Time asymptotic behavior for singular neutron transport equation with bounce-back boundary conditions in L^1 spaces

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Abstract: This communication is concerned with the well-posedness of a Cauchy problem governed by a singular neutron transport equation in L^1 spaces with bounce-back boundary conditions. To be more precise, we are concerned with the following equation

$$\begin{cases} \dfrac{\partial \psi}{\partial t}(x,v,t) = A_H \psi(x,v,t) := T_H \psi(x,v,t) + K\psi(x,v,t) \\ \qquad\qquad\qquad = -v\nabla_x \psi(x,v,t) - \sigma(v)\psi(x,v,t) + \displaystyle\int_{\mathbb{R}^n} \kappa(x,v,v')\psi(x,v',t)dv', \\ \psi(x,v,0) = \psi_0(x,v), \end{cases}$$

where $(x,v) \in D \times \mathbb{R}^n$ and K is the partial integral part of A_H, it is called the collision operator. Here D is a bounded open subset of $\mathbb{R}^n$. As usually in transport theory, the function $\psi(x,v,t)$ represents the number (or probability) density of gas particles having the position x and the velocity v at the time t. The functions $\sigma(\cdot)$ and $\kappa(\cdot,\cdot,\cdot)$ are called, respectively, the collision frequency and the scattering kernel. We prove the weak compactness of the second-order remainder term of the Dyson-Phillips expansion which implies that the essential types of the streaming semigroup T_H and to that of the transport semigroup A_H coincide and we derive, via classical arguments, the time asymptotic behavior of the solution.