Early time signatures of γ-ray emission from Supernovae in dense Circumstellar Media

D. Kantzas[1], M. Petropoulou[2], A. Mastichiadis[1]

[1]Department of Physics, University of Athens, 15783 Zografos, Greece

[2]Department of Physics and Astronomy, Purdue University, West Lafayette, IN 47907, USA

Abstract

We will present our results on the gamma emission from interaction-powered supernovae (SNe), a recently discovered type of SN suggested to be surrounded by a very dense Circumstellar Medium ($10^5 - 10^{11}\ cm^{-3}$). These high densities favor the production of gamma ray photons through neutral pion decay as well as the photon production due to relativistic bremsstrahlung. Using a numerical code that includes synchrotron radiation, adiabatic losses due to the expansion of the source, relativistic bremsstrahlung, proton-proton collisions and proton-photon interactions, i.e. photopair ($p\gamma \rightarrow pe^{\pm}$) and photopion ($p\gamma \rightarrow p\pi^0,\ p\gamma \rightarrow p\pi^{\pm}$) production, we calculate the gamma ray emission ($> 100\ MeV$) soon after shock breakout and follow its temporal evolution until 100-1000 days. We show that both pp collisions and relativistic bremsstrahlung contribute significantly to the gamma ray emission and discuss the potential of detecting such SNe with the Fermi telescope.