The Kinematics of the Extensive Bipolar Lobes and Symmetric Knots of the Planetary Nebula KjPn 8 (PK 112-001)

J. A. López[1], J. Meaburn[2], M. Bryce[2] and L. F. Rodríguez[3]

[1]Instituto de Astronomía, UNAM, Ensenada, México;

[2]Dept. of Physics & Astronomy, University of Mancheste, U.K.;

[3]Instituto de Astronomía, UNAM, D.F., México

Spatially resolved profiles of the Hα, and [NII] lines have been obtained with the Manchester echelle spectrometer combined with the 2.1 m San Pedro Mártir telescope over the bipolar lobes, the symmetric low ionization knots and the bright core of the planetary nebula KjPn 8. The lobes of this galactic bipolar nebula have the largest angular extent, $14' \times 4'$, yet discovered.

A wedge-shaped outflow from the core in a NW direction has a receding radial velocity of 200 kms^{-1} with respect to the systemic velocity ($V_{HEL} = -44$ kms^{-1}). An approaching counterflow, towards the SE has a radial velocity difference of 206 kms^{-1}.

Individual knots, in one of the pairs of symmetric groups, have similarly symmetric radial velocities of ± 220 kms^{-1} with respect to the systemic radial velocity. Remarkably, these extreme radial velocities for each knot are continuous down to the systemic radial velocity.

The diffuse, but limb-brightened, bipolar lobes emit split [N II] 6584 Å profiles at ± 40 kms^{-1} with respect to the systemic radial velocity over large angular extents. There is some evidence that these split components converge on to the systemic radial velocity at these bright rims. It is concluded that the extensive lobes are three dimensional structures and most likely represent the earliest outflows from the nebular core.

VLA observations at 3.5 cm, with an angular resolution of $0.9''$ show that the $4''$ diameter core of KjPn 8 has a clumpy structure. The two most prominant knots observed in the radio continuum could be aligned with the fastest ejecta observed at the larger scale and may represent material ejected in the last few decades.

Various possibilities for the generation of these observed kinematical features are explored. In particular, the action of bipolar, episodic jets is considered for the creation of the high velocity, symmetric groups of collisionally ionized knots.

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