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Orders of Fermi- and Plasma-Accelerations of Cosmic Rays

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(Submitted on 26 Oct 2010)

The generic acceleration model for ultra high energy cosmic rays, which has been introduced in {\tt 1006.5708 [astro-ph.HE]}, suggests various types of electromagnetic interactions between cosmic charged particles and the different types of the plasma fields, which are assumed to have general configurations, spatially and temporally. The well-known Fermi acceleration mechanisms are also included in the model. Meanwhile Fermi mechanisms in non-relativistic limit adhere first- and second-order of β, the ratio of particle's velocity relative to the velocity of the stellar magnetic cloud, in the plasma field sector, β does not play any role, i.e. zero-order. In the relativistic limit, the orders of Fermi acceleration are only possible, when applying the corresponding conditions, either elastic scatterings or shock waves. Furthermore, it is found that the coefficients of β are functions of the initial and final velocities and the characteristic Larmor radius.

Comments:	4 pages, 0 figure
Subjects:	**High Energy Astrophysical Phenomena (astro-ph.HE)**
Report number:	ECTP-2010-08
Cite as:	**arXiv:1010.5390v1 [astro-ph.HE]**

Submission history

From: A. Tawfik [view email]
[v1] Tue, 26 Oct 2010 13:19:35 GMT (5kb)

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