Molecular Gas in 3C 293: The First Detection of CO Emission and Absorption in an FR II Radio Galaxy

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abstract

The first detection of CO emission in a Fanaroff-Riley Class II (i.e., edge-brightened radio morphology) radio galaxy is presented. Multiwavelength (0.36-2.17 µm) imaging of 3C 293 shows it to be a disk galaxy with an optical jet or tidal tail extending towards what appears to be a companion galaxy 28 kpc away via a low surface brightness envelope. The molecular gas appears to be distributed in an asymmetric disk rotating around an unresolved continuum source, which is presumably emission from the AGN. A narrow (∆v_{abs} ~ 60 km s^{-1}) absorption feature is also observed in the CO spectrum and is coincident with the continuum source. Using the standard CO conversion factor, the molecular gas (H$_2$) mass is calculated to be $1.5 \times 10^{10}$ M$_\odot$, several times the molecular gas mass of the Milky Way. The high concentration of molecular gas within the central 3 kpc of 3C 293, combined with the multiwavelength morphological peculiarities, support the idea that the radio activity has been triggered by a gas-rich galaxy-galaxy interaction or merger event.