

Equal ejected shells from central engine: a schedule for the GRB outflow and its application to GRB 050904

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For the long duration gamma-ray bursts, they are well believed originated from collapsing of massive stars. Consequently, the envelope of the massive must be overcome by the ejected shells from the central engine. We give a schedule like this: supposing that all the shells ejected from the central engine are equally massive and equally energetic, they collide with the envelope and merge together one by one, and the gamma rays emit from these collisions. We applied this schedule to GRB 050904, and our analytical results can provide a natural explanation for the multi-band observations of this burst. It implies that the early X-ray flares and the optical emissions of the burst, as well as the gamma rays themselves, are all originated from the collisions of the ejected shells with the merged envelope of the collapsar.