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Relativistic Speeds and Transverse Velocity Structure on 50 kpc Scales in NGC6251

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We present new, deep, high-resolution images of the iconic jets in the nearby radio galaxy NGC 6251 made with the Karl G. Jansky VLA, resolving the faint counter-jet in width for the first time. We model the jet velocity field using the method of Laing & Bridle (2002, 2014). We assume that the jets are intrinsically symmetrical, axisymmetric, stationary flows and fit to images of linear polarization as well as total intensity. We show that the jets have transverse velocity structure, with a high Lorentz factor spine surrounded by a mildly relativistic shear layer. The jets in NGC6251, unlike those we have studied previously, maintain high speeds out to at least 50 kpc from the nucleus rather than decelerating rapidly. The dominant magnetic field component in the jet is longitudinal close to the nucleus and toroidal at large distances.

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