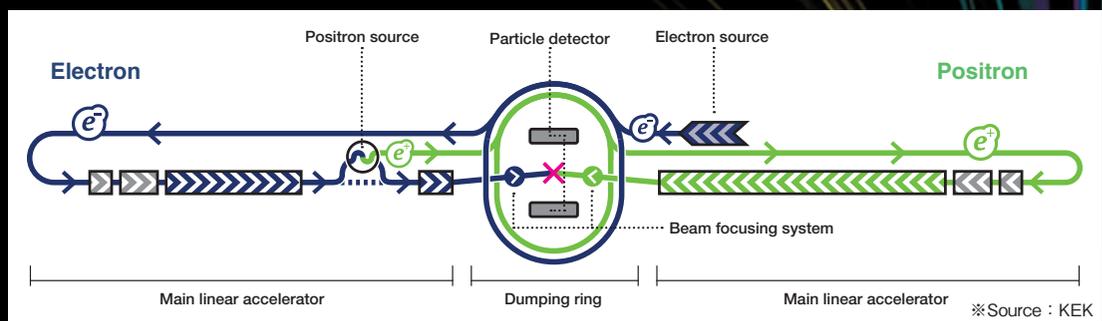


## What is the ILC?

It is an acronym for the International Linear Collider, which will be a large facility centered around a 31~50km-long accelerator constructed in an underground tunnel. Researchers worldwide are collaborating to realize this project, of which there will only be one in the world. The world 'linear' indicates that the accelerator forms a straight line, and 'collider' means that it accelerates particles and collides them together.

## How does the ILC work?

It injects electrons into one end of an ultra-high-vacuum beam pipe installed in an underground tunnel, and positrons\*<sup>1</sup> into the other end, and accelerates them to near the speed of light. It then brings them to a head-to-head collision at the center of the facility which creates high-energy state similar to what was found during the Big Bang\*<sup>2</sup>. By measuring and analyzing the various particles\*<sup>3</sup> created by the collision, it opens the door to explaining the origins of the Universe.



## What is an accelerator?

It is a machine that accelerates particles which carry an electric charge. There are many accelerators being used in fields intrinsic to our daily lives, such as industry and medicine.

### [Examples of accelerators]

- **Cathode ray tube** : It draws images by repeatedly scanning an electron beam over a surface coated with fluorescent material.
- **Electron microscope** : It scans an electron beam over specimens and forms images by detecting and amplifying the generated secondary electrons.
- **Positron Emission Tomography (PET)** : Radioisotopes produced by accelerators are inserted in glucose which is introduced into the body, and emitted positrons can then be detected. Used in clinical oncology.
- **Particle radiation therapy (cancer treatment)** : Protons and other particles accelerated in an accelerator are aimed at cancerous cells in the body for treatment.



Positron Emission Tomography (PET)

※Picture provided by Tottori Municipal Hospital

### [Glossary]

- \*<sup>1</sup> Positron...The antiparticle of an electron. It has a positive electric charge, which is opposite to the negative charge of an electron. Its mass and the absolute value of electric charge are the same as those of an electron. When a positron encounters an electron, they annihilate.
- \*<sup>2</sup> Big Bang...The cosmic explosion that is thought to have occurred at the beginning of the Universe. The Big Bang theory supposes that the Universe began with an explosion (the 'Big Bang') 13.7 billion years ago followed by the expansion of the Universe in which elementary particles, atoms, molecules, galaxies, and stars were formed.
- \*<sup>3</sup> Elementary particles...The smallest units that compose matter. They are particles that cannot be subdivided any further. Examples are leptons such as electrons and neutrinos, and the quarks that compose protons and neutrons.