



## 10767 - Further Resolving the Puzzle of Hybrid Star X-rays

Cycle: 14, Proposal Category: GO

(Availability Mode: SUPPORTED)

### INVESTIGATORS

| <i>Name</i>                     | <i>Institution</i>                       | <i>E-Mail</i>                  |
|---------------------------------|--|--------------------------------|
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### VISITS

| <i>Visit</i> | <i>Targets</i> | <i>Configurations</i> | <i>Orbits Used</i> | <i>Last Orbit Planner Run</i> | <i>OP Current with Visit?</i> |
|--------------|----------------|-----------------------|--------------------|-------------------------------|-------------------------------|
| 01           | (1) HD150798   | WFPC2                 | 1                  | 14-Oct-2005 21:24:45.0        | yes                           |
| 02           | (1) HD150798   | WFPC2                 | 1                  | 14-Oct-2005 21:24:48.0        | yes                           |
| 03           | (1) HD150798   | WFPC2                 | 1                  | 14-Oct-2005 21:24:51.0        | yes                           |
| 04           | (2) HD198700   | WFPC2                 | 1                  | 14-Oct-2005 21:24:53.0        | yes                           |
| 05           | (2) HD198700   | WFPC2                 | 1                  | 14-Oct-2005 21:24:55.0        | yes                           |
| 06           | (2) HD198700   | WFPC2                 | 1                  | 14-Oct-2005 21:24:57.0        | yes                           |

6 Total Orbits Used

### ABSTRACT

Do Alpha TrA (K2II) and Beta Ind (K1II) have previously unrecognized X-ray active dwarf companions, leading us astray concerning the coronal properties of the "hybrid-chromosphere" class? Establishing the true X-ray luminosities of the hybrids is a basis for understanding magnetic field

## Proposal 10767 - Overview

generation in evolved supergiants, the driving of their winds, and the seeding of coronal conditions in their extended outer envelopes. It also bears on the issue of late-type dwarfs orbiting main sequence B stars, the evolutionary predecessors of K bright giants. We propose to directly image the putative hybrid companions using Chandra, with supporting observations from HST/WFPC2.

### **OBSERVING DESCRIPTION**

The two targets, both K-type supergiants, will be observed with the WFPC2/F160BW in an attempt to detect close UV-bright companions, thought to be responsible for the anomalous X-ray properties. Three HST orbits will be devoted to each star, each visit at a different ORIENT to avoid hiding the companion under a psf artifact. During each visit, six 300 s exposures will be taken, in a 2-pt spatial dither with 3 images at each pointing to mitigate cosmic rays.

Proposal 10767 - Visit 01 - Further Resolving the Puzzle of Hybrid Star X-rays

Sat Oct 15 01:24:59 GMT 2005

|                        |  |   |   |   |                      |                           |                          |                 |   |              |
|------------------------|--|---|---|---|----------------------|---------------------------|--------------------------|-----------------|---|--------------|
| <b>Visit</b>           | <b>Proposal 10767, Visit 01</b><br><b>Diagnostic Status: No Diagnostics</b><br>Scientific Instruments: WFPC2<br>Special Requirements: ORIENT 40.0D TO 50.0 D   |   |   |   |                      |                           |                          |                 |   |              |
|                        | <b>Patterns</b>  | #   | <b>Primary Pattern</b>  |   |                      |                           | <b>Secondary Pattern</b> |                 |   |              |
| (1)                    |  | Pattern Type=WFPC2-LINE<br>Purpose=DITHER<br>Number Of Points=2<br>Point Spacing=0.354<br>Line Spacing= | Coordinate Frame=POS-TARG<br>Pattern Orientation=45<br>Angle Between Sides=<br>Center Pattern=false   |   |                      |                           |                          | (1)             |   |              |
| <b>Fixed Targets</b>   | #  | <b>Name</b>   | <b>Target Coordinates</b>   | <b>Targ. Coord. Corrections</b>   |                      | <b>Fluxes</b>             | <b>Miscellaneous</b>     |                 |   |              |
|                        | (1)  | HD150798<br>Alt Name1: ALPHA-TRA  | RA: 16 48 39.8900 (252.1662083d)<br>Dec: -69 01 39.80 (-69.02772d)<br>Equinox: J2000<br>Plate Id: (?) | Proper Motion RA: 0.014s/yr<br>Proper Motion Dec: -0.034"/yr<br>Parallax: 0.00785"<br>Epoch of Position: 2000.0<br>Radial Velocity: -3.3 km/sec | V=1.92+/-0.1         | Coordinate Source: SIMBAD |                          |                 |   |              |
| <b>Exposures</b>       | #  | <b>Label</b>  | <b>Target</b>   | <b>Config,Mode,Aperture</b>   | <b>Spectral Els.</b> | <b>Opt. Params.</b>       | <b>Special Reqs.</b>     | <b>Groups</b>   | <b>Exp. Time/[Actual Dur.]</b>  | <b>Orbit</b> |
|                        | 1  | 01  | (1) HD150798  | WFPC2, IMAGE, PC1   | F160BW               | CR-SPLIT=0.546            |                          | Pattern 1-1 (1) | 1100.0 Secs<br>[=>700.0 Secs (Pattern 1, Split 1)]<br>[=>500.0 Secs (Pattern 1, Split 2)]<br>[=>700.0 Secs (Pattern 2, Split 1)]<br>[=>500.0 Secs (Pattern 2, Split 2)] | [1]          |
| <b>Orbit Structure</b> | <p><b>Orbit 1</b> <span style="float: right;"><b>Server Version: 20050717</b></span></p> <p>The diagram illustrates the timing of observations and overheads for Orbit 1. The x-axis represents time in seconds from 0 to 5500. Key events are marked with arrows: GS Acq at 0s, Exp. 1, split 1 at approximately 400s, Overhead and Pointing Maneuver at approximately 1400s, Exp. 1, split 1 at approximately 2000s, Overhead and Exp. 1, split 2 at approximately 3000s, and Occultation at approximately 3500s. A blue checkered bar indicates the observation period from approximately 400s to 3500s. The period from 3600s to 5500s is labeled as 'Unused Visibility = 67'.</p> |   |   |   |                      |                           |                          |                 |   |              |

Proposal 10767 - Visit 02 - Further Resolving the Puzzle of Hybrid Star X-rays

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|                        |  |                         |                                  |                             |                                 |                                      |                          |                           |   |              |
|------------------------|--|-------------------------|----------------------------------|-----------------------------|---------------------------------|--------------------------------------|--------------------------|---------------------------|---|--------------|
| <b>Visit</b>           | <b>Proposal 10767, Visit 02</b><br><b>Diagnostic Status: No Diagnostics</b><br>Scientific Instruments: WFPC2<br>Special Requirements: ORIENT 95.0D TO 105.0 D  |                         |                                  |                             |                                 |                                      |                          |                           |   |              |
|                        | <b>Patterns</b>  | #                       | <b>Primary Pattern</b>           |                             |                                 |                                      | <b>Secondary Pattern</b> |                           |   |              |
| (1)                    |  | Pattern Type=WFPC2-LINE |                                  | Coordinate Frame=POS-TARG   |                                 |                                      |                          |                           |   | (1)          |
| <b>Fixed Targets</b>   | #  | <b>Name</b>             | <b>Target Coordinates</b>        |                             | <b>Targ. Coord. Corrections</b> |                                      | <b>Fluxes</b>            | <b>Miscellaneous</b>      |   |              |
|                        | (1)  | HD150798                | RA: 16 48 39.8900 (252.1662083d) |                             | Proper Motion RA: 0.014s/yr     |                                      | V=1.92+/-0.1             | Coordinate Source: SIMBAD |   |              |
| <b>Exposures</b>       | #  | <b>Label</b>            | <b>Target</b>                    | <b>Config,Mode,Aperture</b> | <b>Spectral Els.</b>            | <b>Opt. Params.</b>                  | <b>Special Reqs.</b>     | <b>Groups</b>             | <b>Exp. Time/[Actual Dur.]</b>  | <b>Orbit</b> |
|                        | 1  | 01                      | (1) HD150798                     | WFPC2, IMAGE, PC1           | F160BW                          | CR-SPLIT=0.546;<br>CR-TOLERANCE=0.10 |                          | Pattern 1-1 (1)           | 1100.0 Secs<br>[=>700.0 Secs (Pattern 1, Split 1)]<br>[=>500.0 Secs (Pattern 1, Split 2)]<br>[=>700.0 Secs (Pattern 2, Split 1)]<br>[=>500.0 Secs (Pattern 2, Split 2)] | [1]          |
| <b>Orbit Structure</b> | <p><b>Orbit 1</b> <span style="float: right;"><b>Server Version: 20050717</b></span></p> <p>The diagram illustrates the timing of observations for Orbit 1. The x-axis represents time in seconds from 0 to 5500. Key events are marked with arrows: GS Acq at 0s, Exp. 1, split 1 at approximately 400s, Overhead and Pointing Maneuver at approximately 1800s, Exp. 1, split 1 at approximately 2100s, Exp. 1, split 2 at approximately 3000s, Overhead and Occultation at approximately 3600s, and Exp. 1, split 2 at approximately 3100s. A blue checkered bar indicates the observation period from approximately 400s to 3600s. Unused visibility is 67 seconds.</p> |                         |                                  |                             |                                 |                                      |                          |                           |   |              |
|                        |  |                         |                                  |                             |                                 |                                      |                          |                           |   |              |

Proposal 10767 - Visit 03 - Further Resolving the Puzzle of Hybrid Star X-rays

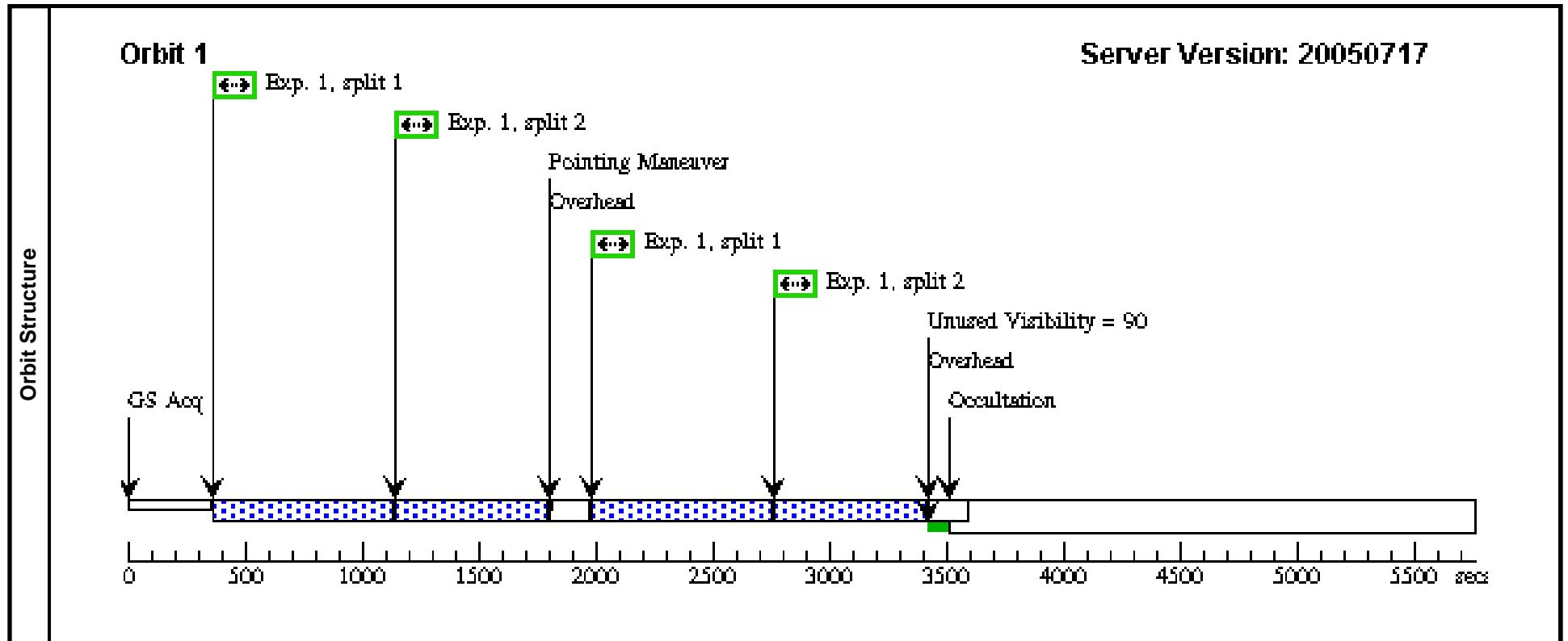
Sat Oct 15 01:25:00 GMT 2005

|                        |  |   |   |   |                      |                     |                           |                 |   |              |
|------------------------|--|---|---|---|----------------------|---------------------|---------------------------|-----------------|---|--------------|
| <b>Visit</b>           | <b>Proposal 10767, Visit 03</b><br><b>Diagnostic Status: No Diagnostics</b><br>Scientific Instruments: WFPC2<br>Special Requirements: ORIENT 340.0D TO 350.0 D |   |   |   |                      |                     |                           |                 |   |              |
|                        | <b>Patterns</b>  | #   | <b>Primary Pattern</b>  |   |                      |                     | <b>Secondary Pattern</b>  |                 |   |              |
| (1)                    |  | Pattern Type=WFPC2-LINE<br>Purpose=DITHER<br>Number Of Points=2<br>Point Spacing=0.354<br>Line Spacing= | Coordinate Frame=POS-TARG<br>Pattern Orientation=45<br>Angle Between Sides=<br>Center Pattern=false   |   |                      |                     |                           | (1)             |   |              |
| <b>Fixed Targets</b>   | #  | <b>Name</b>   | <b>Target Coordinates</b>   | <b>Targ. Coord. Corrections</b>   |                      | <b>Fluxes</b>       | <b>Miscellaneous</b>      |                 |   |              |
|                        | (1)  | HD150798<br>Alt Name1: ALPHA-TRA  | RA: 16 48 39.8900 (252.1662083d)<br>Dec: -69 01 39.80 (-69.02772d)<br>Equinox: J2000<br>Plate Id: (?) | Proper Motion RA: 0.014s/yr<br>Proper Motion Dec: -0.034"/yr<br>Parallax: 0.00785"<br>Epoch of Position: 2000.0<br>Radial Velocity: -3.3 km/sec | V=1.92+/-0.1         |                     | Coordinate Source: SIMBAD |                 |   |              |
| <b>Exposures</b>       | #  | <b>Label</b>  | <b>Target</b>   | <b>Config,Mode,Aperture</b>   | <b>Spectral Els.</b> | <b>Opt. Params.</b> | <b>Special Reqs.</b>      | <b>Groups</b>   | <b>Exp. Time/[Actual Dur.]</b>  | <b>Orbit</b> |
|                        | 1  | 01  | (1) HD150798  | WFPC2, IMAGE, PC1   | F160BW               | CR-SPLIT=0.546      |                           | Pattern 1-1 (1) | 1100.0 Secs<br>[=>700.0 Secs (Pattern 1, Split 1)]<br>[=>500.0 Secs (Pattern 1, Split 2)]<br>[=>700.0 Secs (Pattern 2, Split 1)]<br>[=>500.0 Secs (Pattern 2, Split 2)] | [1]          |
| <b>Orbit Structure</b> | <p><b>Orbit 1</b> <span style="float: right;"><b>Server Version: 20050717</b></span></p>   |   |   |   |                      |                     |                           |                 |   |              |
|                        | <p>Timeline labels: GS Acq, Exp. 1, split 1, Overhead, Pointing Maneuver, Exp. 1, split 1, Exp. 1, split 2, Occultation, Unused Visibility = 67.</p>           |   |   |   |                      |                     |                           |                 |   |              |

Proposal 10767 - Visit 04 - Further Resolving the Puzzle of Hybrid Star X-rays

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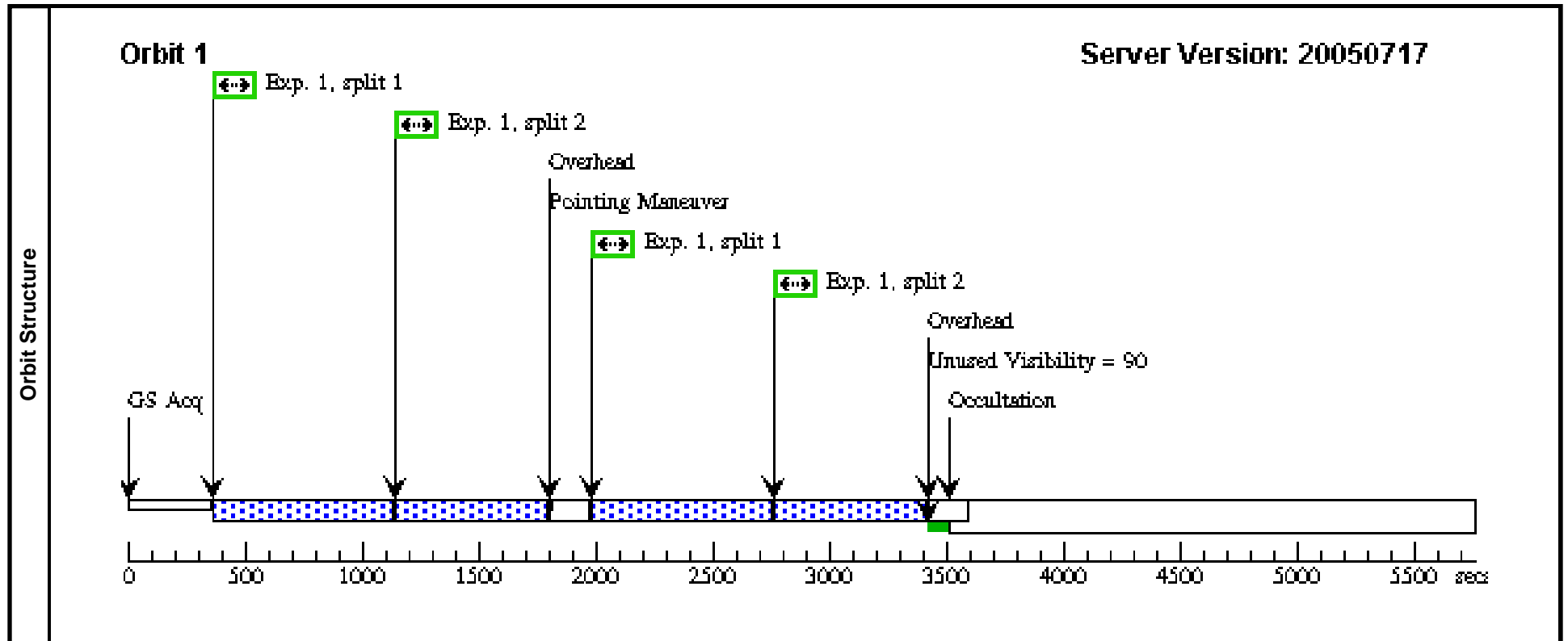
| Visit         |     | <b>Proposal 10767, Visit 04</b><br><b>Diagnostic Status: No Diagnostics</b><br>Scientific Instruments: WFPC2<br>Special Requirements: ORIENT 25.0D TO 35.0 D |   |   |                   |                           |               |                 |   |       |
|---------------|-----|--|---|---|-------------------|---------------------------|---------------|-----------------|---|-------|
| Patterns      | #   | Primary Pattern  |   |   | Secondary Pattern |                           |               | Exposures       |   |       |
|               | (1) | Pattern Type=WFPC2-LINE<br>Purpose=DITHER<br>Number Of Points=2<br>Point Spacing=0.354<br>Line Spacing=  | Coordinate Frame=POS-TARG<br>Pattern Orientation=45<br>Angle Between Sides=<br>Center Pattern=false   |   |                   |                           |               |                 | (1)   |       |
| Fixed Targets | #   | Name   | Target Coordinates  | Targ. Coord. Corrections  | Fluxes            | Miscellaneous             |               |                 |   |       |
|               | (2) | HD198700<br>Alt Name1: BETA-IND  | RA: 20 54 48.6000 (313.7025000d)<br>Dec: -58 27 15.00 (-58.45417d)<br>Equinox: J2000<br>Plate Id: (?) | Proper Motion RA: 0.017s/yr<br>Proper Motion Dec: -0.026"/yr<br>Parallax: 0.00541"<br>Epoch of Position: 2000.0<br>Radial Velocity: -4.9 km/sec | V=3.66+/-0.1      | Coordinate Source: SIMBAD |               |                 |   |       |
| Exposures     | #   | Label  | Target  | Config,Mode,Aperture  | Spectral Els.     | Opt. Params.              | Special Reqs. | Groups          | Exp. Time/[Actual Dur.]   | Orbit |
|               | 1   | 01   | (2) HD198700  | WFPC2, IMAGE, PC1   | F160BW            | CR-SPLIT=DEF              |               | Pattern 1-1 (1) | 1000.0 Secs<br><i>[==&gt;500.0 Secs (Pattern 1, Split 1)]</i><br><i>[==&gt;600.0 Secs (Pattern 1, Split 2)]</i><br><i>[==&gt;500.0 Secs (Pattern 2, Split 1)]</i><br><i>[==&gt;600.0 Secs (Pattern 2, Split 2)]</i> | [1]   |



Proposal 10767 - Visit 05 - Further Resolving the Puzzle of Hybrid Star X-rays

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|                      |  |   |   |   |                      |                     |                           |                 |   |              |
|----------------------|--|---|---|---|----------------------|---------------------|---------------------------|-----------------|---|--------------|
| <b>Visit</b>         | <b>Proposal 10767, Visit 05</b><br><b>Diagnostic Status: No Diagnostics</b><br>Scientific Instruments: WFPC2<br>Special Requirements: ORIENT 260.0D TO 270.0 D |   |   |   |                      |                     |                           |                 |   |              |
|                      | <b>Patterns</b>  | <b>#</b>  | <b>Primary Pattern</b>  |   |                      |                     | <b>Secondary Pattern</b>  |                 |   |              |
| (1)                  |  | Pattern Type=WFPC2-LINE<br>Purpose=DITHER<br>Number Of Points=2<br>Point Spacing=0.354<br>Line Spacing= | Coordinate Frame=POS-TARG<br>Pattern Orientation=45<br>Angle Between Sides=<br>Center Pattern=false   |   |                      |                     |                           | (1)             |   |              |
| <b>Fixed Targets</b> | <b>#</b>   | <b>Name</b>   | <b>Target Coordinates</b>   | <b>Targ. Coord. Corrections</b>   |                      | <b>Fluxes</b>       | <b>Miscellaneous</b>      |                 |   |              |
|                      | (2)  | HD198700<br>Alt Name1: BETA-IND   | RA: 20 54 48.6000 (313.7025000d)<br>Dec: -58 27 15.00 (-58.45417d)<br>Equinox: J2000<br>Plate Id: (?) | Proper Motion RA: 0.017s/yr<br>Proper Motion Dec: -0.026"/yr<br>Parallax: 0.00541"<br>Epoch of Position: 2000.0<br>Radial Velocity: -4.9 km/sec | V=3.66+/-0.1         |                     | Coordinate Source: SIMBAD |                 |   |              |
| <b>Exposures</b>     | <b>#</b>   | <b>Label</b>  | <b>Target</b>   | <b>Config,Mode,Aperture</b>   | <b>Spectral Els.</b> | <b>Opt. Params.</b> | <b>Special Reqs.</b>      | <b>Groups</b>   | <b>Exp. Time/[Actual Dur.]</b>  | <b>Orbit</b> |
|                      | 1  | 01  | (2) HD198700  | WFPC2, IMAGE, PC1   | F160BW               | CR-SPLIT=DEF        |                           | Pattern 1-1 (1) | 1000.0 Secs<br>[==>500.0 Secs (Pattern 1, Split 1)]<br>[==>600.0 Secs (Pattern 1, Split 2)]<br>[==>500.0 Secs (Pattern 2, Split 1)]<br>[==>600.0 Secs (Pattern 2, Split 2)] | [1]          |



Proposal 10767 - Visit 06 - Further Resolving the Puzzle of Hybrid Star X-rays

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|                      |  |   |   |   |                      |                           |                          |                 |   |                  |
|----------------------|--|---|---|---|----------------------|---------------------------|--------------------------|-----------------|---|------------------|
| <b>Visit</b>         | <b>Proposal 10767, Visit 06</b><br><b>Diagnostic Status: No Diagnostics</b><br>Scientific Instruments: WFPC2<br>Special Requirements: ORIENT 315.0D TO 325.0 D |   |   |   |                      |                           |                          |                 |   |                  |
|                      | <b>Patterns</b>  | <b>#</b>  | <b>Primary Pattern</b>  |   |                      |                           | <b>Secondary Pattern</b> |                 |   | <b>Exposures</b> |
| (1)                  |  | Pattern Type=WFPC2-LINE<br>Purpose=DITHER<br>Number Of Points=2<br>Point Spacing=0.354<br>Line Spacing= | Coordinate Frame=POS-TARG<br>Pattern Orientation=45<br>Angle Between Sides=<br>Center Pattern=false   |   |                      |                           |                          |                 | (1)   |                  |
| <b>Fixed Targets</b> | <b>#</b>   | <b>Name</b>   | <b>Target Coordinates</b>   | <b>Targ. Coord. Corrections</b>   | <b>Fluxes</b>        | <b>Miscellaneous</b>      |                          |                 |   |                  |
|                      | (2)  | HD198700<br>Alt Name1: BETA-IND   | RA: 20 54 48.6000 (313.7025000d)<br>Dec: -58 27 15.00 (-58.45417d)<br>Equinox: J2000<br>Plate Id: (?) | Proper Motion RA: 0.017s/yr<br>Proper Motion Dec: -0.026"/yr<br>Parallax: 0.00541"<br>Epoch of Position: 2000.0<br>Radial Velocity: -4.9 km/sec | V=3.66+/-0.1         | Coordinate Source: SIMBAD |                          |                 |   |                  |
| <b>Exposures</b>     | <b>#</b>   | <b>Label</b>  | <b>Target</b>   | <b>Config,Mode,Aperture</b>   | <b>Spectral Els.</b> | <b>Opt. Params.</b>       | <b>Special Reqs.</b>     | <b>Groups</b>   | <b>Exp. Time/[Actual Dur.]</b>  | <b>Orbit</b>     |
|                      | 1  | 01  | (2) HD198700  | WFPC2, IMAGE, PC1   | F160BW               | CR-SPLIT=DEF              |                          | Pattern 1-1 (1) | 1000.0 Secs<br>[==>500.0 Secs (Pattern 1, Split 1)]<br>[==>600.0 Secs (Pattern 1, Split 2)]<br>[==>500.0 Secs (Pattern 2, Split 1)]<br>[==>600.0 Secs (Pattern 2, Split 2)] | [1]              |

