



# 12683 - Estimating the Black Hole Mass in the New UltraLuminous X-ray Source in M83

Cycle: 18, Proposal Category: GO/DD

(Availability Mode: SUPPORTED)

## INVESTIGATORS

<i>Name</i>	<i>Institution</i>	<i>E-Mail</i>
<b>Dr. P. Frank Winkler (PI)</b>	<b>Middlebury College</b>	<b>winkler@middlebury.edu</b>
Dr. Roberto Soria (CoI)	Curtin University	rsoria@physics.usyd.edu.au
Dr. Knox S. Long (CoI)	Space Telescope Science Institute	long@stsci.edu
Dr. William P. Blair (CoI) (Contact)	The Johns Hopkins University	wpb@pha.jhu.edu
Dr. Kip Kuntz (CoI)	The Johns Hopkins University	kuntz@pha.jhu.edu
Dr. Brad C. Whitmore (CoI)	Space Telescope Science Institute	whitmore@stsci.edu
Dr. Paul P. Plucinsky (CoI)	Smithsonian Institution Astrophysical Observatory	plucinsky@cfa.harvard.edu

## 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) M-83-ULX	WFC3/UVIS	2	20-Jul-2011 01:34:49.0	yes

2 Total Orbits Used

## ABSTRACT

In late December 2010 we discovered a transient ultraluminous X-ray source (ULX) in an inter-arm region of the nearby spiral galaxy M83, during the first in a series of Chandra observations. Most ULXs are associated with very young stars, and so finding one in an inter-arm region was unusual. In April 2010 we found from Gemini-South a faint blue object within the X-ray error circle that was conspicuously absent in earlier images---from Magellan (April 2009) and from WFC3 (this region of M83 had fortuitously been observed as part of the WFC3 ERS program in August 2009).

Here we request 3 orbits of DD time for new broad-band images of this region with WFC3, to positively identify the optical counterpart of the ULX and measure its characteristics. Given a precise position, we can determine which, if any, of a few very faint red stars within the error circle, all barely detected in the ERS images, is the progenitor---presumably the donor star in an accreting binary system containing a black hole. From new post-outburst WFC3 photometry, we can infer the present temperature and characteristic size of the optical secondary, which is now glowing primarily due to X-ray heating of its surface. This unique opportunity for "before and after" pictures will enable us to set stringent limits on the mass of the black hole that forms the central engine for the ULX, and help to resolve the controversy that exists concerning the nature of ULXs. Since we don't know how long the X-ray outburst will last, we request that the observations take place as soon as reasonably possible, and no later than the end of August 2011, when our final Chandra observation is scheduled.

#### **OBSERVING DESCRIPTION**

We plan to observe a single field with WFC3 in 4 broadband filters, equivalent to U, B, V, and I. We use the same standard 3-point line dither pattern for each filter. We center the ULX at the optimum position in the UVIS2-M1K1C-SUB aperture (which reads out only a 1K x 1K section near the center of chip 2). This saves us on overhead, since a single readout is sufficient for all the frames. This then allows us to use shorter (than 350 sec) exposures for V, and longer ones for U and I.

We request that the observation be scheduled as soon as possible--at latest before the end of August 2011, when our final Chandra observaton of M83 is scheduled. We also request to be notified as soon as the observation is scheduled, since we hope to arrange a near-simultaneous X-ray observation from Swift.

Proposal 12683 - Visit 01 - Estimating the Black Hole Mass in the New UltraLuminous X-ray Source in M83

Wed Jul 20 05:34:55 GMT 2011

Visit	<b>Proposal 12683, Visit 01, scheduling</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: WFC3/UVIS Special Requirements: BEFORE 01-SEP-2011:00:00:00									
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures					
		(3)	Pattern Type=WFC3-UVIS-DITHER- LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=0.135 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false		(1), (2), (3), (4)				
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	M-83-ULX	RA: 13 37 5.1400 (204.2714167d) Dec: -29 52 7.10 (-29.86864d) Equinox: J2000		V=7.54	Reference Frame: ICRS				
<i>Comments: This is the same position as observed with WFC3 in August 2009 as part of the Early Release Science program.</i>										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1		(1) M-83-ULX	WFC3/UVIS, ACCUM, UVIS2-M1K1C-SUB	F438W			Pattern 3, Exps 1-1 i n Visit 01 (3)	330 Secs	
									[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[1]
	2		(1) M-83-ULX	WFC3/UVIS, ACCUM, UVIS2-M1K1C-SUB	F814W			Pattern 3, Exps 2-2 i n Visit 01 (3)	487 Secs	
									[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[1]
3		(1) M-83-ULX	WFC3/UVIS, ACCUM, UVIS2-M1K1C-SUB	F336W			Pattern 3, Exps 3-3 i n Visit 01 (3)	608 Secs		
								[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[2]	
4		(1) M-83-ULX	WFC3/UVIS, ACCUM, UVIS2-M1K1C-SUB	F555W			Pattern 3, Exps 4-4 i n Visit 01 (3)	245 Secs		
								[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)]	[2]	

Orbit Structure



