FIAS Seminar

Thursday, November 27, 2008, 14:30
FIAS, Ruth-Moufang-Str. 1, 60438 Frankfurt am Main
Lecture Hall 0.100

Speaker: Prof. Dr. Andrey V. Solov’yov, FIAS

Title: A multi-scale approach to the physics of ion beam cancer therapy

Abstract: For more than ten years, ion-beam cancer therapy has been successfully used clinically in Germany and Japan. Proton-beam therapy is performed in many more centres around the globe. Thousands of patients per year are being treated. These therapies appear to be a more favourable alternative to the conventional photon therapy, also known as radiotherapy. Despite apparent experimental and clinical successes, a comprehensive theoretical description of a physical scenario is missing. One reason is that the phenomena initiated by an energetic ion incident on tissue happen on a variety scales in time, distance, and energy.

Many thorough papers have been devoted to Monte Carlo simulations of different fragments of the scenario, but they cannot include all scales together because, e.g., time scales for physical processes vary from $10^{-22}$ s to 1 s. In addition, they do not present the scenario as a hierarchy of phenomena, which is very attractive physically. Thus, the important goal here is to understand the physics of beam therapy on a microscopic level.

I will present a multi-scale approach to the scenario of irradiation with ions, being an alternative to the Monte Carlo method. This approach has been recently developed at FIAS and it can be used as a natural platform for joining further efforts of several expert groups at FIAS to tackle the complex problem.