



13432 - To be or not to be the progenitor: The question about Tycho-B

Cycle: 21, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

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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) RCM2004-TYCHO-B (2) RCM2004-TYCHO-A	STIS/CCD STIS/NUV-MAMA	2	11-Jul-2013 20:19:01.0	yes

2 Total Orbits Used

ABSTRACT

Despite the importance of Type Ia SNe, we still do not know whether they result from mass transfer onto a WD from a non-degenerate companion, from the coalescence of two degenerate stars, or perhaps a from a combination of these two pathways. Here we seek to show, by identifying the donor star, that SN1572--the prototypical Galactic SN Ia reported by Tycho--resulted from the single-degenerate scenario. We know from ground-based high-resolution spectra that many stars near the projected center of SN1572 lack the characteristics expected for a donor companion. But one of them, the unusual A-star denoted Tycho-B, exhibits fast rotation and an unusual abundance pattern of low overall metallicity ($[Fe/H] \sim -1$) yet high abundances of C and O. Tycho-B is a few arcsec from the geometric center of SN1572, and our distance estimate is consistent with that for SN1572.

If Tycho-B is in fact the surviving companion, it must be located within the SNR shell. In this case, we expect it will show broad, blue-shifted absorption in Fe II from undecelerated cold ejecta that have long-since swept past the companion star, but have not yet encountered a reverse shock. We propose to use HST/STIS to obtain UV spectra that will clearly reveal such absorption. While a positive result is not guaranteed, the potential payoff of establishing Tycho-B as the donor is large. If Tycho-B is instead a background object, these spectra will still provide an important probe for the cold ejecta in SN1572, as we have done for the older Ia remnant of SN1006.

OBSERVING DESCRIPTION

We are aiming to acquire a STIS NUV spectrum of the the star Tycho-B (U=16.78). Tycho-B is located roughly 3 arcseconds from Tycho-A (U=15.96), which we will use as a acquisition and "guide" star. We want to have the slit over both these stars so we know about the contamination of Tycho-B from Tycho-A. We plan to acquire once and then spent our two orbits observing.

Proposal 13432 - Visit 01 - To be or not to be the progenitor: The question about Tycho-B

Visit	Proposal 13432, Visit 01, implementation Fri Jul 12 00:19:10 GMT 2013 Diagnostic Status: No Diagnostics Scientific Instruments: STIS/CCD, STIS/NUV-MAMA Special Requirements: ORIENT 15D TO 15 D; ORIENT 195D TO 195 D																																																																					
	Fixed Targets	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>#</th> <th>Name</th> <th>Target Coordinates</th> <th>Targ. Coord. Corrections</th> <th>Fluxes</th> <th>Miscellaneous</th> </tr> </thead> <tbody> <tr> <td>(1)</td> <td>RCM2004-TYCHO-B</td> <td>RA: 00 25 20.0406 (6.3335025d) Dec: +64 08 17.37 (64.13816d) Equinox: J2000</td> <td>Radial Velocity: -45 km/sec</td> <td>V=15.4+/-0.03 B=16.35, U=16.78</td> <td>Reference Frame: ICRS</td> </tr> <tr> <td colspan="6"><i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i></td> </tr> <tr> <td>(2)</td> <td>RCM2004-TYCHO-A</td> <td>RA: 00 25 19.8082 (6.3325342d) Dec: +64 08 19.99 (64.13889d) Equinox: J2000</td> <td></td> <td>V=13.3 U=15.96</td> <td>Reference Frame: ICRS</td> </tr> <tr> <td colspan="6"><i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i></td> </tr> </tbody> </table>										#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous	(1)	RCM2004-TYCHO-B	RA: 00 25 20.0406 (6.3335025d) Dec: +64 08 17.37 (64.13816d) Equinox: J2000	Radial Velocity: -45 km/sec	V=15.4+/-0.03 B=16.35, U=16.78	Reference Frame: ICRS	<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i>						(2)	RCM2004-TYCHO-A	RA: 00 25 19.8082 (6.3325342d) Dec: +64 08 19.99 (64.13889d) Equinox: J2000		V=13.3 U=15.96	Reference Frame: ICRS	<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i>																																		
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