4–11 Development of the Particle and Heavy Ion Transport Code System, PHITS
— Simulating the Motion of All Radiations in One Computational Code —

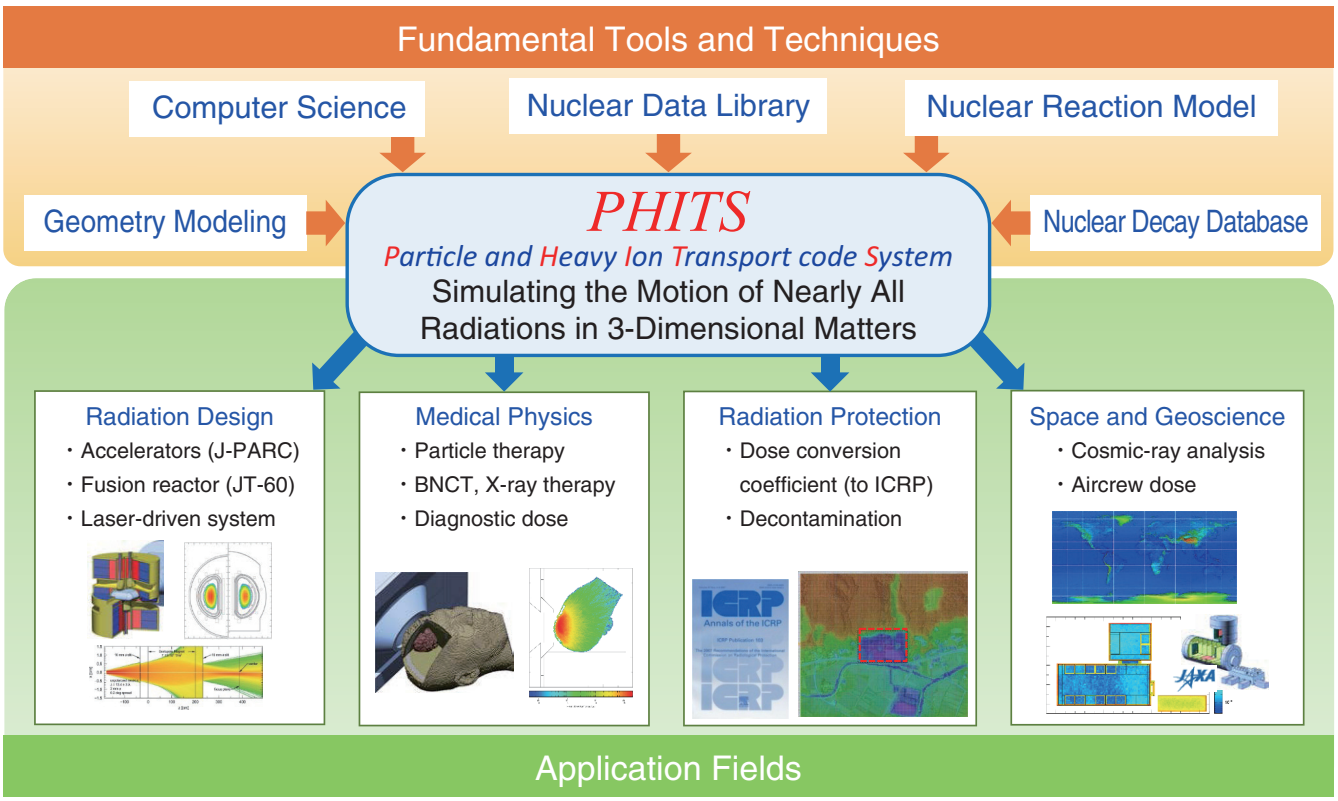

Fig.4-26 Overview and applications of the PHITS code

Radiations travel through matter in complicated ways by inducing ionization and nuclear reactions. Thus, it is very important to precisely simulate the motion of radiation when designing the shielding of nuclear reactors and accelerators as well as when planning treatment during radiation therapy. Several particle transport simulation codes have been developed in Japan, but they have been insufficient for use in various purposes because of their limited functions.

We therefore developed a new general purpose particle transport simulation code by combining and improving a number of related techniques and tools developed in Japan, under collaboration with various institutes (Fig.4-26). The code was designated as PHITS: the Particle and Heavy Ion Transport code System. The basic features of PHITS are as follows.

(1) PHITS can simulate the transport of nearly all radiations over a wide energy range, including low-energy neutrons and photons that are important for nuclear technology as well as high-energy protons and heavy ions that are important for accelerator design, medical physics, and space applications.
(2) PHITS contains high-reliability nuclear reaction models and nuclear data libraries that can well reproduce experimental data.
(3) PHITS has two kinds of parallel execution functions that can be utilized not only on super computers but also on conventional PCs such as Windows® and Mac PCs.
(4) PHITS is easy to setup and use owing to its semi-automatic installer and user-friendly interface. In addition, we have frequently organized PHITS tutorials, including that held in Paris in 2013 and have established a hospitable user-support system.

Owing to these features, PHITS has been used in various applications such as design of radiation facilities, medical physics, radiation protection research, and space and geosciences. The number of PHITS users has continuously increased and reached up to 1600 in Japan and a few hundred outside Japan within 5 years after its first release.

For more detailed information, please visit its website: http://phits.jaea.go.jp.

Reference

Sato, T. et al., Particle and Heavy Ion Transport Code System, PHITS, Version 2.52, Journal of Nuclear Science and Technology, vol.50, issue 9, 2013, p.913–923.