

Spatially Resolved Molecular Absorption Lines on a Nuclear Jet of NGC 1052

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Molecular Absorption Lines in AGN	The target source NGC 1052		
It is generally accepted that pronounced activity of an AGN is driven by the accretion of gas from its			
circumnuclear torus onto a SMBH.	Its AGN is classified as LINER.		
The size of the torus is smaller than 10 pc, and a milliarcsecond (mas) resolution is required to study	 Several atomic and molecular lines detected. H2O megamaser, as an emission. 		
its internal structure in nearby AGNs.	 HI, OH, HCO+, HCN, CO, as absorptions. Spans 15001800 km/s, redshifted from Vsys. 		
VLBI observations have revealed the pc- or subpc- scale morphology of nearby AGN.	A symmetric two-sided radio jet along E-W direction.		
♀ VLBI maps can display thermal absorption lines of	 A pc-scale circumnuclear torus. Cold dense plasma H2O megamaser 		
the gas in silhouette against a bright background synchrotron radiation source with mas resolution.			
Observations & data reduction	Simultaneous dual-frequency observation		
Target source NGC 1052			

☑ IF#2: 22	GHz for the	reference	frequency	v band.
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- To track a rapid phase time variation at 88 GHz, the frequency phase transfer method were used.
- Calibration, data flagging, fringe fitting and imaging were performed using the NRAO AIPS software.

Results & Discussions

HCN J=1-0

KJCC

Korean VLBI Network (KVN)

5 March 2015 (7.5 hr)

Target transition

Observation Date

Array

Correlator



- Two velocity features of HCN(1-0) absorption at 1656 (I) and 1719 (II) km/s.
 Redshifted by 149 and 212 km/s with respect to Vsys.
 - Agrees well with the profile from the PdBI data.
- Spatially resolved HCN absorption features on the pc-scale jet.
 High optical depth localized on the western receding jet side.
 - \bigcirc The size of the foreground absorbing gas is on approximately 1-pc scales.
- HCN absorbing gas could be associated with the torus, like the dense plasma.
 Should lie in the cooler molecular layer next to XDR (~400K).
 - The redshifted velocity is indicative of ongoing gas infall to the SMBH.
 - More likely to be several small clumps, because the absorption spectrum consists of at least two narrow absorption features.

Possible model for the geometry of the torus

XDR

Plasma

reaion





Column density of HCN 1-0 absorption

Label	V_p	Vp-V _{sys}	$\Delta \mathbf{v}$	N _{HCN} (T=100K)	N _{HCN} (T=230K)
	[km/s]	[km/s]	[km/s]	[10 ¹⁴ cm ⁻²]	[10 ¹⁴ cm ⁻²]
Ι	1656	149	31.7	9.5	50
II	1719	212	52.9	20	101