# 11344 - Velocity Gradients in the Jets of BL Lac Objects

Cycle: 16, Proposal Category: GO

(Availability Mode: SUPPORTED)

**INVESTIGATORS**



| *Name* | *Institution* | *E-Mail* |
|---|---|---|
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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) OJ287 | WFPC2 | 2 | 17-Oct-2007 22:29:02.0 | yes |

2 Total Orbits Used

**ABSTRACT**

We propose to observe the arcsec-scale jets of 2 BL Lac objects with highly relativistic jets (bulk Lorentz factor of 16) on parsec scales in order to determine whether a velocity gradient exists between the axis and edge of the jet and along the length of the jet. Models both for the morphology of jets in BL Lac objects and for the launching of the jet predict such gradients. If radio-selected BL Lac objects are end-on FR 1 sources, there should be strong X-ray emission from inverse Compton scattering of CMB photons along the highly beamed fast spine of the jet. The imaging observations with Chandra, HST, SST, and the VLA will therefore verify whether such a spine exists and on what length scale it decelerates to nonrelativistic speeds.

**OBSERVING DESCRIPTION**

We will use WFPC2/WFC with filter F606W to observe the BL Lac object OJ287 (the target accepted in Phase I) during two orbits in order to detect and measure the flux of knots in the extended jet. On VLA radio images, the jet extends 10 arcsec to the west of the nucleus, with knots at about 5 and 9 arcsec and possibly some closer. The nucleus has a magnitude of about 14 (highly variable, range of 13-15 mag.) in R-band. We expect the jet knots to have a magnitude of roughly 25, so we will need to use drizzle and Tiny Tim PSF subtraction in order to detect the knots with certainty and to either measure or place interesting upper limits on their angular sizes. Our observations will be long exposures in a boxed dither pattern. We require an orientation of the telescope so that the diffraction spikes are not along the jet, which lies at a position angle of 270D relative to the nucleus.

## Visit

**Proposal 11344, Visit 01, implementation** Thu Oct 18 02:29:07 GMT 2007

**Diagnostic Status: No Diagnostics**

Scientific Instruments: WFPC2

Special Requirements: ORIENT 120.0D TO 150.0 D; ORIENT 300.0D TO 330.0 D

## Patterns

| # | Primary Pattern | | Secondary Pattern | Exposures |
|---|---|---|---|---|
| (1) | Pattern Type=WFPC2-BOX | Coordinate Frame=POS-TARG | | (1) |
| | Purpose=DITHER | Pattern Orientation=26.57 | | |
| | Number Of Points=4 | Angle Between Sides=143.13 | | |
| | Point Spacing=0.559 | Center Pattern=false | | |
| | Line Spacing=0.559 | | | |

## Fixed Targets

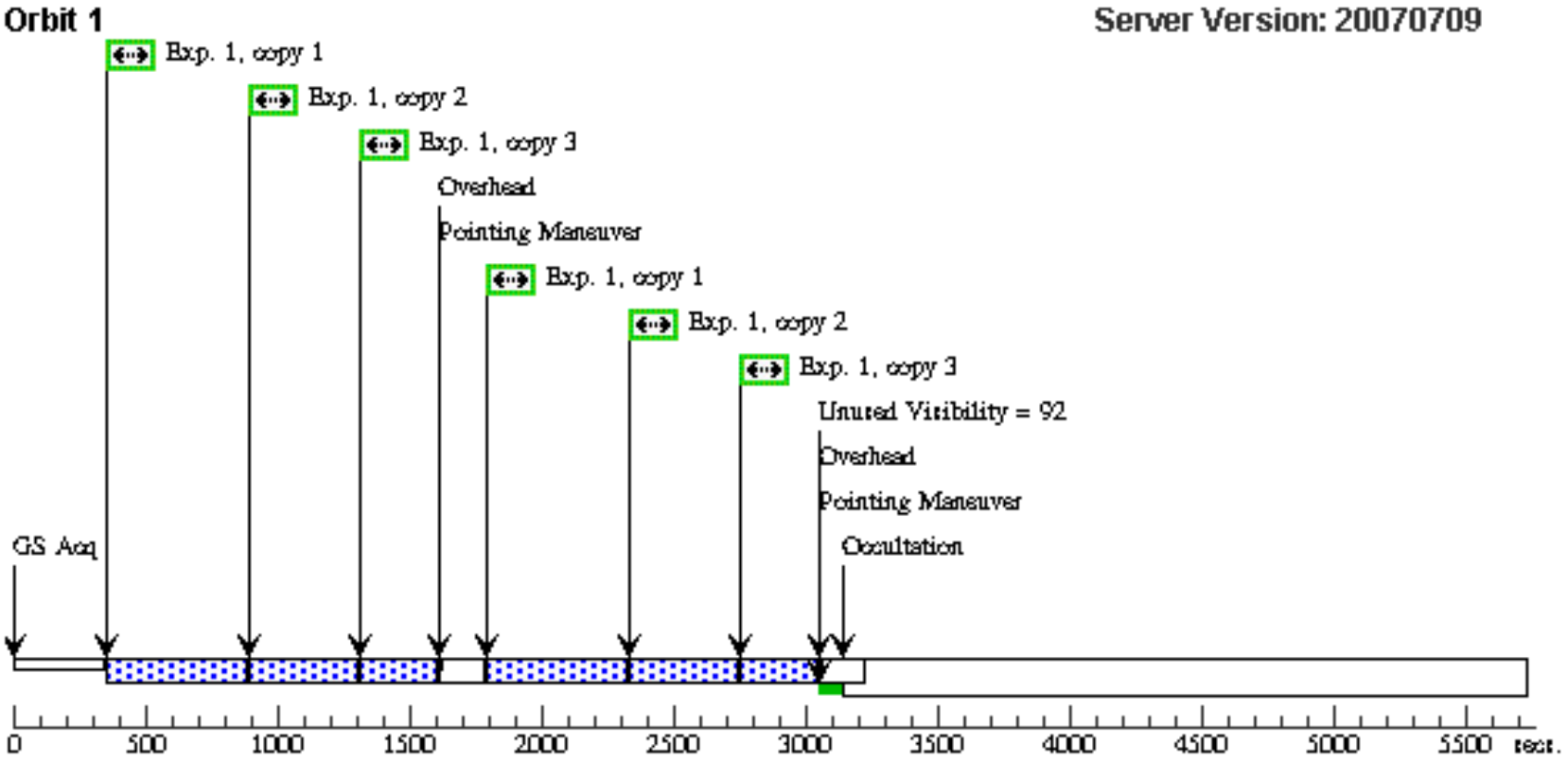
| # | Name | Target Coordinates | Targ. Coord. Corrections | Fluxes | Miscellaneous |
|---|---|---|---|---|---|
| (1) | OJ287 | RA: 08 54 48.9000 (133.7037500d) | Redshift: 0.306 | V=14.5+/-1.0 | Reference Frame: NED |
| | Alt Name1: 0851+202 | Dec: +20 06 30.60 (20.10850d) | | R-band: 14.0+/-1 | |
| | | Equinox: J2000 | | | |

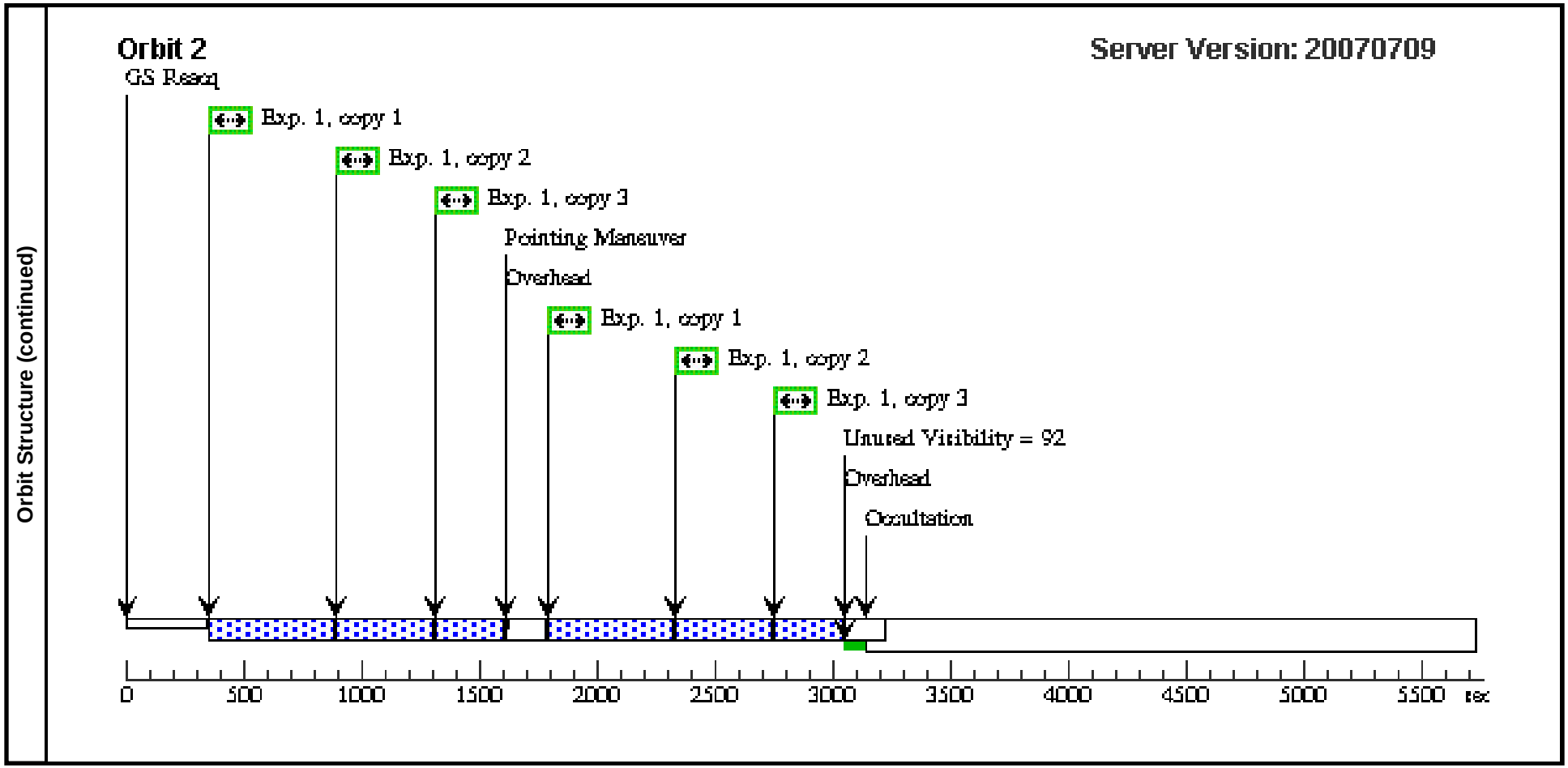
*Comments: This object was generated by the targetselector and retrieved from the NED database. The dec given by NED was adjusted slightly to be accurate to within 0.1 arcsec. The main object is highly variable in flux.*

## Exposures

| # | Label | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | (1) OJ287 | WFPC2, IMAGE, PC1 | F606W | CR-SPLIT=NO | | Pattern 1-1 (1) | 230.0 Secs X 3 | |
| | | | | | | | | *[==>(Pattern 1, Copy 1)]* | ***[1]*** |
| | | | | | | | | *[==>(Pattern 1, Copy 2)]* | |
| | | | | | | | | *[==>(Pattern 1, Copy 3)]* | |
| | | | | | | | | *[==>(Pattern 2, Copy 1)]* | |
| | | | | | | | | *[==>(Pattern 2, Copy 2)]* | |
| | | | | | | | | *[==>(Pattern 2, Copy 3)]* | |
| | | | | | | | | *[==>(Pattern 3, Copy 1)]* | ***[2]*** |
| | | | | | | | | *[==>(Pattern 3, Copy 2)]* | |
| | | | | | | | | *[==>(Pattern 3, Copy 3)]* | |
| | | | | | | | | *[==>(Pattern 4, Copy 1)]* | |
| | | | | | | | | *[==>(Pattern 4, Copy 2)]* | |
| | | | | | | | | *[==>(Pattern 4, Copy 3)]* | |

Orbit Structure




Orbit Structure (continued)
Orbit 2
Server Version: 20070709
GS Reacq
Exp. 1, copy 1
Exp. 1, copy 2
Exp. 1, copy 3
Pointing Maneuver
Overhead
Exp. 1, copy 1
Exp. 1, copy 2
Exp. 1, copy 3
Unused Visibility = 92
Overhead
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec