

Pitch-angle Diffusion and Bohm-type Approximations in Diffusive Shock Acceleration

Tuesday, 9 July 2019 16:45 (15 minutes)

The problem of accelerating cosmic rays is one of fundamental importance, particularly given the uncertainty in the conditions inside the acceleration sites. In this talk, I describe our work in which we examine diffusive shock acceleration in arbitrary turbulent magnetic fields, constructing a new model that is capable of bridging the gap between the very weak ($\delta B/B_0 \ll 1$) and the strong turbulence regimes. To describe the diffusion we provide a quantitative analytical description of the “Bohm exponent” in each regime.

I show that our results converge to the well known quasi-linear theory in the weak turbulence regime. In the strong regime, we quantify the limitations of the Bohm-type models. Furthermore, our results account for the anomalous diffusive behavior which has been noted previously. Finally, I will discuss the implications of our model in the study of possible acceleration sites in different astronomical objects.

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