

**Acceleration of particles** (electrons, protons, and other charged particles) is achieved by propelling them with electromagnetic waves. The energy of the waves is transferred to the particles as the particles travel through special cavities made of copper or superconducting material.

To understand how this works, imagine a surfer riding a wave. If the surfer paddles at the right speed and gets on a wave at the right time, the surfer will be accelerated to the speed of the wave. If the initial speed of the surfer is wrong, the wave will just pass the surfer by; if the timing is wrong, the surfer will lose speed.

An electron traveling through a cavity "filled" with radio-frequency waves acts very similarly. If the particle enters the cavity at the right time, it will gain energy from the wave. If it arrives at the wrong time, it will gain less energy, be decelerated, or be lost.

In a particle accelerator, particles travel through multiple cavities to go from low speed to almost the speed of light. The trick is to tune the cavities so that the waves are in sync with the particles and provide maximum acceleration at each point along the accelerator.

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