



10788 - Probing the Central Dark Mass Concentration of the Collapsed-Core Globular Cluster M15

Cycle: 15, 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) NGC7078	WFPC2	1	21-May-2007 18:04:51.0	yes

1 Total Orbits Used

ABSTRACT

We plan to probe the central dark mass concentration in the collapsed-core globular cluster M15 by analyzing the structure of its central stellar cusp with the highest possible angular resolution. The rapid rise of M/L toward the center of M15 can be alternatively explained by a central concentration of several thousand compact remnants (heavy white dwarfs and neutron stars) or instead by the presence of an intermediate-mass black hole (IMBH) of a few thousand solar masses. We propose to obtain one orbit of highly dithered WFPC2 F555W (V) imaging to supplement the available ACS/HRC F435W (B) imaging from GO-10401. This will allow us (1) to improve the constraints on the radius of the as yet unresolved

core and (2) to investigate the relation between cusp slope and stellar mass, the form of which depends on the size and mix of the remnant population and on whether or not an IMBH is present. We will compare the central cusp structure with predictions from both Fokker-Planck and GRAPE-6 N-body models, with and without IMBHs, to constrain the nature of the intriguing dark mass concentration.

OBSERVING DESCRIPTION

We have selected a sequence of WFPC2 F555W exposures to image the center of M15 with the highest possible angular resolution by using an optimized 3x3 dither pattern. This sequence consists of one 8s short exposure and 9 x 30s long exposures. The 8s exposure length ensures that no star in the PC1 field saturates. The 9 x 30s exposure sequence provides sufficient photometric depth to reach at least 4 mag below the main-sequence turnoff, while ensuring that no star in the critical central region saturates. We have specified the 15e/DN gain channel to increase the effective dynamic range and thus maximize the possible exposure length. We have selected a set of 9 separate dither positions for each of the 30s exposures that provide a dense sampling of the subpixel phase space over the WFPC2 field, with the subpixel sampling optimized for the PC1 field. The dither pattern also provides multipixel steps, to increase photometric accuracy. The short exposure will be taken at the same position as the final long exposure.

Proposal 10788 - Visit 01 - Probing the Central Dark Mass Concentration of the Collapsed-Core Globular Cluster M15

Mon May 21 17:04:55 GMT 2007

Visit	Proposal 10788, Visit 01, implementation Diagnostic Status: No Diagnostics Scientific Instruments: WFPC2 Special Requirements: (none)									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
	(1)	NGC7078	RA: 21 29 58.3000 (322.4929167d)		V=13.5	Reference Frame: ICRS				
		Alt Name1: MESSIER-015	Dec: +12 10 1.00 (12.16694d)		(brightest star in field)					
		Alt Name2: M15	Equinox: J2000							
	<i>Comments: This object was generated by the targetselector and retrieved from the NED database. The position was updated to GSC2/ICRS.</i>									
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	NGC7078-01	(1) NGC7078	WFPC2, IMAGE, PC1-FIX	F555W	ATD-GAIN=15			30.0 Secs [==>]	[1]
	2	NGC7078-02	(1) NGC7078	WFPC2, IMAGE, PC1-FIX	F555W	ATD-GAIN=15	POS TARG 0.1827,0.5632		30.0 Secs [==>]	[1]
	3	NGC7078-03	(1) NGC7078	WFPC2, IMAGE, PC1-FIX	F555W	ATD-GAIN=15	POS TARG 0.3653,1.1264		30.0 Secs [==>]	[1]
	4	NGC7078-04	(1) NGC7078	WFPC2, IMAGE, PC1-FIX	F555W	ATD-GAIN=15	POS TARG 0.5632,0.1827		30.0 Secs [==>]	[1]
	5	NGC7078-05	(1) NGC7078	WFPC2, IMAGE, PC1-FIX	F555W	ATD-GAIN=15	POS TARG 0.7459,0.7459		30.0 Secs [==>]	[1]
	6	NGC7078-06	(1) NGC7078	WFPC2, IMAGE, PC1-FIX	F555W	ATD-GAIN=15	POS TARG 0.9285,1.3091		30.0 Secs [==>]	[1]
	7	NGC7078-07	(1) NGC7078	WFPC2, IMAGE, PC1-FIX	F555W	ATD-GAIN=15	POS TARG 1.1264,0.3653		30.0 Secs [==>]	[1]
	8	NGC7078-08	(1) NGC7078	WFPC2, IMAGE, PC1-FIX	F555W	ATD-GAIN=15	POS TARG 1.3091,0.9285		30.0 Secs [==>]	[1]
	9	NGC7078-09	(1) NGC7078	WFPC2, IMAGE, PC1-FIX	F555W	ATD-GAIN=15	POS TARG 1.4918,1.4918		30.0 Secs [==>]	[1]
	10	NGC7078-10	(1) NGC7078	WFPC2, IMAGE, PC1-FIX	F555W	ATD-GAIN=15	SAME POS AS 9		8.0 Secs [==>]	[1]

