

# Mach Stem Hysteresis: Experiments Addressing a Novel Explanation of Clumpy Astrophysical Jet Emission

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## Abstract

Recent epochal observations using the Hubble Space Telescope (Hartigan et al., 2011) reveal localized emission features which may be followed over nearly 15 years. Some of these features are believed to be dense *clumps* which emit due to a velocity dispersion with their fellows or the background. We propose that others, however, are better described as the result of intersecting bow shocks. Shock theory indicates that if the angle between two intersecting bows is above a certain value, a third shock (*Mach stem*) will form and grow. The Mach stem will form perpendicular to the direction of flow, meaning incoming particles will see a normal shock instead of an oblique one,

which could lead to brighter emission at this location. We have carried out experiments aimed at understanding the formation, growth, and destruction of such Mach stems. We present our results to date, as well as our new program to push the experiments into the radiative regime.