Advanced Research Center for Beam Science
- Particle Beam Science -

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Students

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Visitors

Prof HOFMANN, Ingo
GSI, Germany, 2 March 2005
Prof HANGST, Jeffrey
University of Aarhus, Denmark, 17 March 2005
Dr COUPRIE, Marie-Emmanuelle
LURE, France, 24 October 2005
Prof SHEVELKO, V.P.
Lebedev Physical Institute, Russia, 26 October 2005
Prof SYRESIN, Evgeny
JINR, Russia, 16 November - 1 December 2005
Dr SELEZNEV, Igor
JINR, Russia, 21 November - 8 December 2005

Scope of Research

Particle and photon beams generated with accelerators and their instrumentations both for fundamental research and practical applications are studied. The following subjects are being studied: Beam dynamics related to space charge force in accelerators; Beam handling during the injection and extraction processes of the accelerator ring; Radiation mechanism of photons by electrons in the magnetic field; R&D to realize a compact synchrotron dedicated for cancer therapy; and Irradiation of materials with particle and photon beams.

Research Activities (Year 2005)

Presentations


Beam Simulations in S-shaped Curved Solenoids, Iwashita Y, 7th International Workshop on Neutrino Factories and Superbeams, Italy, 22 June 2005.


**Beam Commissioning and First Electron Beam Cooling at S-LSR**

The ion storage and cooler ring, S-LSR have been constructed at Institute for Chemical Research (see Figure 1). The beam commissioning was started from the beginning of October, 2005. The linac injected the 7 MeV proton beam into the new ring. We observed the first beam accumulation at 10th October. The number of the accumulated proton was $3 \times 10^7$ particles. Now it is improved up to $10^9$ particles.

The aim of S-LSR is technical developments of the compact ion accelerator for the cancer therapy using the electron beam cooling. The commissioning of the electron beam cooler was started from 31st October. Figure 2 shows the results of the first cooling experiments. We succeeded in reducing the horizontal beam size from 40mm to 1mm and the momentum spread from 0.4% to 0.02% without any beam losses. As a result, the beam density in the phase space is increased about $10^6$ times higher.

**Phase Rotation of the Laser Produced Ions**

Recently there are many reports of the high energy ion production by high intensity, ultra short pulse lasers. The energy spread of the laser produced ions is very wide from 0 to 100% without the energy peak. This situation can be greatly improved using the phase rotation scheme by the RF field synchronized with the laser pulse.

The phase rotation experiment was carried out at JAEA-KANSAI. Figure 3 shows the RF cavity for the phase rotation. The laser pulse up to 4 TW, 70 fsec was focused on the Ti foil with the thickness of 3 µm. The laser field is about $10^{18}$ W/cm$^2$ on the target. Figure 4 shows the energy spectrum of the laser produced ions. There is no energy peak without the phase rotation. With the phase rotation, the energy peaks appears when the ion energy matches the phase of the RF field.

**Grants**

