Development of Quantum Beam Technology

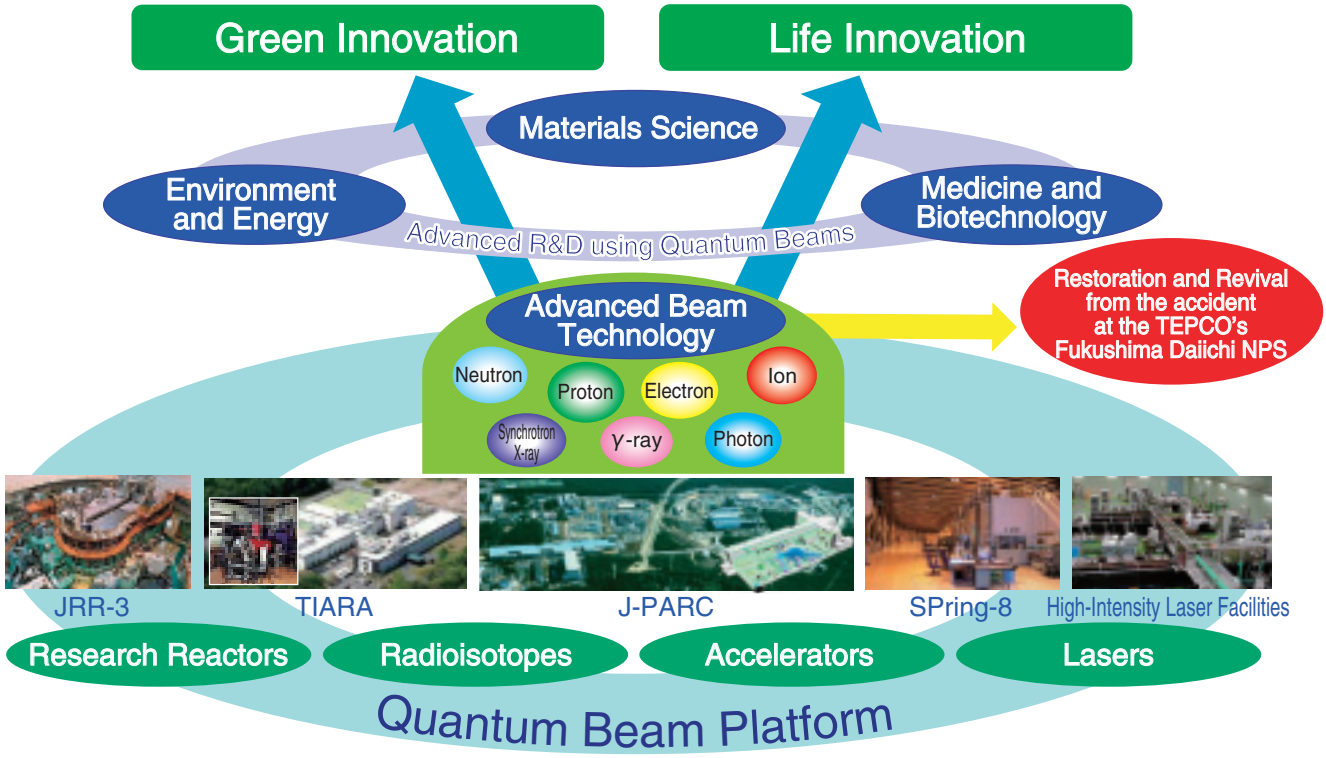

Fig.5-1 JAEA quantum beam facilities

"Quantum beam" is a generic name for neutron beams, ion beams, electron beams, high-intensity lasers, and synchrotron X-rays, which are generated from accelerators, high-intensity laser facilities, and research reactors. Recently, "quantum beam technology" has been greatly developed, with the most advanced manufacturing and observations being made using highly controlled quantum beams.

We own various quantum beam facilities (Quantum Beam Platforms), such as JRR-3 and J-PARC (Tokai area), TIARA, and electron beam and gamma-ray irradiation facilities (Takasaki area), J-KAREN and other lasers (Kizu area), and the SPring-8 beamlines (Harima area). We are carrying out R&D on advanced beam technology and promoting many fundamental and applied research studies in various fields (materials science, environment and energy, medicine and biotechnology) by utilizing the create and probe functions of quantum beams. In addition, we are making efforts to contribute to the recovery from the accident at the Tokyo Electric Power Company, Incorporated Fukushima Daiichi Nuclear Power Station (1F) by developing improved decontamination materials, etc. (Topics 1-13, 1-14, 1-15 in Chapter 1) (Fig.5-1).

Quantum beams have a probe function, by which we can obtain atomic- or molecular-level information through observation of the alterations in beam parameters. They also allow us to process materials on a nanometer level (atomic or molecular level) by interacting with the constituent atoms of a material to change their configuration, composition, and electronic state. In medical applications, they are used for radiotherapy in which a beam is focused on a cancer cell (Fig.5-2).

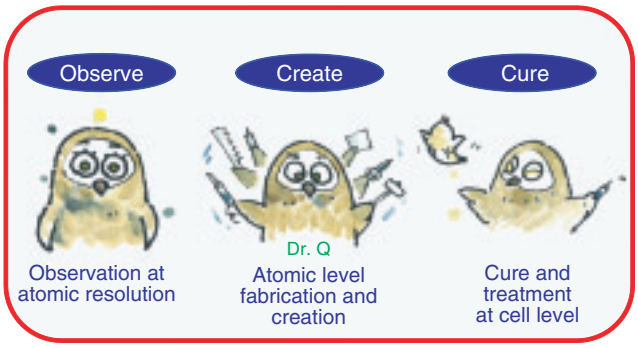

Fig.5-2 Characteristics of quantum beams

In this chapter, we introduce our newest topics related to advanced beam technology and its application in the fields of materials science, environment and energy, and biotechnology.