



18090 - Unraveling Common Envelope Evolution with Star Clusters: A new post-common envelope binary in the Alessi 12 open cluster

Cycle: 33, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

<i>Name</i>	<i>Institution</i>
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Dr. Kyle Kremer (CoI)	University of California - San Diego

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) ALESSI12-PCE	COS/FUV COS/NUV	2	14-Aug-2025 15:00:16.0	yes
02	(1) ALESSI12-PCE	COS/FUV COS/NUV	2	14-Aug-2025 15:00:18.0	yes

4 Total Orbits Used

ABSTRACT

The progenitor systems of type Ia supernovae and gravitational wave sources are believed to arise from a mass transfer process known as common envelope (CE) evolution. Although a large fraction of binary systems will undergo CE evolution, the detailed physics remains poorly understood,

largely due to the lack of observed benchmark systems where both the pre-CE and post-CE conditions are known. While post-CE systems containing a white dwarf (WD) and main-sequence (MS) star have been observed, they are located in the field, making it difficult to gain insights into their pre-CE parameters. Finding post-CE systems in star clusters can provide an independent constraint on the binary's age, but only two WD+MS post-CE systems in a star cluster have ever been found. Recently, a new WD+MS post-CE system was discovered in the Alessi 12 cluster. Alessi12-PCE is an ideal candidate to study CE evolution as it (i) is a cluster member, (ii) is a confirmed short-period binary and (iii) has clear spectral features of both a WD and a MS star in an optical spectrum. However, while spectral features at optical wavelengths can measure a WD's temperature and surface gravity (and thus its mass), there are systematic uncertainties that can have a significant impact on the inferred pre-CE conditions. Thus, we request 4 orbits with HST COS to obtain an ultraviolet spectrum to measure the effective temperature and surface gravity of Alessi12-PCE from its Lyman-alpha feature and use this measurement to refine the precision on the WD's mass. Alessi12-PCE will be just the third WD+MS post-CE binary ever identified in a star cluster, highlighting the necessity of this data.

OBSERVING DESCRIPTION

This proposal will obtain a UV spectrum for a recently discovered post-common envelope WD+MS binary in the Alessi12 cluster. These measurements will allow for an independent constraint on the mass of the WD via modelling of the Lyman Alpha feature.

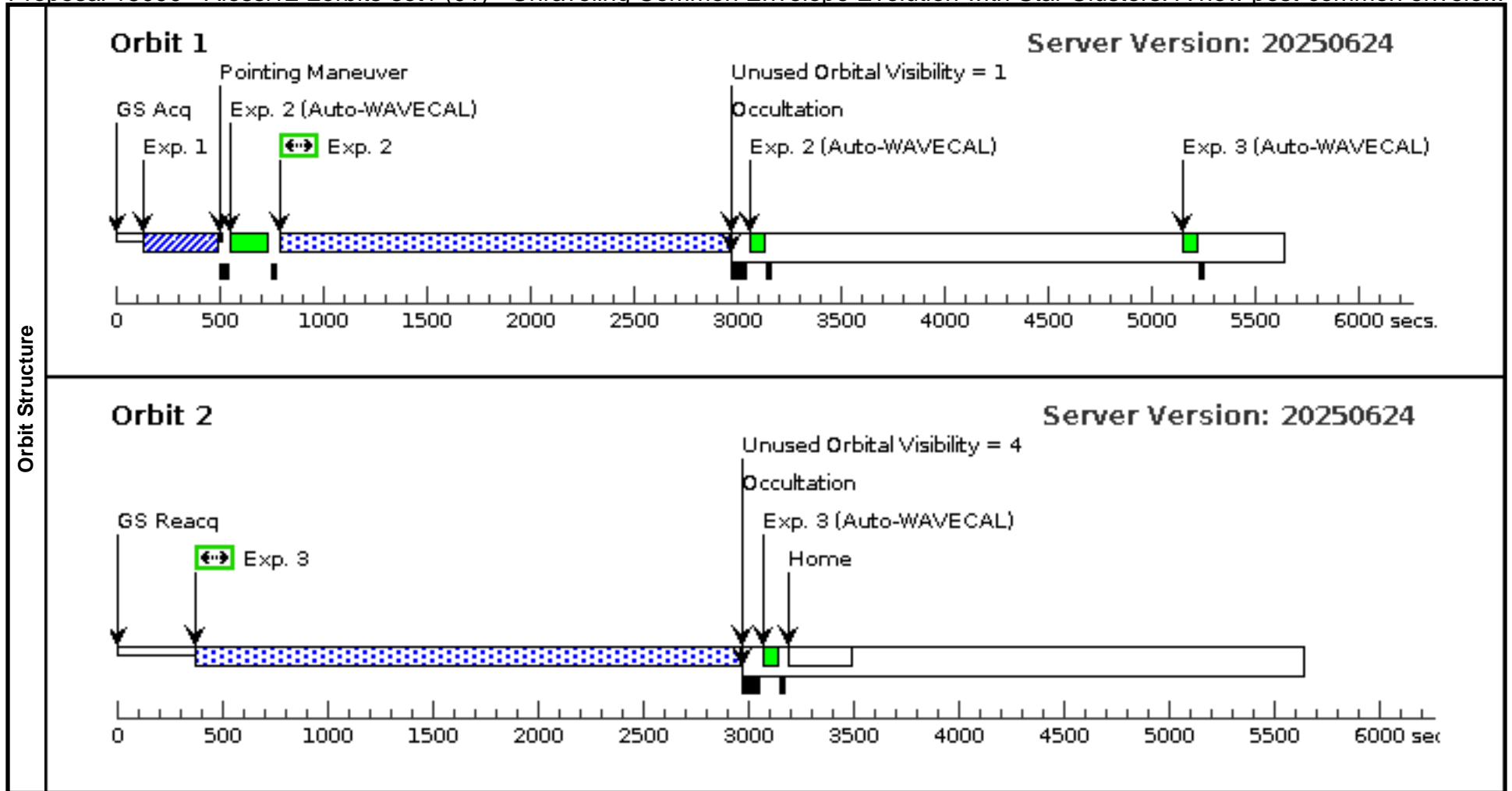
Observations will be obtained in the G130M grism and a central wavelength of 1291 AA. As the Lyman Alpha feature is in Segment B, observations will be obtained in FP-POS 3 and 4.

The impacts of a reduced gyro operations on this program would primarily be reduced schedulability due to the smaller field of regard. Slightly longer acquisition times would have only a small effect on the S/N of our observations.

Proposal 18090 - Alessi12-2orbits-set1 (01) - Unraveling Common Envelope Evolution with Star Clusters: A new post-common envelo...

Thu Aug 14 19:00:18 GMT 2025

Visit	Proposal 18090, Alessi12-2orbits-set1 (01) Diagnostic Status: No Diagnostics Scientific Instruments: COS/FUV, COS/NUV Special Requirements: (none)									
	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
Fixed Targets	(1)	ALESSI12-PCE	RA: 20 46 24.9967 (311.6041529d) Dec: +24 38 20.16 (24.63893d) Equinox: J2000	Proper Motion RA: 4.5167 mas/yr Proper Motion Dec: -4.5174 mas/yr Epoch of Position: 2016	V=18.76 Swift AB magnitudes -- UVW2: 16.95mag, UVM2: 17.68mag, UVW1: 17.44mag, U:18.35mag, B: 18.54mag	Reference Frame: ICRS				
	<i>Comments:</i> Category=STAR Description=[DA, M V-IV] Extended=NO									
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	Alessi12-Ac q (COS.ta.202 4429)	(1) ALESSI12-PCE	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				24 Secs (24 Secs) [==>]	[1]
	2	Alessi12-Sci ence (COS.sp.202 4434)	(1) ALESSI12-PCE	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=37 00			2120 Secs (2120 Secs) [==>]	[1]
	3	Alessi12-Sci ence (COS.sp.202 4434)	(1) ALESSI12-PCE	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=4; BUFFER-TIME=37 00			2535 Secs (2535 Secs) [==>]	[2]



Proposal 18090 - Alessi12-2orbits-set2 (02) - Unraveling Common Envelope Evolution with Star Clusters: A new post-common envelo...

Thu Aug 14 19:00:18 GMT 2025

Visit	Proposal 18090, Alessi12-2orbits-set2 (02) Diagnostic Status: No Diagnostics Scientific Instruments: COS/FUV, COS/NUV Special Requirements: (none)									
	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
Fixed Targets	(1)	ALESSI12-PCE	RA: 20 46 24.9967 (311.6041529d) Dec: +24 38 20.16 (24.63893d) Equinox: J2000	Proper Motion RA: 4.5167 mas/yr Proper Motion Dec: -4.5174 mas/yr Epoch of Position: 2016	V=18.76 Swift AB magnitudes -- UVW2: 16.95mag, UVM2: 17.68mag, UVW1: 17.44mag, U:18.35mag, B: 18.54mag	Reference Frame: ICRS				
	Comments: Category=STAR Description=[DA, M V-IV] Extended=NO									
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	Alessi12-Ac q (COS.ta.202 4429)	(1) ALESSI12-PCE	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				24 Secs (24 Secs) [==>]	[1]
	2	Alessi12-Sci ence (COS.sp.202 4434)	(1) ALESSI12-PCE	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=37 00			2120 Secs (2120 Secs) [==>]	[1]
	3	Alessi12-Sci ence (COS.sp.202 4434)	(1) ALESSI12-PCE	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=4; BUFFER-TIME=37 00			2535 Secs (2535 Secs) [==>]	[2]

