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Fourier-Plane Modeling of the Jet in the Nucleus of the Galaxy M81

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The mildly active nuclear region in the galaxy M81 (henceforth, M81*) is one of the nearest low-luminosity active galactic nuclei (LLAGN) whose structure is marginally resolved when probed with Very Long Baseline Interferometry (VLBI). Motivated by the way resolved radio sources usually appear on the smallest scales, i.e., a core with a one-sided jet structure, we developed a strictly one-sided, asymmetric triangular model, which we call ASYM, with brightness distribution along a line segment on the sky, with maximum brightness at one end of the segment fading linearly to zero at the other end. The ASYM model is compared and contrasted with an elliptical Gaussian model (hereafter, GAUS), by fitting existing VLBI data of M81* at 39 epochs between 1993 and 2003 at 8.4 and 5.0 GHz with the two models. Contrary to what we envisioned, we find that for 77% of our epochs, a simple GAUS model fits the visibility data of M81* at 8.4 GHz better (i.e., has a lower reduced $\chi 2$) than the ASYM model. We conclude that M81* is not strictly a one-sided, asymmetric jetted source; as is thought to be the case for the majority of AGN observed at VLBI scales. Our results imply that M81* is mostly symmetrical with a significant jet counterpart which cannot be overlooked.