

## Safety Design of Radioactive Isotope Beam Facility (RIBF) at RIKEN

Yoshitomo Uwamino, Shin Fujita, Hisao Sakamoto and Nobuhisa Fukunishi

*RIKEN*

*2-1, Hirosawa, Wako, Saitama 351-0198 Japan*

*e-mail: uwamino@riken.jp*

### 1. Outline of RIBF

The RIBF is a facility-expanding project. It consists of three ring cyclotrons (fRC, IRC and SRC), the big RIKEN projectile-fragment separator (Big-RIPS) which is the RI beam production device, and the experimental facilities. SRC is the final stage cyclotron of superconducting and its maximum energy is 400 MeV/u for ions lighter than Ar and 350 MeV/u for uranium. The beam intensity is 1  $\mu\text{A}$  ( $6 \times 10^{12}$  particle/s) for any element at the goal. The beam will be started in 2006 with the intensity of a few pA.

### 2. Shielding design

Neutron production by the 400-MeV/u  $^{20}\text{Ne}$  beam was measured at HIMAC of NIRS and it was used for the source term of the shielding calculations. The deep penetration of high-energy neutrons was calculated by using the ANISN code with the DLC-119/HILO86R group constants and also by using the HETC-3STEP code. The ANISN results were fitted by a simple formula for practical use.

### 3. Radiation safety system

Three types of radiation monitors will be installed. First type consists of a neutron rem counter and an ionization chamber, which are designed for area monitors. Second is a conventional handy-type rem-counter of which logarithmic level is read by a programmable logic controller of the radiation safety interlock system (HIS). Third is a simple plastic scintillator for high radiation level, and called as a beam loss monitor. All the monitors have threshold levels for the beam stop, and HIS will take their stop signals.