On the relativistic Fokker-Planck operator

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We study a class of second order strongly degenerate kinetic operators $\mathscr{L}$ in the framework of special relativity. More precisely, the operator $\mathscr{L}$ we consider here is a possible suitable relativistic generalization of the kinetic Fokker-Planck operator. We first describe $\mathscr{L}$ as a Hörmander operator which is invariant with respect to Lorentz transformations. We then prove a Lorentz-invariant Harnack type inequality, and we derive accurate asymptotic lower bounds for positive solutions to $\mathscr{L}f = 0$. As a consequence, we obtain lower bounds for the density of the relativistic stochastic process associated to $\mathscr{L}$.
This is a joint work with Francesca Anceschi (Università Politecnica delle Marche) and Sergio Polidoro (Università degli Studi di Modena e Reggio Emilia).