13464 - Accurate Mass Determination of the Old White Dwarf G105-30 through Astrometric Microlensing

Cycle: 21, Proposal Category: GO

(Availability Mode: AVAILABLE)

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?*
01	(3) G105-30-SOURCE	WFC3/UVIS	1	27-May-2015 21:00:34.0	yes

1 Total Orbits Used

ABSTRACT

We propose to determine the mass of the cool, nearby, high-proper-motion white dwarf (WD) G 105-30 (LHS 1838) through astrometric microlensing. In a reprise of the famous 1919 solar eclipse that verified general relativity, G 105-30 will pass very close in front of a 19.5-mag background star in June 2012, with an impact parameter of only ~0.08 arcsec. As it passes in front, it will cause a relativistic deflection of the background star's image by >2 milliarcsec, an amount easily detectable with HST/WFC3. The gravitational deflection angle depends only on the distances and relative positions of the stars, and on the mass of the WD. Since the distance to G 105-30 is already known from an accurate parallax, and the relative positions can be determined precisely before the event, the astrometric measurement offers a unique and direct method to measure the mass of the WD to high accuracy (<5%, potentially <1% for favorable circumstances).

One key astrophysical prediction for WDs is the existence of a mass-radius relation (MRR), which depends on the WD's core composition. Since the luminosity and distance of G 105-30 are known, its radius is known. Our measurements will thus provide a new, precise point in the MRR. The mass of G 105-30 is of special interest because it is an old and relatively massive WD, which would provide new constraints near the bottom of the WD cooling curve, currently being used to age-date stellar populations.

Visit

Proposal 13464, Visit 01, implementation Thu May 28 01:00:36 GMT 2015

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: ORIENT 287D TO 287 D; BETWEEN 30-SEP-2015 AND 15-OCT-2015

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	G105-30-SOURCE	RA: 06 20 48.2000 (95.2008333d) Dec: +06 45 17.10 (6.75475d) Equinox: J2000		V=16.37	Reference Frame: ICRS

Comments: The coordinates were calculated using POSS2 red image. The coordinates are that of the source that will be lensed by the WD.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(3) G105-30-SOURCE	WFC3/UVIS, ACCUM, UVIS2	F606W	FLASH=10; BLADE=A	POS TARG 0,0	Sequence 1-15 Non-Int in Visit 01	40 Secs (40 Secs) *[==>]*	*[1]*
2		(3) G105-30-SOURCE	WFC3/UVIS, ACCUM, UVIS2	F606W		POS TARG 0,0; SPATIAL SCAN 0.004,88.091 Degrees,Forward	Sequence 1-15 Non-Int in Visit 01	466 Secs (466 Secs) *[==>]*	*[1]*
3		(3) G105-30-SOURCE	WFC3/UVIS, ACCUM, UVIS2	F606W		POS TARG 2,0; SPATIAL SCAN 0.004,88.091 Degrees,Forward	Sequence 1-15 Non-Int in Visit 01	466 Secs (466 Secs) *[==>]*	*[1]*
4		(3) G105-30-SOURCE	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F606W	FLASH=10; BLADE=A	POS TARG null,2	Sequence 1-15 Non-Int in Visit 01	40 Secs (40 Secs) *[==>]*	*[1]*
5		(3) G105-30-SOURCE	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F606W	FLASH=10	SAME POS AS 4	Sequence 1-15 Non-Int in Visit 01	80 Secs (80 Secs) *[==>]*	*[1]*
6		(3) G105-30-SOURCE	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F606W	FLASH=10	POS TARG 0.2925,2.1255	Sequence 1-15 Non-Int in Visit 01	40 Secs (40 Secs) *[==>]*	*[1]*
7		(3) G105-30-SOURCE	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F606W	FLASH=10	SAME POS AS 6	Sequence 1-15 Non-Int in Visit 01	80 Secs (80 Secs) *[==>]*	*[1]*
8		(3) G105-30-SOURCE	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F606W	FLASH=10	POS TARG 0.1862,2.3044	Sequence 1-15 Non-Int in Visit 01	40 Secs (40 Secs) *[==>]*	*[1]*
9		(3) G105-30-SOURCE	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F606W	FLASH=10	SAME POS AS 8	Sequence 1-15 Non-Int in Visit 01	80 Secs (80 Secs) *[==>]*	*[1]*
10		(3) G105-30-SOURCE	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F606W	FLASH=10	POS TARG 1,2	Sequence 1-15 Non-Int in Visit 01	40 Secs (40 Secs) *[==>]*	*[1]*
11		(3) G105-30-SOURCE	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F606W	FLASH=10	SAME POS AS 10	Sequence 1-15 Non-Int in Visit 01	80 Secs (80 Secs) *[==>]*	*[1]*
12		(3) G105-30-SOURCE	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F606W	FLASH=10	POS TARG 1.2925,2.1255	Sequence 1-15 Non-Int in Visit 01	40 Secs (40 Secs) *[==>]*	*[1]*
13		(3) G105-30-SOURCE	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F606W	FLASH=10	SAME POS AS 12	Sequence 1-15 Non-Int in Visit 01	80 Secs (80 Secs) *[==>]*	*[1]*
14		(3) G105-30-SOURCE	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F606W	FLASH=10	POS TARG 0.1862,2.3044	Sequence 1-15 Non-Int in Visit 01	40 Secs (40 Secs) *[==>]*	*[1]*
15		(3) G105-30-SOURCE	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F606W	FLASH=10	SAME POS AS 14	Sequence 1-15 Non-Int in Visit 01	80 Secs (80 Secs) *[==>]*	*[1]*

Orbit Structure