

GRB 131014A: A Laboratory for Studying the Thermal-like and Non-thermal Emissions in Gamma-Ray Bursts

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Over the past few years, evidence has been accumulated in support of the existence of a thermal-like component during the GRB prompt phase. This component—often associated with the GRB jet’s photosphere—is usually subdominant compared to a much stronger non-thermal one. The prompt emission of GRB 131014A detected by Fermi provides a unique opportunity to trace the history of this thermal-like component. In this GRB, the thermal emission is much more intense than in other bursts and a pure thermal episode is observed at early times. The intensity of the non-thermal component progressively increases until being energetically dominant at late times, similar to what is typically observed. GRB 131014A is a case study to disentangle the thermal component from the non-thermal component. Using this analysis, we derived fundamental physical quantities describing the GRB relativistic jet such as the evolution of (i) the bulk Lorentz Factor of the outflow, (ii) the photospheric radius, (iii) the injection radius, and (iv) the injected power.

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