Particle and Heavy Ion Transport Code System; PHITS

Koji Niita

RIST (Research Organization for Information Science & Technology) Tokai-mura, Naka-gun, Ibaraki-ken 319-1106, Japan

Intermediate and high energy nuclear data are strongly required in design study of many facilities such as accelerator-driven systems, intense pulse spallation neutron sources, and also in medical and space technology. There is, however, few evaluated nuclear data of intermediate and high energy nuclear reactions. Therefore, we have to use some models or systematics for the cross sections, which are essential ingredients of high energy particle and heavy ion transport code to estimate neutron yield, heat deposition and many other quantities of the transport phenomena in materials

We have developed general purpose particle and heavy ion transport Monte Carlo code system, PHITS (Particle and Heavy Ion Transport code System) [1], based on the NMTC/JAM code [2] by the collaboration of Tohoku University, JAERI and RIST. The PHITS has three important ingredients which enable us to calculate (1) high energy nuclear reactions up to 200 GeV, (2) heavy ion collision and its transport in material, (3) low energy neutron transport based on the evaluated nuclear data.

In the PHITS, the cross sections of high energy nuclear reactions are obtained by JAM model [3]. JAM (Jet AA Microscopic Transport Model) [3] is a hadronic cascade model, which explicitly treats all established hadronic states including resonances and all hadron-hadron cross sections parametrized based on the resonance model and string model by fitting the available experimental data.

The PHITS can describe the transport of heavy ions and their collisions by making use of JQMD [4] and SPAR code. The JQMD (JAERI Quantum Molecular Dynamics) [4] is a simulation code for nucleus nucleus collisions based on the molecular dynamics. The SPAR code is widely used to calculate the stopping powers and ranges for charged particles and heavy ions.

The PHITS has included some part of MCNP4C code, by which the transport of low energy neutron, photon and electron based on the evaluated nuclear data can be described. Furthermore, the high energy nuclear data like LA150 and JENDL high energy file can be also used by the PHITS.

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