Observing Application

Date :	May, 11 2009
Proposal ID :	VLBA/09A-132
Legacy ID :	BB273
PI :	Michael Bietenholz
Type :	Rapid Response - Target of Opportunity
Category :	Extragalactic
Total Time :	10.0

Resolving a Hypernova Jet in SN 2009bb

Abstract:

We have just detected strong radio emission from the young Type Ic supernova, SN 2009bb. This supernova has broad optical absorption features reminiscent of gamma-ray burst supernovae/hypernova, and at 40 Mpc, is unusually close - and thus presents a unique opportunity for high-resolution studies. The properties of the radio emission indicate that the ejecta are expanding at trans-relativistic speed. This object therefore straddles the populations of ultra-relativistic GRB jets and non-relativistic spherical SN explosions. We have mounted a multi-wavelength campaign to investigate the energetics and geometry of the SN ejecta from radio through X-ray wavelengths. VLBI observations could directly resolve relativistic ejecta in this object, and indeed are the only possibility for directly determination the ejecta geometry. We request 10 hours of VLBI time with the VLBA and phased VLA, and the Australian LBA. We would like observations to be scheduled in the period May 15 to June 15. Our current projections suggest a flux density of ~3 mJy towards the end of this period.

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Related proposals:

(Proposal also submitted to Australian Long Baseline Array and University of Tasmania Hobart Station)

Joint:

Joint with VLA

Observing type(s):

Continuum

VLBA Resources

Name	Wavelength	Processor	Stations	Observing Parameters	Correlation Parameters
VLBA + Y27	3.6 cm	Socorro	VLBA ☑ Br ☐ Fd ☑ Hn ☑ Kp ☑ La ☑ Mk ☑ Kp ☑ Ov ☑ Pt ☑ Sc ☑ HSA Ar ☐ Ef ☐ GBT ☐ VLA-Y27 ☑ VLA-Y1 Geodetic	Bandwidth: 8 MHz Baseband Channels 8 Sample Rate (Msample/s) 32 Bits/Sample 2 Polarization RCP & Agg. Bit Rate (Mbits/sec) 512	Full Polarization Pulsar Gate Correlator Passes 1 Averaging Time (sec) 2.0 Spectral Points /BBC 8

Sources:

Name	RA / RA Range	Dec / Dec Range	Epoch	Velocity / z	Group
SN2009bb	10:31:33.9 00:00:00.0	-39:57:30 00:00:00	J2000	Velocity : 0.00	SN2009bb + cal
J1036-3744	10:36:53.4 00:00:00.0	-37:44:15 00:00:00	J2000	Velocity : 0.00	SN2009bb + cal

Sessions:

Name	Session Time (hours)	Repeat	Separation	GST minimum	GST maximum	Elevation Minimum
SN2009bb VLBI	10.00	1	0 day	15:00:00	01:00:00	0

Session Constraints:

Name	Constraints	Comments
SN2009bb VLBI	Session to be observed between May 15 and June 15. Scheduling to be coordinated with Australian LBA scheduling.	Y27 only needed GST 15 to 20.

Session Source/Resource Pairs:

Session Name	Source	Resource	Time	Figure of Merit
SN2009bb VLBI	SN2009bb J1036-3744	VLBA + Y27	10.0 hour	0.03 mJy/bm

Staff support: None Plan of Dissertation: no