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# Jet Structure and Burst Environment of GRB 221009A

We conducted a comprehensive investigation of the brightest-of-all-time GRB 221009A using new insights from very high energy (VHE) observations from LHAASO and a complete multiwavelength afterglow dataset. Through data fitting, we imposed constraints on the jet structure, radiation mechanisms, and burst environment of GRB 221009A. Our findings reveal a structured jet morphology characterized by a core+wing configuration. A smooth transition of energy within the jet takes place between the core and wing, but with a discontinuity in the bulk Lorentz factor. The jet structure diers from both the case of short GRB 170817A and the results of numerical simulations for longduration bursts. The VHE emission can be explained by the forward-shock synchrotron self-Compton radiation of the core component, but requiring a distinctive transition of the burst environment from uniform to wind-like, suggesting the presence of complex pre-burst mass ejection processes. The lowenergy multiwavelength afterglow is mainly governed by the synchrotron radiation from the forward and reverse shocks of the wing component. Our analysis indicates a magnetization factor of 5 for the wing component. Additionally, by comparing the forward shock parameters of the core and wing components, we find a potential correlation between the electron acceleration efficiency and both the Lorentz factor of the shock and the magnetic field equipartition factor. We discuss the signficance of our findings, potential interpretations, and remaining issues.

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