



13447 - The massive monsters living deep in the Tarantula nebula: How massive are they really?

Cycle: 21, Proposal Category: GO
(Availability Mode: SUPPORTED)

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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) R136	FGS	1	08-Sep-2014 21:02:23.0	yes

1 Total Orbits Used

ABSTRACT

The recent suggestion that stars with masses in excess of about 300 solar masses exist in the dense star cluster R136 at heart of the Tarantula Nebula received wide interest. It reopened the debate about the upper stellar-mass limit of the initial mass function (IMF) and it raised the question whether pair-instability supernovae -- originally thought exclusively originate from first generation of pop III stars -- can occur in the vicinity of Milky Way.

A major challenge hampering mass estimates of the most massive stars is crowding and unresolved companions. High-resolution imaging from the ground and with HST reaching resolutions of about 0.1 arcsec resolved the brightest source in R136 into three separate components. Unfortunately, the extreme crowding and faintness of the targets prohibits ground-based facilities to reach further towards milli-arcsecond resolution.

We propose to exploit the new full two-dimensional calibration program of Fine Guidance Sensor (Nelán, Prop ID 13175) to probe the most luminous stars in R136 for previously unseen companions down to a resolution of 12 milli-arcsecond, exploring the separation of about 500-5000 AU. Furthermore, we will characterize the claimed source R136-a1B and if needed revise downward the mass estimates of the most massive stars known date.

OBSERVING DESCRIPTION

This is a single CVZ orbit observation to probe the most luminous stars of the central region of R136 using the FGS1r in its high angular resolution TRANSfer mode. The photocenter of this very crowded region will be placed at the POS_TARG(x,y)=(0,0) location at the center of the FGS1r FOV, near R136-A1. Observations will be made with the F583W filter using one of the possible scan ORIENTations of 18, 108, 198, or 288 degrees over an 9 arcsec by 9 arcsec scan path in order to optimize the projected separation of objects A1, A2,A3, B, and C from field stars. The long scan will require a Continuous Viewing Zone (CVZ) orbit to maximize the SNR and to include the four major science targets in this region. The individual scans will be de-jittered, cross-correlated, coadded, and smoothed to produce high SNR interference fringes in two orthogonal directions. We propose to exploit the new full two-dimensional calibration program of Fine Guidance Sensor (Nelán, ID 13175) to model (and thus remove) the effect of the numerous field stars present in the beam to enable detection of any previously unseen companions in the A,B,C stars down to a resolution of ~15 milli-arcsecond.

R136 is host to the most massive stars observed to date (Crowther et al. 2010, MNRAS, 408, 731). R136 has previously been observed with FGS, however the specified orientation is needed to characterize the claimed source R136-A1b and the wider FOV will include the most massive stars observed to date: R136-A1, R136-A2, R136-B and R136-C.

Proposal 13447 - R136 (01) - The massive monsters living deep in the Tarantula nebula: How massive are they really?

Tue Sep 09 01:02:25 GMT 2014

Visit	Proposal 13447, R136 (01), implementation Diagnostic Status: Warning Scientific Instruments: FGS Special Requirements: CVZ; ORIENT 108D TO 108 D; ORIENT 18D TO 18 D; ORIENT 198D TO 198 D; ORIENT 288D TO 288 D									
Diagnostics	(R136 (01)) Warning (Orbit Planner): LONG FGS SCAN LENGTH MAY SIGNAL PROBLEMS									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	R136	RA: 05 38 42.3840 (84.6766000d) Dec: -69 06 3.12 (-69.10087d) Equinox: J2000		V=9.5	Reference Frame: ICRS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(1) R136	FGS, TRANS, 1	F583W	SCANS=20; STEP-SIZE=1.0	GS ACQ SCENARI O ONEB1B3		4700 Secs (4700 Secs) [==>]	[1]
Orbit Structure	<div style="display: flex; justify-content: space-between;"> <div> <p>Orbit 1</p> </div> <div> <p>Server Version: 20140605</p> </div> </div>									