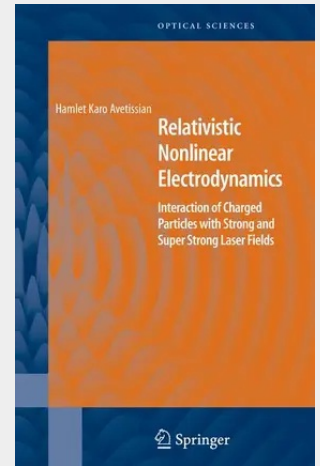


Relativistic Nonlinear Electrodynamics

Interaction of Charged Particles with Strong and Super Strong Laser Fields

This is the first book on the subject matter of relativistic nonlinear electrodynamics. The book presents new results on various nonlinear electromagnetic phenomena. The topics discussed in the book will be the center of fundamental research in the next decade.

With the appearance of lasers have come real possibilities of revealing numerous nonlinear phenomena of diverse nature resulting from the interaction of strong electromagnetic fields either with matter or with free charged particles. First attempts of investigators, especially experimentalists, were directed toward studying the processes of interaction of laser radiation with matter, which led to the rapid formation of a new field — Nonlinear Optics. The numerous published monographs on this subject are evidence of that. The situation regarding the processes of interaction of laser radiation with free charged particles (free-free transitions) is different. Whereas the experimental results on atomic systems frequently had preceded the theoretical ones, the experimental investigations on free electrons began gathering power only recently. It is enough to mention that the first experiments on the observation of multiphoton exchange between free electrons and laser radiation started in 1975 (the Cherenkov and bremsstrahlung processes) whereas, due to the progress of Nonlinear Optics, the precision laser spectroscopy of superhigh resolution on atomic systems had already been established. This situation is explained by two objective factors. Whereas the experiments on atoms require only laser devices in common laboratories, the experiments on free electron beams require accelerators of charged particles and laser laboratories, i. e., this field is a synthesis of Accelerator and Laser Physics. The second major factor is the smallness of the photon-electron interaction cross section in comparison with the photon-atom one; revealing nonlinear phenomena on free electrons thus requires laser fields of relativistic intensities (e. g., even the observation of the second harmonic in nonlinear Compton scattering).



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