

## Comparison of the energy spectra between pileup shock and converging shock

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We present a few possibilities for forming an extended energy spectrum and producing a varied slope in different double-shock models. In our previous work, the converging double-shock model would provide more kinetic energy injecting into the particles acceleration. The high efficient injection rate excited by amplified magnetic turbulence from the converged region make the extended energy spectrum be possible. In our present work, the pileup-shock model provide a opportunity of the re-accelerated processes of the particles on the merged shock precursor region. With the expended precursor region, more and more particles can participate into the pileup-shock system, the “ankle” slope of the energy spectrum would be produced due to the enhancement magnetic turbulence between the merged pileup-shock. We have proved that the converging double-shock model taken a negative effect on the accelerated particles and produce an energy “break” slope. And we investigate that a positive effect on particle acceleration in pileup twin-shock scenario can produce an “ankle” slope on the energy spectrum.

37<sup>th</sup> International Cosmic Ray Conference (ICRC 2021)  
July 12th – 23rd, 2021  
Online – Berlin, Germany

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