



11701 - The jackpot in technicolor: photometric redshift and mass to light decomposition of a double Einstein Ring

Cycle: 17, 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) SLACSJ0946+1006	WFC3/UVIS	3	18-Feb-2010 21:00:53.0	yes

3 Total Orbits Used

ABSTRACT

The structure, formation and evolution of early-type galaxies is still largely an open problem in cosmology: how does the Universe evolve from large linear scales dominated by dark matter to the non-linear scales of galaxies, where baryons and dark matter both play important, interacting, roles? To understand the complex physical processes involved in their formation scenario, it is critically important to understand the relative distribution of luminous and dark matter at galactic scales. Over the last four years, using HST, the SLACS collaboration has discovered some 100 new

gravitational lenses and developed a toolbox to tackle these issues by combining new non-parametric strong lensing techniques, stellar dynamics, and weak gravitational lensing.

Among the 100 new lenses, we discovered the first double Einstein Ring, the so-called "jackpot". The presence of two rings at different radii provides qualitatively new insights into the distribution of luminous and dark matter at 10 kpc scales. Via a joint lensing and dynamical analysis, this system has the potential to deliver the most precise measurements on galactic scales of the inner slope of dark matter halos, of the total mass profile, and of the stellar mass to light ratio. Unfortunately, the precision is currently limited by the lack of a redshift for the outer ring, in spite of ultradeep spectroscopy at the 10m Keck Telescope. We propose to obtain F336W and F438W WFC3 images of the system, which in combination with our existing F606W, F814W and F160W images will allow us to obtain a photo-z for the outer ring, precise enough to fully realize the potential of this system. The multicolor HST images will also be used to derive a stellar mass-to-light and constrain the initial mass function by comparison with the lens and dynamical measurement.

OBSERVING DESCRIPTION

The immediate goal of the HST observations is to obtain multicolor photometry to pinpoint the photometric redshift of the outer ring. The redshift is predicted by the gravitational lens model to be $z=2.6+1.0-0.7$, a range where UV and NIR colors are essential to obtain unbiased and precise photo-z (e.g., Abdalla et al. 2007). The main reason is that the UV filter helps constraining the redshift via the Lyman-alpha forest absorption at $z>2$, while the optical to NIR colors help constrain the redshift via the detection of a possible 4000 Å break at $1<z<2$.

We intend to image the galaxy with WFC3 through filters F336W and F438W to complete the filter coverage needed for an accurate photo-z.

Based on the measured surface brightness of the outer ring (F814W~22.6 mag /arcsec² and the typical colors of galaxies at $z\sim 2$ we estimate F336W band surface brightness of ~24.6 and F438W~23.3. For the F336W band, S/N 3 will be sufficient to detect a dropout, and thus nail the redshift using the Lyman break technique. This is achieved in approximately 4800s according to the ETC, i.e. 2 orbits. For the F438W-band we require higher quality photometry: S/N=10 is achieved in 2290s, i.e. 1 orbit.

As done in our previous programs with ACS, we will divide each integration in four sub-exposures with semi-integer pixel dither strategy. This will improve the sampling of the PSF, crucial in the F336W and F438W filters, and help remove cosmic rays and defects.

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Visit		Proposal 11701, Visit 01, implementation							Fri Feb 19 02:00:58 GMT 2010		
Patterns		# Primary Pattern		Secondary Pattern				Exposures			
		(1)	Pattern Type=WFC3-UVIS-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.173 Line Spacing=0.112	Coordinate Frame=POS-TARG Pattern Orientation=23.884 Angle Between Sides=81.785 Center Pattern=false					(1), (2)		
Fixed Targets		#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
		(1)	SLACSJ0946+1006	RA: 09 46 56.6800 (146.7361667d) Dec: +10 06 52.80 (10.11467d) Equinox: J2000		V=18	Reference Frame: SDSS				
Exposures		#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
		1		(1) SLACSJ0946+1006	WFC3/UVIS, ACCUM, UVIS1	F438W	CR-SPLIT=NO		Pattern 1, Exps 1-1 (1)	500 Secs [==>630.0 Secs (Pattern 1)] [==>630.0 Secs (Pattern 2)] [==>630.0 Secs (Pattern 3)] [==>630.0 Secs (Pattern 4)]	[1]
		2		(1) SLACSJ0946+1006	WFC3/UVIS, ACCUM, UVIS1	F336W	CR-SPLIT=NO		Pattern 1, Exps 2-2 (1)	1100 Secs [==>1443.0 Secs (Pattern 1)] [==>1443.0 Secs (Pattern 2)] [==>1443.0 Secs (Pattern 3)] [==>1443.0 Secs (Pattern 4)]	[2] [3]



