Our numerical simulations show that even if the emission mechanism is switching from synchrotron to SSC, the gamma-ray light curves can be a smooth power law, which agrees with the observed light curve and the late detection of a 32 GeV photon in GRB 130427A.
Numerical Method (Follow the full evolutions of $e$, $\gamma$ and shock)

**Formulation**

\[
\begin{align*}
\frac{dM}{dt} &= \frac{1}{\Gamma} \frac{dM}{dt'}, \\
\frac{dE_{\text{sh}}'}{dt'} &= \Gamma c^2 \frac{dM}{dt'} - \frac{dE_{\text{rad}}'}{dt'} - \frac{dE_{\text{ad}}'}{dt'}, \\
E_{\text{sh}} &= \Gamma E_{\text{sh}}', \\
E_{\text{sh}}' &= E_0 + MC^2 - E_{\text{rad}}', \\
\frac{dE_B'}{dt'} &= \epsilon_B (\Gamma - 1) c^2 \frac{dM}{dt'}, \\
\frac{dN_e'}{dt'} &= \frac{\eta}{m_p} \frac{dM}{dt'} = \int_{\varepsilon_{\text{min}}}^{\varepsilon_{\text{max}}} d\varepsilon' \tilde{N}_e' (\varepsilon'), \\
\frac{dE_e'}{dt'} &= \epsilon_e (\Gamma - 1) c^2 \frac{dM}{dt'} = \int_{\varepsilon_{\text{min}}}^{\varepsilon_{\text{max}}} d\varepsilon' \tilde{N}_e' (\varepsilon').
\end{align*}
\]

**Evolution of the electron spectrum**

\[
\begin{align*}
E_0 &= 10^{32} \text{ erg}, \quad \Gamma_0 = 100, \quad n_{\text{ISM}} = 1 \text{ cm}^{-3}, \\
\frac{\partial N_e(\varepsilon_e)}{\partial t} &= \frac{\partial}{\partial \varepsilon_e} [(\langle \varepsilon_e \rangle_{\text{syn}} + (\langle \varepsilon_e \rangle_{\text{IC}} + (\langle \varepsilon_e \rangle_{\text{ad}} \\
&- (\langle \varepsilon_e \rangle_{\text{SSA}}) N_e(\varepsilon_e)] + N_{e,\gamma}(\varepsilon_e) + N_{\text{imp}}(\varepsilon_e), \\
\varepsilon_{\text{obs}} &= \frac{E_0}{\Gamma (1 - \beta \cos \theta)(1 + z)}, \\
t_{\text{obs}} &= (1 + z) \left[ t - \frac{R - R_0}{c \cos \theta} + \frac{R_0}{c} (1 - \cos \theta) \right].
\end{align*}
\]
Light curves and consistency

Discrepancy factor defined as

Analytically Estimated Flux
Numerically Obtained Flux

at 1 keV at $t_{\text{obs}} = 10^4$ s assuming $z = 2$.

$E_0 = 10^{52}$ erg, $\Gamma_0 = 100$, $n_{\text{ISM}} = 1$ cm$^{-3}$, $p = 2.2$, $\epsilon_e = 0.1$, $\epsilon_B = 0.1$, and $\eta = 1$.

Roughly consistent with the conventional analytical approximation.
GRB 130427A

The simple power-law decay at 0.1 GeV is reproduced without fine tuning. SSC emission is dominant at GeV including the 32 GeV photon detected at 30,000 s.