



# Observing Application

Date : Jul, 02 2010  
 Proposal ID : VLBA/10B-145  
 Legacy ID : BR159  
 PI : Anthony Rushton  
 Type : Rapid Response - Target of Opportunity  
 Category : Galactic  
 Total Time : 48.0

## High-resolution observations of Cygnus X-1 during a state transition

### Abstract:

We propose multiple high-resolution observations of the Galactic black hole candidate Cygnus X-1, to test fundamental jet parameters that can only be studied using VLBI. Using models developed with other black hole X-ray binaries, we believe it is possible to study the evolution of a compact AU-scale jet into discrete plasmons during a hard-to-soft X-ray spectral state change. A new state transition has recently begun for the first time in about five years (four VLBA were approved in June 2009, but after the first epoch we decided to cancel observations as the flare was a 'failed' state transition; however, the July 2010 flare is much softer and the source has now completely entered the soft state). We therefore request four further 6-cm VLBA observations to be schedule between 3--15 July 2010 in-order to: test if Cygnus X-1 forms plasmons and counter knots at VLBI resolution, measure the velocity of the plasmons, infer the power of the jet and hence test if a low spinning black hole produces less powerful jets. We have also requested e-VLBI observations from the EVN that may help improve the scheduling.

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### Related proposals:

### Joint:

Not a Joint Proposal

## Observing type(s):

Continuum, Phase Referencing

## VLBA Resources

Name	Wavelength	Processor	Stations	Observing Parameters	Correlation Parameters
VLBA	3.6/13 cm	Socorro-DiFX	VLBA <input checked="" type="checkbox"/> Br <input checked="" type="checkbox"/> Fd <input checked="" type="checkbox"/> Hn <input checked="" type="checkbox"/> Kp <input checked="" type="checkbox"/> La <input checked="" type="checkbox"/> Mk <input checked="" type="checkbox"/> Kp <input checked="" type="checkbox"/> Ov <input checked="" type="checkbox"/> Pt <input checked="" type="checkbox"/> Sc <input checked="" type="checkbox"/> HSA Ar Ef GBT VLA-Y27 VLA-Y1 Geodetic	Bandwidth: 8 MHz Baseband 8 Channels Sample Rate 16 (Msample/s) Bits/Sample 2 Polarization RCP & Agg. Bit Rate 256 (Mbits/sec)	Full Polarization <input checked="" type="checkbox"/> Pulsar Gate Correlator Passes 1 Integration Period (sec) 2.0 Spectral Points /BBC 8 No of Fields 0

## Sources:

Name	Position		Velocity		Group
CygX-1	Coordinate System	Equatorial	Convention	Radio	CygX-1 and cal.
	Equinox	J2000			
	Right Ascension	19:58:21.7 00:00:00.0	Ref. Frame	LSRK	
	Declination	+35:12:05 00:00:00	Velocity	0.00	
J1953+3537	Coordinate System	Equatorial	Convention	Radio	CygX-1 and cal.
	Equinox	J2000			
	Right Ascension	19:53:19.63 00:00:00.0	Ref. Frame	LSRK	
	Declination	+35:31:31 00:00:00	Velocity	0.00	

## Sessions:

Name	Session Time (hours)	Repeat	Separation	GST minimum	GST maximum	Elevation Minimum
VLBA	12.00	4	2 day	00:00:00	24:00:00	0

## Session Constraints:

Name	Constraints	Comments
VLBA	To be scheduled between 3-15 July 2010	

## Session Source/Resource Pairs:

Session Name	Source	Resource	Time	Figure of Merit
VLBA	CygX-1 J1953+3537	VLBA	12.0 hour	0.035 mJy/bm

Staff support: None

Plan of Dissertation: no