattern 1)]	***[1]***
								[==>850.0 Secs (Pattern 2)] *[==>850.0 Secs (Pattern 3)]* *[==>850.0 Secs (Pattern 4)]*	***[2]***

Visit

Proposal 10554, Visit 02 Mon Jun 20 15:23:04 GMT 2005

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: PCS MODE FINE; SCHED 30%; ORIENT 290.0D TO 310.0 D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=4 Point Spacing=3.011 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.3 Angle Between Sides= Center Pattern=false		(1), (2)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	NGC3156	RA: 10 12 41.2500 (153.1718750d) Dec: +03 07 45.30 (3.12925d) Equinox: J2000 Plate Id: 02AG		V=25.0	Coordinate Source: GUIDE_STAR_CATALOG

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	f475w	(2) NGC3156	ACS/WFC, ACCUM, WFC	F475W	CR-SPLIT=NO		Pattern 1-1 (1)	345.0 Secs	
								[==>(Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2	f850lp	(2) NGC3156	ACS/WFC, ACCUM, WFC	F850LP	CR-SPLIT=NO		Pattern 2-2 (1)	795.0 Secs	
								[==>587.0 Secs (Pattern 1)]	***[1]***
								[==>(Pattern 2)] *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[2]***

Visit

Proposal 10554, Visit 03 Mon Jun 20 15:23:04 GMT 2005

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: PCS MODE FINE; SCHED 30%; ORIENT 240.0D TO 280.0 D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=4 Point Spacing=3.011 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.3 Angle Between Sides= Center Pattern=false		(1), (2)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	NGC1172	RA: 03 01 33.7573 (45.3906554d) Dec: -14 50 20.34 (-14.83898d) Equinox: J2000 Plate Id: 00OF		V=25.0	Coordinate Source: GSC_SURVEY_PLATE

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	f475w	(3) NGC1172	ACS/WFC, ACCUM, WFC	F475W	CR-SPLIT=NO		Pattern 1-1 (1)	345.0 Secs	
								[==>(Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2	f850lp	(3) NGC1172	ACS/WFC, ACCUM, WFC	F850LP	CR-SPLIT=NO		Pattern 2-2 (1)	795.0 Secs	
								[==>602.0 Secs (Pattern 1)]	***[1]***
								[==>801.0 Secs (Pattern 2)] *[==>801.0 Secs (Pattern 3)]* *[==>801.0 Secs (Pattern 4)]*	***[2]***

Visit

Proposal 10554, Visit 04 Mon Jun 20 15:23:04 GMT 2005

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: PCS MODE FINE; SCHED 30%

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=4 Point Spacing=3.011 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.3 Angle Between Sides= Center Pattern=false		(1), (2)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	NGC3818	RA: 11 41 57.3300 (175.4888750d) Dec: -06 09 20.80 (-6.15578d) Equinox: J2000 Plate Id: 02ND		V=25.0	Coordinate Source: GUIDE_STAR_CATALOG

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	f475w	(4) NGC3818	ACS/WFC, ACCUM, WFC	F475W	CR-SPLIT=NO		Pattern 1-1 (1)	345.0 Secs	
								[==>(Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2	f850lp	(4) NGC3818	ACS/WFC, ACCUM, WFC	F850LP	CR-SPLIT=NO		Pattern 2-2 (1)	795.0 Secs	
								[==>593.0 Secs (Pattern 1)]	***[1]***
								[==>798.0 Secs (Pattern 2)] *[==>798.0 Secs (Pattern 3)]* *[==>798.0 Secs (Pattern 4)]*	***[2]***

Visit

Proposal 10554, Visit 05 Mon Jun 20 15:23:04 GMT 2005

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: PCS MODE FINE; SCHED 30%

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=4 Point Spacing=3.011 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.3 Angle Between Sides= Center Pattern=false		(1), (2)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(5)	NGC3073	RA: 10 00 52.1800 (150.2174167d) Dec: +55 37 7.10 (55.61864d) Equinox: J2000 Plate Id: 01RP		V=25.0	Coordinate Source: GUIDE_STAR_CATALOG

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	f475w	(5) NGC3073	ACS/WFC, ACCUM, WFC	F475W	CR-SPLIT=NO		Pattern 1-1 (1)	345.0 Secs	
								[==>357.0 Secs (Pattern 1)] *[==>357.0 Secs (Pattern 2)]* *[==>357.0 Secs (Pattern 3)]* *[==>357.0 Secs (Pattern 4)]*	***[1]***
2	f850lp	(5) NGC3073	ACS/WFC, ACCUM, WFC	F850LP	CR-SPLIT=NO		Pattern 2-2 (1)	795.0 Secs	
								[==>820.0 Secs (Pattern 1)]	***[1]***
								[==>890.0 Secs (Pattern 2)] *[==>890.0 Secs (Pattern 3)]* *[==>890.0 Secs (Pattern 4)]*	***[2]***

Visit

Proposal 10554, Visit 06 Mon Jun 20 15:23:04 GMT 2005

Diagnostic Status: Error

Scientific Instruments: ACS/WFC

Special Requirements: PCS MODE FINE; SCHED 30%

Diagnostics

(Visit 06) Error: INTERNAL INCONSISTENCY IN MERGING PROCESS

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=4 Point Spacing=3.011 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.3 Angle Between Sides= Center Pattern=false		(1), (2)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(6)	NGC1439	RA: 03 44 49.9100 (56.2079583d) Dec: -21 55 13.90 (-21.92053d) Equinox: J2000 Plate Id: 015R		V=25.0	Coordinate Source: GUIDE_STAR_CATALOG

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	f475w	(6) NGC1439	ACS/WFC, ACCUM, WFC	F475W	CR-SPLIT=NO		Pattern 1-1 (1)	345.0 Secs	
								[==>340.0 Secs (Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2	f850lp	(6) NGC1439	ACS/WFC, ACCUM, WFC	F850LP	CR-SPLIT=NO		Pattern 2-2 (1)	795.0 Secs	
								[==>614.0 Secs (Pattern 1)]	***[1]***
								[==>757.0 Secs (Pattern 2)] *[==>826.0 Secs (Pattern 3)]* *[==>826.0 Secs (Pattern 4)]*	***[2]***

Visit

Proposal 10554, Visit 07 Mon Jun 20 15:23:04 GMT 2005

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: PCS MODE FINE; SCHED 30%

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=4 Point Spacing=3.011 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.3 Angle Between Sides= Center Pattern=false		(1), (2)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(7)	NGC4033	RA: 12 00 34.7700 (180.1448750d) Dec: -17 50 34.40 (-17.84289d) Equinox: J2000 Plate Id: 04UV		V=25.0	Coordinate Source: GUIDE_STAR_CATALOG

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	f475w	(7) NGC4033	ACS/WFC, ACCUM, WFC	F475W	CR-SPLIT=NO		Pattern 1-1 (1)	345.0 Secs	
								[==>(Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2	f850lp	(7) NGC4033	ACS/WFC, ACCUM, WFC	F850LP	CR-SPLIT=NO		Pattern 2-2 (1)	795.0 Secs	
								[==>608.0 Secs (Pattern 1)]	***[1]***
								[==>803.0 Secs (Pattern 2)] *[==>803.0 Secs (Pattern 3)]* *[==>803.0 Secs (Pattern 4)]*	***[2]***

Visit

Proposal 10554, Visit 08 Mon Jun 20 15:23:04 GMT 2005

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: PCS MODE FINE; SCHED 30%

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=4 Point Spacing=3.011 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.3 Angle Between Sides= Center Pattern=false		(1), (2)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(8)	NGC3377	RA: 10 47 42.3400 (161.9264167d) Dec: +13 59 8.30 (13.98564d) Equinox: J2000 Plate Id: 0258		V=25.0	Coordinate Source: GUIDE_STAR_CATALOG

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	f475w	(8) NGC3377	ACS/WFC, ACCUM, WFC	F475W	CR-SPLIT=NO		Pattern 1-1 (1)	345.0 Secs	
								[==>(Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2	f850lp	(8) NGC3377	ACS/WFC, ACCUM, WFC	F850LP	CR-SPLIT=NO		Pattern 2-2 (1)	795.0 Secs	
								[==>602.0 Secs (Pattern 1)]	***[1]***
								[==>801.0 Secs (Pattern 2)] *[==>801.0 Secs (Pattern 3)]* *[==>801.0 Secs (Pattern 4)]*	***[2]***

Visit

Proposal 10554, Visit 09 Mon Jun 20 15:23:04 GMT 2005

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: PCS MODE FINE; SCHED 30%

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=4 Point Spacing=3.011 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.3 Angle Between Sides= Center Pattern=false		(1), (2)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(9)	NGC1426	RA: 03 42 49.0700 (55.7044583d) Dec: -22 06 29.70 (-22.10825d) Equinox: J2000 Plate Id: 015R		V=25.0	Coordinate Source: GUIDE_STAR_CATALOG

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	f475w	(9) NGC1426	ACS/WFC, ACCUM, WFC	F475W	CR-SPLIT=NO		Pattern 1-1 (1)	345.0 Secs	
								[==>340.0 Secs (Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2	f850lp	(9) NGC1426	ACS/WFC, ACCUM, WFC	F850LP	CR-SPLIT=NO		Pattern 2-2 (1)	795.0 Secs	
								[==>614.0 Secs (Pattern 1)]	***[1]***
								[==>757.0 Secs (Pattern 2)] *[==>826.0 Secs (Pattern 3)]* *[==>826.0 Secs (Pattern 4)]*	***[2]***

Visit

Proposal 10554, Visit 10 Mon Jun 20 15:23:04 GMT 2005

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: PCS MODE FINE; SCHED 30%; ORIENT 255.0D TO 310.0 D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=4 Point Spacing=3.011 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.3 Angle Between Sides= Center Pattern=false		(1), (2)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(10)	NGC7173	RA: 22 02 3.9417 (330.5164238d) Dec: -31 59 4.34 (-31.98454d) Equinox: J2000 Plate Id: 02J3		V=25.0	Coordinate Source: GSC_SURVEY_PLATE

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	f475w	(10) NGC7173	ACS/WFC, ACCUM, WFC	F475W	CR-SPLIT=NO		Pattern 1-1 (1)	345.0 Secs	
								[==>340.0 Secs (Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2	f850lp	(10) NGC7173	ACS/WFC, ACCUM, WFC	F850LP	CR-SPLIT=NO		Pattern 2-2 (1)	795.0 Secs	
								[==>639.0 Secs (Pattern 1)]	***[1]***
								[==>774.0 Secs (Pattern 2)] *[==>831.0 Secs (Pattern 3)]* *[==>831.0 Secs (Pattern 4)]*	***[2]***