



14899 - DES16C2nm: Is the Highest-Redshift Supernova to Date also the Most Luminous?

Cycle: 24, Proposal Category: GO/DD

(Availability Mode: SUPPORTED)

INVESTIGATORS

<i>Name</i>	<i>Institution</i>	<i>E-Mail</i>
Dr. Chris D'Andrea (PI) (Contact)	University of Pennsylvania	cdandrea@sas.upenn.edu
Dr. Mark Sullivan (CoI) (ESA Member)	University of Southampton	m.sullivan@soton.ac.uk
Dr. Mathew Smith (CoI) (ESA Member)	University of Southampton	mat.smith@soton.ac.uk
Prof. Bob Nichol (CoI) (ESA Member)	University of Portsmouth	bob.nichol@port.ac.uk
Prof. Masao Sako (CoI)	University of Pennsylvania	masao@sas.upenn.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) DES16C2NM	WFC3/IR	1	06-Dec-2016 21:03:52.0	yes

1 Total Orbits Used

ABSTRACT

The Dark Energy Survey (DES) has discovered DES16C2nm, a superluminous supernova (SLSN) at redshift of 1.998. DES16C2nm is the highest-redshift spectroscopically-classified supernova of any type ever discovered. The griz photometry from DES shows a flat, slightly rising light curve over the past 80 days (27 days rest-frame), and we estimate that DES16C2nm may be the most luminous SLSN ever discovered ($M_u < -23$). But our DES photometry only covers the rest-frame UV, making it impossible to accurately measure the bolometric luminosity of this event. Furthermore, the high redshift of this SN makes it possible to obtain photometry of the FUV region, essential for understanding how to find SLSNe at even higher redshifts. Finally, while we can confirm the classification and redshift of this object with our optical photometry, to fully compare with low-redshift

SLSNe we need to obtain rest-frame optical spectra. We propose to use cadenced HST UV photometry along with NIR photometry and spectroscopy to obtain a complete picture of this unique, most distant ever supernova.

OBSERVING DESCRIPTION

We observe the $z=1.9985$ Superluminous Supernova DES16C2nm ($H\sim 23.2$) with the F160W filter and take a spectrum using the G141 grism in order to constrain the rest-frame optical properties of this highest-redshift-ever spectroscopically-classified supernova.

We assume the spectral shape of a blackbody with $T=10000$ K to estimate observing times. The G141 filter is 46.5Å per pixel, which is 15.5Å per pixel in the rest-frame. For a 'classifiable' spectrum, we want to obtain a minimum SNR of 3 per 10Å resolution element, thus a minimum SNR of 3.7 per resolution element across the spectrum. This is achievable across the entirety of the sensitive range of the G141 filter (1.1-1.65 μm) with an exposure of 2369s, with the peak SNR 50% higher than this minimum value. We conservatively suppose the SN may fade by ~ 0.5 mag by the time of our requested observations. To obtain 20-sigma detections (mag uncertainty 0.05) in the F160W filter, we estimate a 285s integration time.

We use a two-point WFC3-IR-DITHER-BLOB dither pattern with a set of F160W and G141 spectra taken in each dither. This allows the F160W exposure to serve as a pointing constraint for the spectrum. The total exposure time in F160W in this visit is 306s, and the G141 spectrum is 2406s, exceeding both of our exposure time requirements.

Proposal 14899 - 01 (01) - DES16C2nm: Is the Highest-Redshift Supernova to Date also the Most Luminous?

Wed Dec 07 02:03:52 GMT 2016

Visit

Proposal 14899, 01 (01)
Diagnostic Status: No Diagnostics
Scientific Instruments: WFC3/IR
Special Requirements: (none)
Comments: A dithered set of exposures using the F160W filter followed by G141 spectra.

Patterns

#	Primary Pattern	Secondary Pattern	Exposures
(2)	Pattern Type=WFC3-IR-DITHER-BLOB Coordinate Frame=POS-TARG Pattern Orientation=41.859 Purpose=DITHER Angle Between Sides= Number Of Points=2 Center Pattern=true Point Spacing=5.183 Line Spacing=		(1-2)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	DES16C2NM	RA: 03 40 14.8300 (55.0617917d) Dec: -29 05 53.50 (-29.09819d) Equinox: J2000		V=(?) H = 23.2	Reference Frame: ICRS

Comments: The H-band flux is rather uncertain, as it is derived by fitting a blackbody to the observed griz data and extrapolating a blackbody into the H-band (superluminous supernovae do not have very well-defined templates). The current magnitude could span from 22.9 - 23.6.

The host galaxy is 1.5 magnitudes fainter in the both the DES i and z filters than the target. The galaxy's H-band magnitude is unknown.

Exposures

#	Label	Target	Config, Mode, Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) DES16C2NM	WFC3/IR, MULTIACCUM, GRISM1024	F160W	NSAMP=7; SAMP-SEQ=SPAR S25		Pattern 2, Exps 1-2 in 01 (01) (2)	152.935381 Secs (305.871 Secs) [=>(Pattern 1)] [=>(Pattern 2)]	[1]
2		(1) DES16C2NM	WFC3/IR, MULTIACCUM, GRISM1024	G141	NSAMP=13; SAMP-SEQ=SPAR S100		Pattern 2, Exps 1-2 in 01 (01) (2)	1202.936167 Secs (2405.872 Secs) [=>(Pattern 1)] [=>(Pattern 2)]	[1]

Orbit Structure

Orbit 1

GS Acq

Exp. 1

Exp. 2

Pointing Maneuver

Exp. 1

Exp. 2

Reconfig

Occultation

Unused Orbital Visibility = 15

Server Version: 20160601

0

500

1000

1500

2000

2500

3000

3500

4000

4500

5000

5500

sec