



18118 - VFTS 812: A Quiescent Eccentric Black Hole Binary in the LMC?

Cycle: 33, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

<i>Name</i>	<i>Institution</i>
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Mr. Olivier Verhamme (CoI) (ESA Member)	Katholieke Universiteit Leuven

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) 2MASS-J05393611-6904591	COS/FUV COS/NUV	2	02-Oct-2025 09:00:25.0	yes
02	(1) 2MASS-J05393611-6904591	COS/FUV COS/NUV	2	02-Oct-2025 09:00:25.0	yes

4 Total Orbits Used

ABSTRACT

Understanding how black holes form in massive binary systems is a central question in modern astrophysics, with direct implications for the origin of gravitational-wave sources. VFTS 812, an eccentric 17-day period binary in the sub-solar metallicity environment of the Tarantula Nebula was identified as a prime candidate hosting an O4V star with a possible black hole companion. Current optical observations strongly suggest a non-

Proposal 18118 (STScI Edit Number: 0, Created: Thursday, October 2, 2025, 8:00:26AM Eastern Standard Time) - Overview

luminous companion exceeding the typical mass threshold for black holes, but cannot definitively exclude a faint, non-degenerate star. Furthermore, the primary mass and atmospheric properties are not constrained enough to trace its past evolution.

We propose HST UV observations to decisively determine if the unseen companion in VFTS 812 is indeed a black hole, clarify the physical properties of the O4V primary, and reveal signatures of past mass-transfer episodes. A UV spectroscopic analysis will precisely constrain the rotation and wind characteristics key to understanding the systems evolutionary history. Confirming the black hole companion candidate will provide critical insights into supernova natal kicks, the evolution of massive stars in low-metallicity environments, and the formation of merging binary black holes.

OBSERVING DESCRIPTION

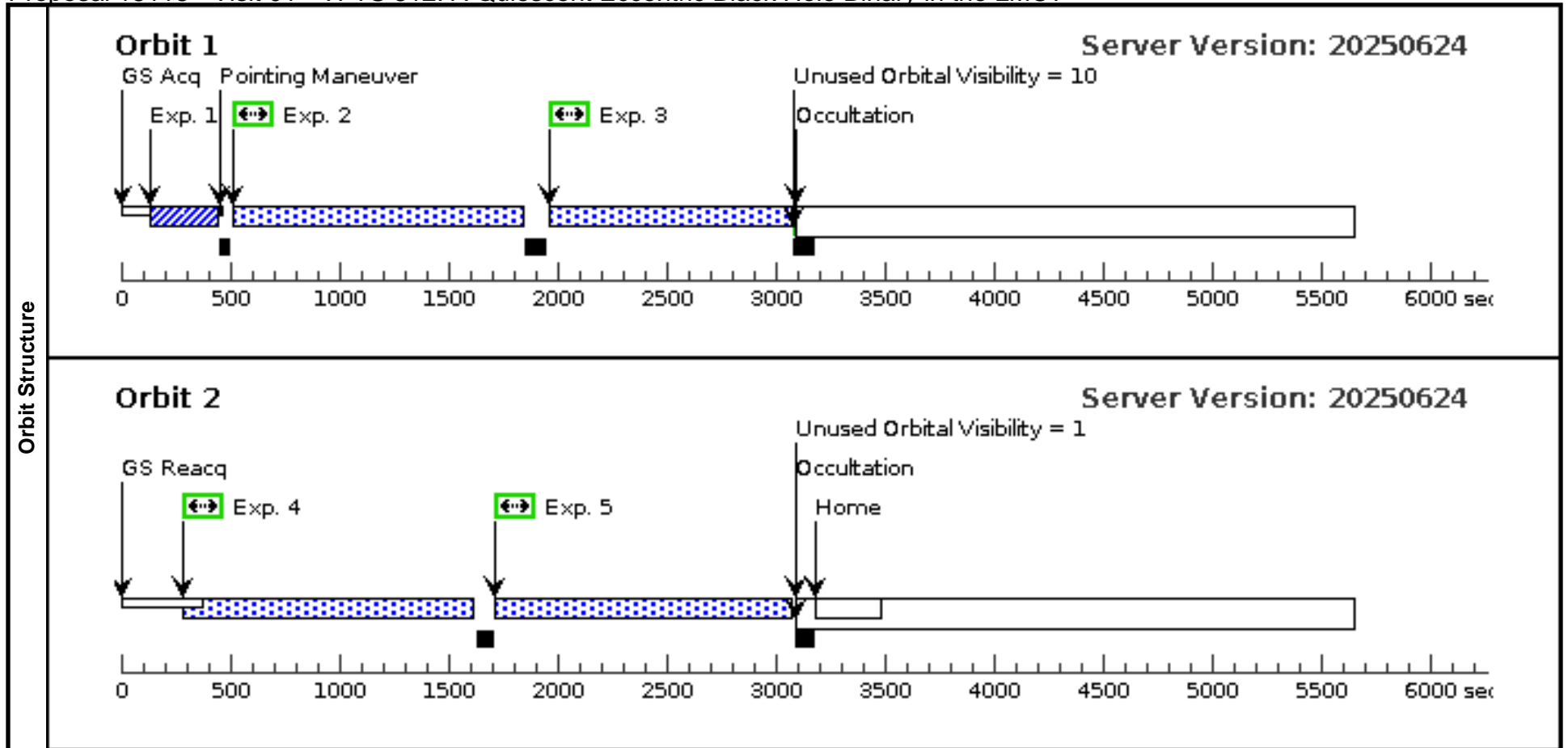
We aim to obtain UV spectra with the G160M (1533 & 1623) grating of the O+black-hole binary candidate VFTS 812 during two randomly timed visits. Each visit requested includes two orbits, one each for the two wavelength settings.

The SNR in each wavelength setting is expected to reach 15-20 based on ETC calculations.

Proposal 18118 - Visit 01 - VFVS 812: A Quiescent Eccentric Black Hole Binary in the LMC?

Thu Oct 02 13:00:26 GMT 2025

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