Fr-3.
Extreme state of matter physics at FAIR

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The Facility for Antiproton and Ion Research in Europe, FAIR, will provide worldwide unique accelerator and experimental facilities allowing for a large variety of unprecedented fore-front research in extreme state of matter physics and applied science. Indeed, it is the largest basic research project on the roadmap of the European Strategy Forum of Research Infrastructures (ESFRI), and it is cornerstone of the European Research Area.
FAIR offers to scientists from the whole world an abundance of outstanding research opportunities, broader in scope than any other contemporary large-scale facility worldwide. More than 2500 scientists are involved in setting up and exploiting the FAIR facility. They will push the frontiers of our knowledge in hadron, nuclear, atomic and applied physics far ahead, with important implications also for other fields in science such as cosmology, astro and particle physics, and technology. It includes 14 initial experiments, which form the four scientific pillars of FAIR.
The main thrust of intense heavy ion and laser beam-matter interaction research focuses on the structure and evolution of matter on both a microscopic and on a cosmic scale.
This presentation outlines the current status of the Facility for Antiproton and Ion Research. It is expected that the actual construction of the facility will commence in 2010 as the project has raised more than one billion euro in funding. The sequence and scope of the construction will be described. Also the physics program of FAIR, based on the acquired funding, will be presented

Reference: www.gsi.de/fair/

Fr-4.
Ion beam heating for fast ignition

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The characteristics features of the formation of the spatial distribution of the energy transferred to the plasma from a beam of ions with different initial energies, masses and charges under fast ignition conditions [1,2] are determined. The notion of the Bragg peak is extended with respect to the spatial distribution of the temperature of the ion-beam-heated medium. The parameters of the ion beams are determined to initiate different regimes of fast ignition of thermonuclear fuel precompressed to a density of 300-500 g/cm^3 – the edge regime, in which the ignition region is formed at the outer boundary of the fuel, and the internal regime, in which the ignition region is formed in central parts of the fuel. The conclusion on the requirements for fast ignition by light [3,4] and heavy [1,5] ion beams is presented. It is shown that the edge heating with negative temperature gradient is described by a self-similar solution. Such a temperature distribution is the reason of the fact that the ignited beam energy at the edge heating is larger than the minimal ignition energy by factor 1.65. The temperature Bragg peak may be produced by ion beam heating in the reactor scale targets with ρR-parameter larger than 3-4 g/cm^2. In particular, for central ignition of the targets with ρR-parameter in the range of 4-8 g/cm^2 the ion beam energy should be, respectively, from 5 to 7 times larger than the minimal ignition energy.

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