



14671 - An HST proper-motion and spectral study of the optical jet in 4C +00.58

Cycle: 24, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

<i>Name</i>	<i>Institution</i>	<i>E-Mail</i>
Dr. Eileen T Meyer (PI) (Contact)	University of Maryland Baltimore County	meyer@umbc.edu
Dr. Markos Georganopoulos (CoI)	University of Maryland Baltimore County	georgano@umbc.edu
Dr. Edmund Hodges-Kluck (CoI)	University of Michigan	ehodges@astro.umd.edu
Dr. William B. Sparks (CoI)	Space Telescope Science Institute	sparks@stsci.edu
Dr. Marco Chiaberge (CoI) (ESA Member)	Space Telescope Science Institute - ESA	marcoc@stsci.edu
Dr. Roeland P. van der Marel (CoI)	Space Telescope Science Institute	marel@stsci.edu
Dr. Jay Anderson (CoI)	Space Telescope Science Institute	jayander@stsci.edu
Prof. Eric S. Perlman (CoI)	Florida Institute of Technology	eperlman@fit.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) 4C00.58	ACS/WFC	1	07-Sep-2016 18:01:33.0	yes
02	(1) 4C00.58	WFC3/UVIS	2	07-Sep-2016 18:01:34.0	yes

3 Total Orbits Used

ABSTRACT

We have recently discovered a remarkably detailed optical jet in the nearby radio galaxy 4C 00.58, which we consider a 'moderate power' hybrid-source analog to the archetypal jets M87 and 3C 273. The unusual 'X-shaped' large-scale radio morphology of this source is thought to be the result of a recent merger-induced reorientation, and the jet displays a remarkable series of 'cannonball' ejections clearly detected in radio through X-rays. The clarity of the optical features and nearness of the source make it an ideal target for a prospective HST proper-motions study. Previous HST

proper-motion studies which revealed superluminal motions in M87 and 3C 264 relied on archival WFPC2 observations and long observing baselines. With the high astrometric precision possible with an all-ACS/WFC imaging study, we can reach 0.5c accuracy with a time baseline of 4 years, requiring only a single additional orbit in cycles 24 and 26, in combination with our existing ACS/WFC imaging from 2015. We also request complimentary near-UV observations (WFC3/UVIS F225W) in order to map the spectral evolution of the knots and hotspot and allow better constraints on the emission mechanisms and physical parameters in the jet.

OBSERVING DESCRIPTION

This is an imaging project for the optical jet located in nearby elliptical galaxy 4C +00.58. The ACS/WFC F606W observations are identical in setup to the first successful imaging done in cycle 22. The current (cycle 24) and future (cycle 26) imaging in the F606W filter are part of a proper-motions monitoring project. In addition, two orbits of WFC3/UVIS imaging in F225W are planned for cycle 24, in order to measure the synchrotron spectrum of the resolved knots in the jet.

For the ACS/WFC imaging, we use a 5-point dithering pattern which covers the chip gap, optimized to sample the PSF. ORIENT constraints are included as a caution against possible saturation spikes from the bright quasar core over-running the jet. While the core was not saturated in previous imaging with similar exposure times, quasar cores are known to be variable.

For the WFC3/UVIS imaging, we have split the 2 orbits into 6 total exposures of about 900 seconds. The exact UV flux of the core (the brightest object near the jet) is not well-constrained, but even at a probably maximum U-band magnitude of 15 (more likely 16-17), a 900 second exposure is just barely at the saturation limit. We do include ORIENT constraints to avoid possible saturation spikes on the jet in any case, and we also include 12 e' of post-FLASH to minimize CTE. This is not strictly necessary in the area of the science target where the background light from the galaxy is high, but it is necessary for better localization of point sources far from the target, which are necessary for aligning the images with V-band imaging. Finally, ORIENT constraints were also applied to avoid a bright nearby galaxy ($V_{\text{mag}} = 14.8$) from being too near or straddling the chip gap or UVIS2 chip edge (with no effect on scheduling).

Proposal 14671 - ACS-optical (01) - An HST proper-motion and spectral study of the optical jet in 4C +00.58

Visit	Proposal 14671, ACS-optical (01), implementation						Wed Sep 07 22:01:34 GMT 2016			
	Diagnostic Status: No Diagnostics									
	Scientific Instruments: ACS/WFC									
	Special Requirements: ORIENT 2.5D TO 47.5 D; ORIENT 92.5D TO 137.5 D; ORIENT 182.5D TO 227.5 D; ORIENT 272.5D TO 317.5 D; BETWEEN 01-JUN-2017:00:00:00 AND 01-NOV-2017:00:00:00									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections		Fluxes	Miscellaneous			
	(1)	4C00.58	RA: 16 06 12.7300 (241.5530417d)			V=17.5	Reference Frame: SIMBAD			
		Alt Name1: 1603+001	Dec: +00 00 27.36 (.00760d)							
			Equinox: J2000							
	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		(1) 4C00.58	ACS/WFC, ACCUM, WFC1	F606W		POS TARG 0,0		404 Secs (404 Secs)	
									[==>]	[1]
	2		(1) 4C00.58	ACS/WFC, ACCUM, WFC1	F606W		POS TARG 0.15914, 0.23969		404 Secs (404 Secs)	
									[==>]	[1]
	3		(1) 4C00.58	ACS/WFC, ACCUM, WFC1	F606W		POS TARG 0.31641, 0.08319		404 Secs (404 Secs)	
									[==>]	[1]
4		(1) 4C00.58	ACS/WFC, ACCUM, WFC1	F606W		POS TARG 0.07990, 4.19413		404 Secs (404 Secs)		
								[==>]	[1]	
5		(1) 4C00.58	ACS/WFC, ACCUM, WFC1	F606W		POS TARG 0.28771, 4.28896		404 Secs (404 Secs)		
								[==>]	[1]	
Orbit Structure	<div><div>Orbit 1</div><div>Server Version: 20160601</div></div>									
	<div><div>GS Acq</div><div>Exp. 1</div><div>Exp. 2</div><div>Exp. 3</div><div>Exp. 4</div><div>Exp. 5</div><div>Unused Orbital Visibility = 0</div></div>									

Proposal 14671 - WFC3-UV (02) - An HST proper-motion and spectral study of the optical jet in 4C +00.58

Visit	Proposal 14671, WFC3-UV (02), completed										Wed Sep 07 22:01:35 GMT 2016	
	Diagnostic Status: No Diagnostics											
	Scientific Instruments: WFC3/UVIS											
	Special Requirements: ORIENT 60D TO 75 D; ORIENT 140D TO 163 D; ORIENT 240D TO 255 D; ORIENT 320D TO 340 D; ORIENT 85D TO 100 D; ORIENT 175D TO 200 D; ORIENT 270D TO 280 D; ORIENT 0D TO 15 D											
Fixed Targets	#	Name		Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous		
	(1)	4C00.58		RA: 16 06 12.7300 (241.5530417d)				V=17.5		Reference Frame: SIMBAD		
		Alt Name1: 1603+001		Dec: +00 00 27.36 (.00760d)								
				Equinox: J2000								
	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		(1) 4C00.58	WFC3/UVIS, ACCUM, UVIS2		F225W	FLASH=12	POS TARG 0,0		866 Secs (866 Secs)		
										[==>]		[1]
	2		(1) 4C00.58	WFC3/UVIS, ACCUM, UVIS2		F225W	FLASH=12	POS TARG 0.20646, 0.14754		866 Secs (866 Secs)		
										[==>]		[1]
	3		(1) 4C00.58	WFC3/UVIS, ACCUM, UVIS2		F225W	FLASH=12	POS TARG 0.41257, 0.24554		866 Secs (866 Secs)		
										[==>]		[1]
	4		(1) 4C00.58	WFC3/UVIS, ACCUM, UVIS2		F225W	FLASH=12	POS TARG 0.12505, 4.34768		903 Secs (903 Secs)		
										[==>]		[2]
	5		(1) 4C00.58	WFC3/UVIS, ACCUM, UVIS2		F225W	FLASH=12	POS TARG 0.33111, 0.42753		903 Secs (903 Secs)		
									[==>]		[2]	
6		(1) 4C00.58	WFC3/UVIS, ACCUM, UVIS2		F225W	FLASH=12	POS TARG 0.53746, 4.56020		903 Secs (903 Secs)			
									[==>]		[2]	

