# 11121 - Proper Motion of the Remarkable Irradiated Jet HH399 in the Trifid Nebula

Cycle: 16, 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) M20 | WFPC2 | 2 | 17-Jan-2008 21:28:03.0 | yes |
| 02 | (1) M20 | WFPC2 | 2 | 17-Jan-2008 21:28:07.0 | yes |

4 Total Orbits Used

**ABSTRACT**

The Trifid nebula has recently been of much interest because of its identification with a large number of massive protostars, as well as young stellar objects. HH 399 is one of the most spectacular Herbig-Haro flows recognized to be irradiated by the UV flux of the massive O7.5 star in the Trifid nebula. The irradiated jet, which is propagating in a fully ionized medium, contains numerous knots along the jet and also shows evidence for a number of isolated knots running immediately outside the jet. Two different HST observations of the nebula, with different scientific goals, were carried out in 1997 and 2002, having sensitivities that differed by a factor of 10. We performed preliminary proper motion measurements of the jet

based on these observations and discovered a continuous velocity structure of the bright knots of about 230 km/sec. Here we propose four WFPC2 orbits to reobserve HH 399 in order to carry out accurate proper motion measurements over the full extent of the jet, based on observations spanning more than 10 years and having equally deep sensitivity. The proposed observations are not simply a repeat of previous measurements, as this will be the first highly accurate proper motion measurement of an irradiated jet based on two identical epochs of WFPC2 observations. The observations will improve the accuracy of proper motion measurements for HH 399 by more than a factor of five and will address important questions beyond our preliminary result. Currently measured velocity differences between the jet features are barely significant. The factor of 5 increase in accuracy will establish the evidence for deceleration along the jet and the lateral motion of the jet. In addition, these measurements will address the kinematics of individual entrained and isolated blobs of the jet as it propagates into an HII region associated with the nebula. This is the last opportunity to perform this experiment before WFPC2 is removed from HST.

**OBSERVING DESCRIPTION**

We will obtain 2-orbit exposures in each of the F656N and F673N WFPC2 filters. The intention is to duplicate, as exactly as possible, the 1997 WFPC2 observations by Hester et al (1999, BAAS, 194, 68.10). The observations in each filter will consist of a CR-SPLIT exposure, with each half of the CR-SPLIT filling (or nearly filling) one orbit. The F656N exposures will have an exposure time of 2000 secs per CR-SPLIT, giving a total of 4000 sec. The F673N exposures will have an exposure time of 2600 secs per CR-SPLIT, giving a total of 5200 sec. We will thus use a total of 4 orbits for the 4 individual exposures. These observations will be analyzed in conjunction with the 1997 observations to derive proper motion measurements of the individual parts of the HH399 jet. In order to minimize instrumental effects that could jeopardize accurate proper motion measurements, the ideal approach to the present exposures would be to use exactly the same telescope pointing and roll angle as the 1997 observations. Unfortunately the same roll angle is no longer available (due to 2-gyro mode pointing restrictions), but a roll angle 180 degrees opposite is available and would minimize complications in the analysis. Therefore an orient special requirement is being requested, in order to obtain this particular roll angle, which is available over most of March through June 2008.

## Visit

**Proposal 11121, Visit 01, implementation** Fri Jan 18 02:28:11 GMT 2008

**Diagnostic Status: No Diagnostics**

Scientific Instruments: WFPC2

Special Requirements: ORIENT 265.2D TO 265.2 D

*Comments: Requesting orient of 265.2, which is exactly 180 degrees opposite the 1997 exposures, which had an orient of 85.2.*

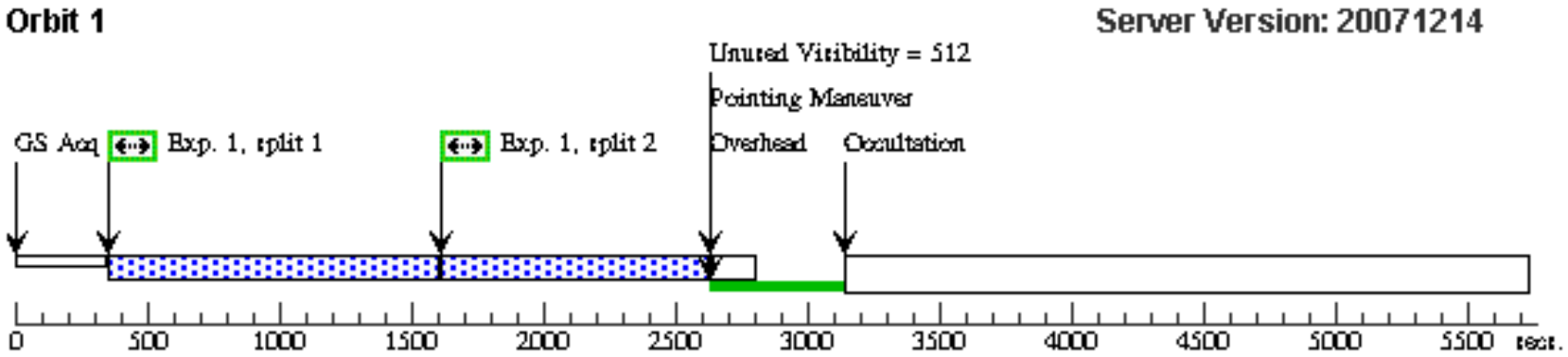
## Fixed Targets

| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (1) | M20<br>Alt Name1: HH399 | RA: 18 02 29.4300 (270.6226250d)<br>Dec: -23 04 41.92 (-23.07831d)<br>Equinox: J2000 | | V=9 | Reference Frame: ICRS |

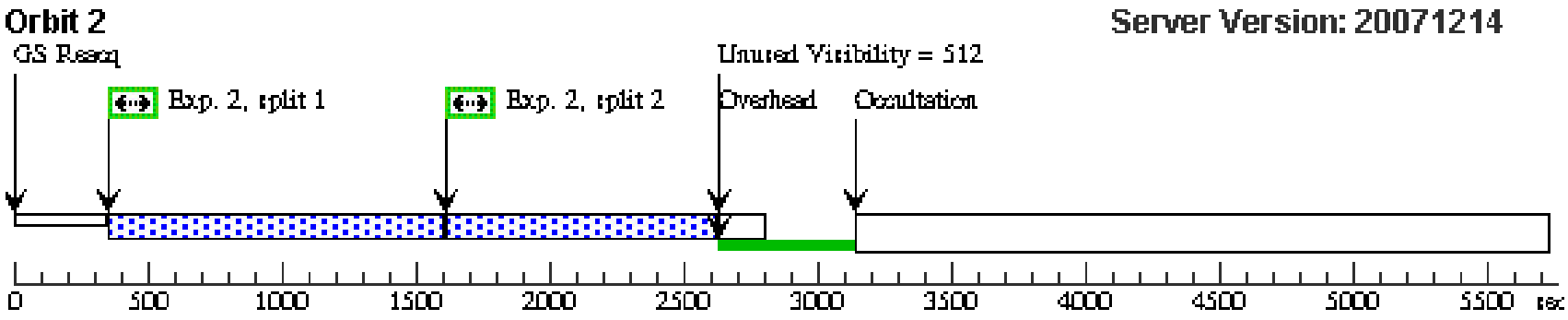
## Exposures

| # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | F656N-1 | (1) M20 | WFPC2, IMAGE, WFALL | F656N | ATD-GAIN=15;<br>CR-SPLIT=DEF | POS TARG 15.0,5.0 | | 2000.0 Secs<br>*[==>(Split 1)]*<br>*[==>(Split 2)]* | *[1]* |
| *Comments: Using same target coords as 1997 exposures. 180 degree difference in roll angle requires use of POS-TARGs to reposition region of interest to optimal center of WF2.* | | | | | | | | | |
| 2 | F656N-2 | (1) M20 | WFPC2, IMAGE, WFALL | F656N | ATD-GAIN=15;<br>CR-SPLIT=DEF | POS TARG 14.7509<br>99999999998,4.751 | | 2000.0 Secs<br>*[==>(Split 1)]*<br>*[==>(Split 2)]* | *[2]* |
| *Comments: Change POSTARG by 0.249 in x and y to get half-pixel dither relative to exposure 1.* | | | | | | | | | |

## Orbit Structure



Orbit Structure (continued)



## Visit

**Proposal 11121, Visit 02, implementation** Fri Jan 18 02:28:12 GMT 2008

**Diagnostic Status: No Diagnostics**

Scientific Instruments: WFPC2

Special Requirements: SAME ORIENT AS 01

*Comments: Must have same orient and pointing as Visit 1.*

## Fixed Targets

| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (1) | M20<br>Alt Name1: HH399 | RA: 18 02 29.4300 (270.6226250d)<br>Dec: -23 04 41.92 (-23.07831d)<br>Equinox: J2000 | | V=9 | Reference Frame: ICRS |

## Exposures

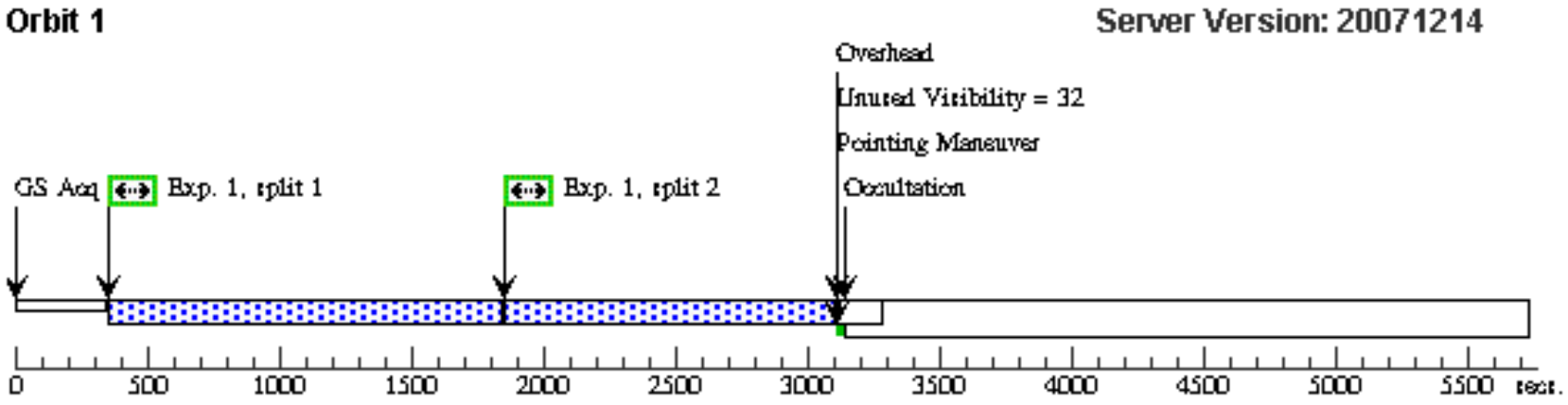
| # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | F673N-1 | (1) M20 | WFPC2, IMAGE, WFALL | F673N | ATD-GAIN=7;<br>CR-SPLIT=DEF | POS TARG 15.0,5.0 | | 2400.0 Secs<br>*[==>(Split 1)]*<br>*[==>(Split 2)]* | ***[1]*** |

*Comments: Using same target coords as 1997 exposures. 180 degree difference in roll angle requires use of POS-TARGs to reposition region of interest to optimal center of WF2.*

| # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 2 | F673N-2 | (1) M20 | WFPC2, IMAGE, WFALL | F673N | ATD-GAIN=7;<br>CR-SPLIT=DEF | POS TARG 14.7509<br>99999999998,4.751 | | 2400.0 Secs<br>*[==>(Split 1)]*<br>*[==>(Split 2)]* | ***[2]*** |

*Comments: Change POSTARG by 0.249 in x and y to get half-pixel dither relative to exposure 1.*

## Orbit Structure



Orbit Structure (continued)