Kinematical Diagrams for Conical Relativistic Jets

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We present diagrams depicting the expected inter-dependences of two key kinematical parameters of radio knots in the parsec-scale jets of blazars, deduced from VLBI observations. The two parameters are the apparent speed (vapp = cβapp) and the effective Doppler boosting factor (δeff) of the relativistically moving radio knot. A novel aspect of these analytical computations of β–δ diagrams is that they are made for parsecscale jets having a conical shape, with modest opening angles (ω up to 10◦),in accord with the VLBI observations of the nuclei of the nearest radio galaxies. Another motivating factor is the recent finding that consideration of a conical geometry can have important implications for the interpretation of a variety of radio observations of blazar jets. In addition to uniform jet flows (i.e., those having a uniform bulk Lorentz factor,), computational results are also presented for stratified jets where an ultra-relativistic central spine along the jet axis is surrounded by a slower moving sheath, possibly arising from a velocity shear.

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