# 13360 - The Peculiar Type Ia Supernova 2012Z: A Massive Star Progenitor?

Cycle: 20, 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?* |
|---|---|---|---|---|---|
| 01 | (1) SN-2012Z | WFC3/UVIS | 3 | 11-Jul-2013 17:13:04.0 | yes |

3 Total Orbits Used

**ABSTRACT**


Despite the tremendous importance of type Ia supernovae (SNe Ia), from their use as cosmological distance indicators to their contribution to the chemical enrichment of the Universe, we are still puzzled by the basic questions: what are their progenitor systems and how do they explode? Peculiar SNe Ia, objects that resemble normal SNe Ia spectroscopically, but lie off the one-parameter Phillips relationship the vast majority of SN Ia follow, play a useful role in answering these questions. By understanding what makes a small, but significant, fraction of SNe Ia different than their normal cousins, we may identify the key initial conditions and physical processes at work. Here we propose late-time HST WFC3/UVIS optical photometry of SN 2012Z, the most recent member of the peculiar SN 2002cx-like subclass of SNe Ia. We will compare our observations with

extremely deep pre-explosion HST ACS images of the host galaxy NGC 1309, to test whether bright (M_I = -6) stars near the position of the SN are in fact coincident with it, testing a massive star progenitor hypothesis for this subclass of explosions, contrary to the most likely progenitor models for normal SNe Ia. We will also continue to follow the optical light curve of SN 2012Z to epochs later than any peculiar SNe Ia has been observed, in order to test signatures of explosion models for these objects.

**OBSERVING DESCRIPTION**

We propose to obtain late-time optical WFC3/UVIS VrI photometry of SN 2012Z in NGC 1309 in two epochs, once during Cycle 20 (scheduled ~500 days after maximum light), and again during Cycle 21 (sometime approximately 680 to 850 days past maximum).

In the second epoch (Cycle 21) observations (between January and July 2014) we anticipate SN 2012Z will have V~26.5, r~26, and I~25.5, with an uncertainty of about 1 mag. For the comparison between models and other late-time SNe, we need S/N >~ 8 in all filters, even in a pessimistic case (with the SN 1 mag below the prediction and near the end of the observing window). We will use 3 dither positions in each filter, the best tradeoff between good PSF sampling and long enough exposures to produce background levels with minimal CTE losses.

## Visit

**Proposal 13360, SN2012Z-epoch2 (01), implementation** Thu Jul 11 21:13:14 GMT 2013

**Diagnostic Status: No Diagnostics**

Scientific Instruments: WFC3/UVIS

Special Requirements: SCHED 100%; BETWEEN 01-JAN-2014:00:00:01 AND 01-AUG-2014:00:00:01

## Patterns

| # | Primary Pattern | | Secondary Pattern | Exposures |
|---|---|---|---|---|
| (2) | Pattern Type=WFC3-UVIS-DITHER-LINE-3PT<br>Purpose=DITHER<br>Number Of Points=3<br>Point Spacing=0.135<br>Line Spacing= | Coordinate Frame=POS-TARG<br>Pattern Orientation=46.84<br>Angle Between Sides=<br>Center Pattern=false | | (1-3) |

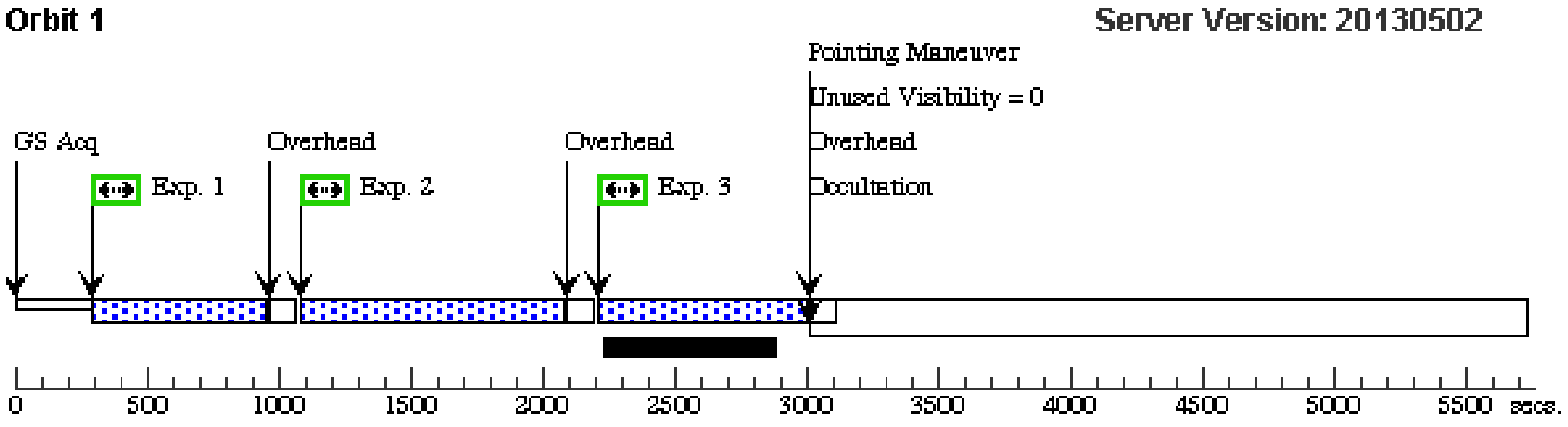
## Fixed Targets

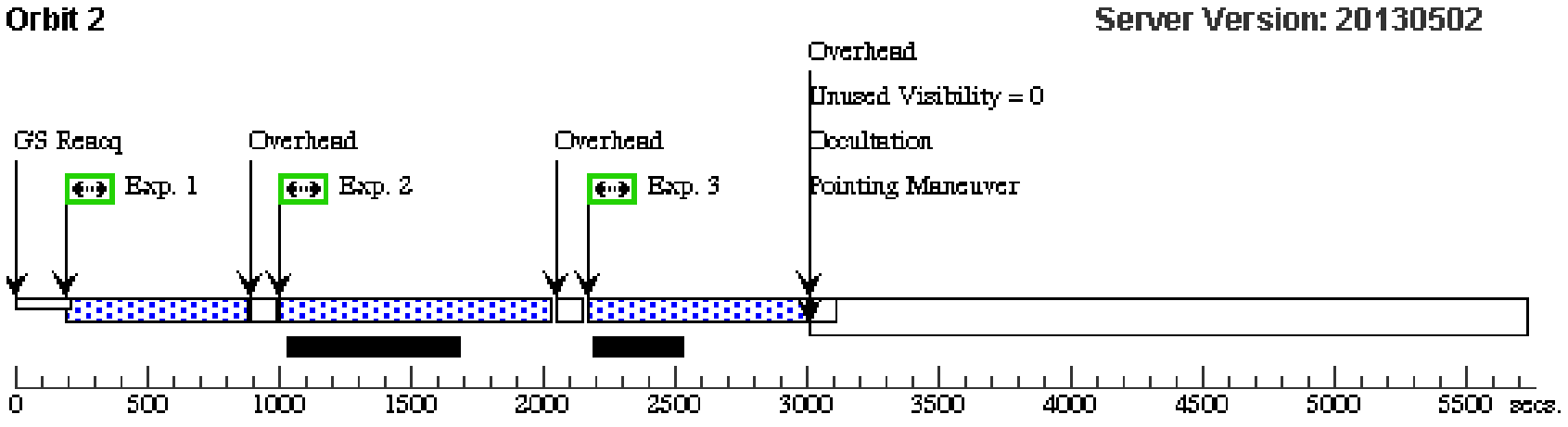
| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (1) | SN-2012Z | RA: 03 22 5.3500 (50.5222917d)<br>Dec: -15 23 15.60 (-15.38767d)<br>Equinox: J2000 | | V=23+/-1<br>fading | Reference Frame: ICRS |

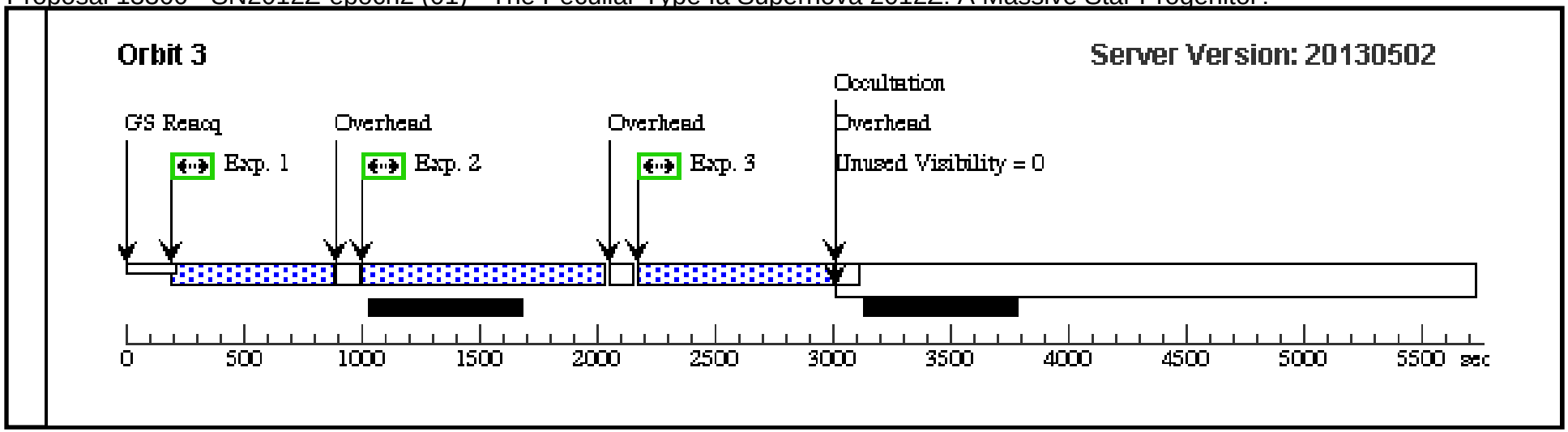
## Exposures

| # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | (1) SN-2012Z | WFC3/UVIS, ACCUM, UVIS2 | F625W | | | Pattern 2, Exps 1-3 in SN2012Z-epoch2 (01) (2) | 500 Secs (1952 Secs) | |
| | | | | | | | | *[==>626.0 Secs (Pattern 1)]* | ***[1]*** |
| | | | | | | | | *[==>663.0 Secs (Pattern 2)]* | ***[2]*** |
| | | | | | | | | *[==>663.0 Secs (Pattern 3)]* | ***[3]*** |
| 2 | | (1) SN-2012Z | WFC3/UVIS, ACCUM, UVIS2 | F555W | | | Pattern 2, Exps 1-3 in SN2012Z-epoch2 (01) (2) | 850 Secs (3002 Secs) | |
| | | | | | | | | *[==>976.0 Secs (Pattern 1)]* | ***[1]*** |
| | | | | | | | | *[==>1013.0 Secs (Pattern 2)]* | ***[2]*** |
| | | | | | | | | *[==>1013.0 Secs (Pattern 3)]* | ***[3]*** |
| 3 | | (1) SN-2012Z | WFC3/UVIS, ACCUM, UVIS2 | F814W | | | Pattern 2, Exps 1-3 in SN2012Z-epoch2 (01) (2) | 650 Secs (2402 Secs) | |
| | | | | | | | | *[==>776.0 Secs (Pattern 1)]* | ***[1]*** |
| | | | | | | | | *[==>813.0 Secs (Pattern 2)]* | ***[2]*** |
| | | | | | | | | *[==>813.0 Secs (Pattern 3)]* | ***[3]*** |

Orbit Structure




Orbit 3
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Occultation
GS Reacq
Overhead
Overhead
Overhead
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Exp. 2
Exp. 3
Unused Visibility = 0
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sec