S27a The Jet Collimation Profile Analysis and Core Shift Measurement of M84

Elika Prameswari Fariyanto (the University of Tokyo), Kazuhiro Hada (NAOJ/SOKENDAI), Mareki Honma (NAOJ/the University of Tokyo), Yuzhu Cui (Shanghai Jiao Tong University)

How the jet in active galactic nuclei (AGN) is collimated has been a longstanding issue in astrophysics. Recent high-resolution VLBI analysis for an increasing number of AGN jet sources has greatly improved our observational understanding of jet collimation properties near the supermassive black hole. However, past jet collimation studies were exclusively based on bright and powerful jet sources. Here we focus on the nearby radio galaxy M84, a prototypical source of low-luminosity AGN (LLAGN), which allows us to examine the jet collimation property at the lower end of the jet activity. We analyzed the detailed jet morphology of M84 using the Very Long Baseline Array and archival Very Large Array data to probe the jet geometry from $\sim 10^2$ Schwarzschild radii ($r_{\rm s}$) up to $\sim 10^7$ $r_{\rm s}$. The well-fitted jet structure exhibits a transition from a semi-parabolic, $W(r) \propto r^{0.72}$, to a conical shape, $W(r) \propto r^{1.17}$, at about 10^4 $r_{\rm s}$. The distance of the collimation break is significantly shorter than those typically seen in more powerful jets, suggesting that the collimation of the low-power jet is less efficient. In addition, we measure the frequency-dependent core shift effect using phase referencing observations and discuss the jet physical properties such as the magnetic field strength.