14210 - Improved masses for two new low-redshift strong lens galaxies: Do giant ellipticals really have a heavy IMF?

Cycle: 23, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
03	(1) ESO286-G022	WFC3/UVIS	2	19-May-2016 06:04:09.0	yes
04	(2) 2MASXJ01414232-0735281	WFC3/UVIS	2	19-May-2016 06:04:10.0	yes

4 Total Orbits Used

ABSTRACT

We propose WFC3/UVIS imaging of newly-identified strong gravitational lenses from SNELLS, the "SINFONI Nearby Elliptical Lens Locator Survey", at the ESO VLT. Our novel approach uses IFU observations to search for lensed background line emitters behind very low redshift (z<0.06) massive ellipticals. The key characteristic of such nearby lenses is that the gravitional deflections are dominated by stellar mass, with only very small contributions from dark matter. As such, they provide uniquely robust constraints on the stellar mass-to-light ratio (M/L), and hence the initial mass function (IMF).

To date, SNELLS has discovered two new lenses, SNL-1 at z=0.031 and SNL-2 at z=0.052. Analysing these systems, as well as the previously-

known low-z lens ESO325-G004, we found that all three have M/L consistent with a standard MW-like IMF. This result is very surprising in the context of recent works which favour Salpeter or bottom-heavy IMFs in massive ellipticals.

A major limitation of our present analysis is that SNL-1 and SNL-2 are two-image systems, and the arcs are unresolved in our ground-based observations. As a result, the lensing mass is degenerate with the component of external shear along the image separation axis. This degeneracy can be broken by measuring the tangential extent of the arcs (or more generally, the detailed structure of the lensed images).

In this application, we propose HST observations which will spatially resolve the arcs, and greatly improve the robustness of our lensing mass estimates. The data will reduce the error on M/L by a factor ~5 and, combined with ongoing deep spectroscopy from the VLT, lead to tighter derived constraints on the IMF.

OBSERVING DESCRIPTION

The targets are two nearby (z=0.03,0.05) early-type galaxies behind which we have discovered multiply-imaged background line emitters.

The aim of the observations is to measure accurate position, flux and size of the lensed images, for improved modelling of the lens system, narrowing the constraints on the stellar mass of the foreground galaxy.

We observe each target in a blue bandpass (F336W or F390W, depending on target), to improve contrast between the star-forming background galaxy and the very red foreground galaxy. We also aquire imaging in a red bandpass (F814W), to help model the stellar mass distribution in the lens.

The observation should be fairly straightforward, with a simple three-point offset pattern in each band for cosmic ray and detector defect rejection.

We elected to use post-flash to mitigate CTE losses in the F336W observations (also for F814W where the exposures are short). This might not be strictly necessary for the primary science, because the "targets", i.e. the lensed sources, will sit on a substantial background (actually foreground!) of light from the lens galaxy. This also means that post-flash will not add significant extra noise for our purposes, and using it should improve the archival value of the data.

Proposal 14210 (STScI Edit Number: 0, Created: Thursday, May 19, 2016 5:04:11 AM EST) - Overview
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Summary of changes since original Phase II submission:

Added a roll-range restriction for SNL-1.

Changed to C1K1C-CTE aperture to keep target close to the amplifier.

Switched to the standard small 3-point line dither, instead of the large 1-arcsec dither as before.

Visit

Proposal 14210, SNL-1 (03) Thu May 19 10:04:11 GMT 2016

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: ORIENT 0D TO 300 D; ORIENT 330D TO 359 D

Comments: Roll range restriction to avoid the brightest star (although would be on opposite corner of the field w.r.t the target). In practice, the orbit planner shows that for late 2016 this target can only be observed near 80 deg. Now using C1K1C-CTE window to place closer to amplifier and using small 3-point line-dither.

Fixed Targets

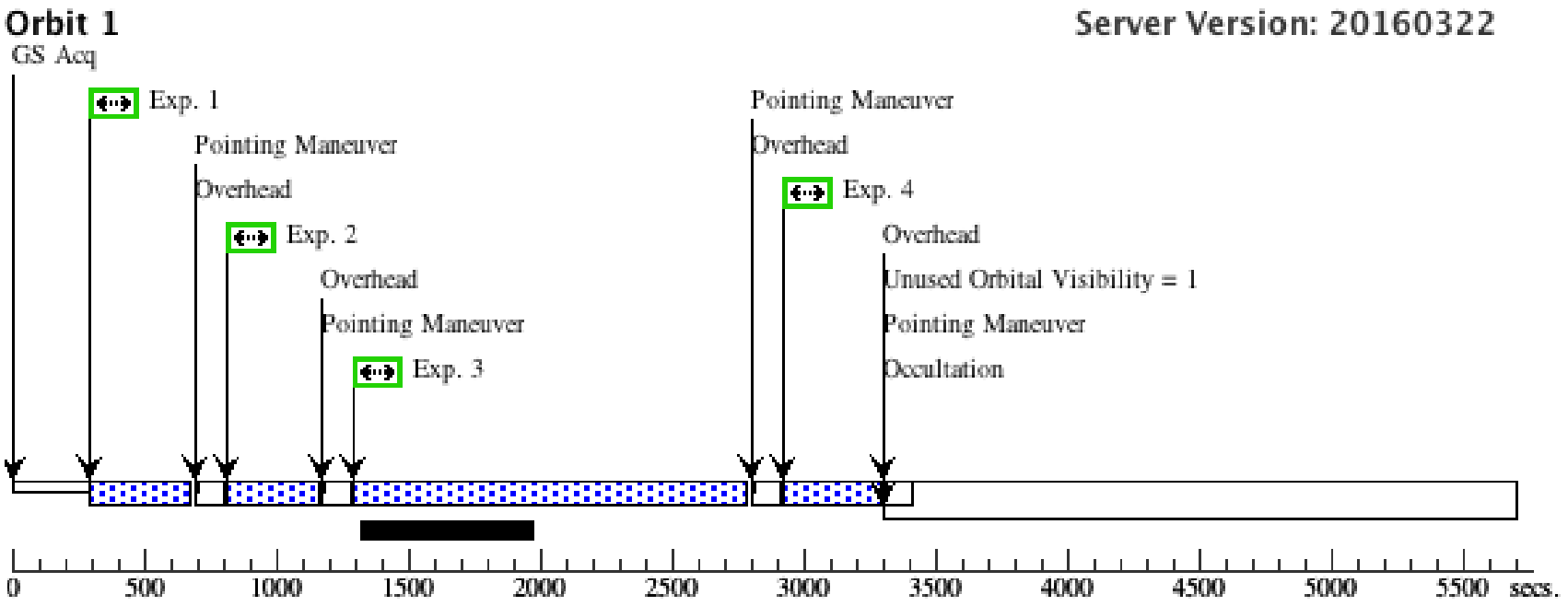
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	ESO286-G022	RA: 21 00 28.7380 (315.1197417d)	Redshift: 0.031	V=(?)	Reference Frame: ICRS
	Alt Name1: SNL-1	Dec: -42 25 23.27 (-42.42313d)		lens J=11.8,	
		Equinox: J2000		source U=25	

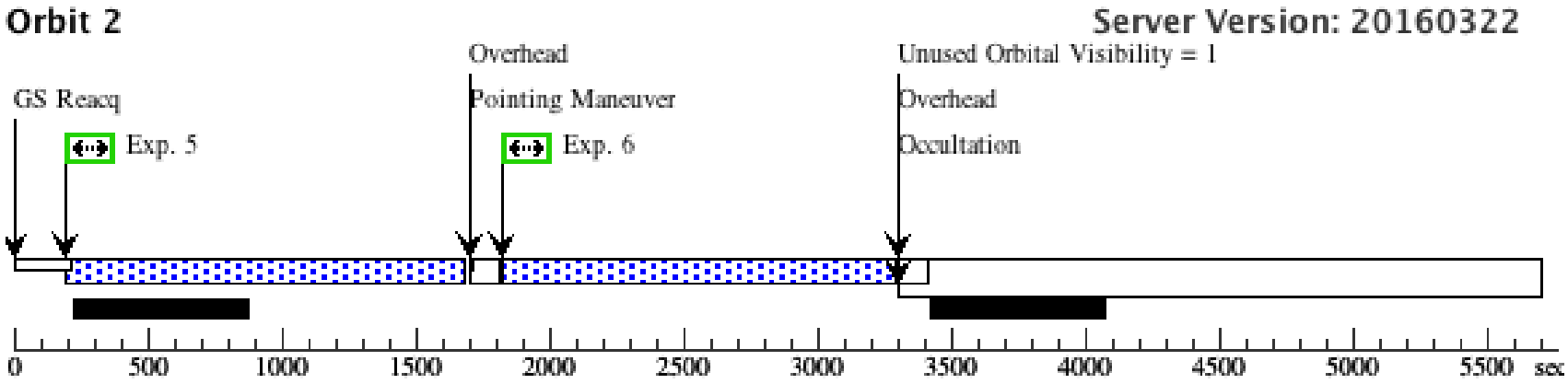
Comments: Redshift is given for the lens galaxy; source redshfift is z=0.9

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	SNL-1-RED-A	(1) ESO286-G022	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F814W	FLASH=5	POS TARG +0.185, +0.197		350 Secs (350 Secs)	
								[==>]	***[1]***
2	SNL-1-RED-B	(1) ESO286-G022	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F814W	FLASH=5	POS TARG 0,0		350 Secs (350 Secs)	
								[==>]	***[1]***
3	SNL-1-BLUE-A	(1) ESO286-G022	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F336W	FLASH=8	POS TARG +0.185, +0.197		1471 Secs (1471 Secs)	
								[==>]	***[1]***
4	SNL-1-RED-C	(1) ESO286-G022	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F814W	FLASH=5	POS TARG +0.092, +0.098		350 Secs (350 Secs)	
								[==>]	***[1]***
5	SNL-1-BLUE-B	(1) ESO286-G022	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F336W	FLASH=8	POS TARG 0,0		1471 Secs (1471 Secs)	
								[==>]	***[2]***
6	SNL-1-BLUE-C	(1) ESO286-G022	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F336W	FLASH=8	POS TARG +0.092, +0.098		1471 Secs (1471 Secs)	
								[==>]	***[2]***

Orbit Structure





Visit

Proposal 14210, SNL-2 (04) Thu May 19 10:04:11 GMT 2016

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Comments: No roll-range restriction. Now using C1K1C-CTE window to place closer to amplifier and using small 3-point line-dither.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	2MASXJ01414232-0735281 Alt Name1: SNL-2	RA: 01 41 42.3000 (25.4262500d) Dec: -07 35 28.00 (-7.59111d) Equinox: J2000	Redshift: 0.052	V=(?) lens J=11.9, source U=25	Reference Frame: ICRS

Comments: Redshift is given for the lens galaxy; source redshfift is z=2.0

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	SNL-2-RED-A	(2) 2MASXJ01414232-0735281	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F814W	FLASH=5	POS TARG +0.185, +0.197		334 Secs (334 Secs) *[==>]*	 ***[1]***
2	SNL-2-RED-B	(2) 2MASXJ01414232-0735281	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F814W	FLASH=5	POS TARG 0,0		334 Secs (334 Secs) *[==>]*	 ***[1]***
3	SNL-2-BLUE-A	(2) 2MASXJ01414232-0735281	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F390W		POS TARG +0.185, +0.197		1424 Secs (1424 Secs) *[==>]*	 ***[1]***
4	SNL-2-RED-C	(2) 2MASXJ01414232-0735281	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F814W	FLASH=5	POS TARG +0.092, +0.098		334 Secs (334 Secs) *[==>]*	 ***[1]***
5	SNL-2-BLUE-B	(2) 2MASXJ01414232-0735281	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F390W		POS TARG 0,0		1424 Secs (1424 Secs) *[==>]*	 ***[2]***
6	SNL-2-BLUE-C	(2) 2MASXJ01414232-0735281	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F390W		POS TARG +0.092, +0.098		1424 Secs (1424 Secs) *[==>]*	 ***[2]***

Orbit Structure