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Mitsubishi Electric Develops Multi-function Irradiation Nozzle for Proton-type Particle Therapy Systems

Single nozzle for three types of beam irradiation lightens burden on patients

TOKYO, February 17, 2015 – [Mitsubishi Electric Corporation](http://www.mitsubishielectric.com) (TOKYO: 6503) has developed an advanced multi-function irradiation nozzle for particle therapy systems for cancer treatment that enables quickly switching between broad-beam, layer-stacking, and scanning particle beams. The innovative nozzle achieves flexibly varied treatment matched to tumor’s individual location and shape to be performed in one treatment room, thereby lightening the burden on patients.

The multi-function nozzle is expected to be adopted by two proton treatment centers in Japan that aim to start offering treatment in the fiscal year starting in April 2016. Mitsubishi Electric will apply for regulatory approval of scanning with the Multi-function Irradiation Nozzle in compliance with Japan’s Pharmaceutical Affairs Act.

The nozzle’s high-speed scanning electromagnet, previously used only for scanning, now can be used for broad-beam as well as layer-stacking irradiation. Scanning speed has been increased by a factor of five, from 20 mm to 100 mm per millisecond, compared to the conventional speed. The nozzle can provide arbitrary beam scanning according to the tumor’s shape without having to widen the beam, thereby minimizing the dose blocked by the multi-leaf collimator (MLC). As a result, a particle therapy system integrated with the nozzle can irradiate a beam with a higher dose for greater efficiency,

reducing irradiation time to as short as approximately 1/3 that of a conventional system.

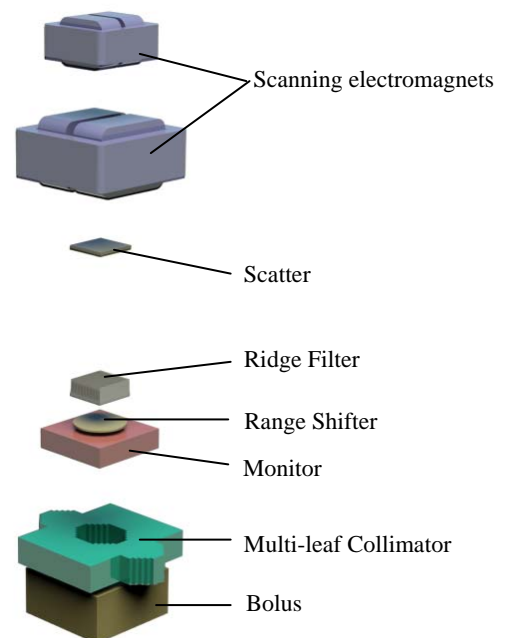


Fig.1 Multi-function Nozzle major devices

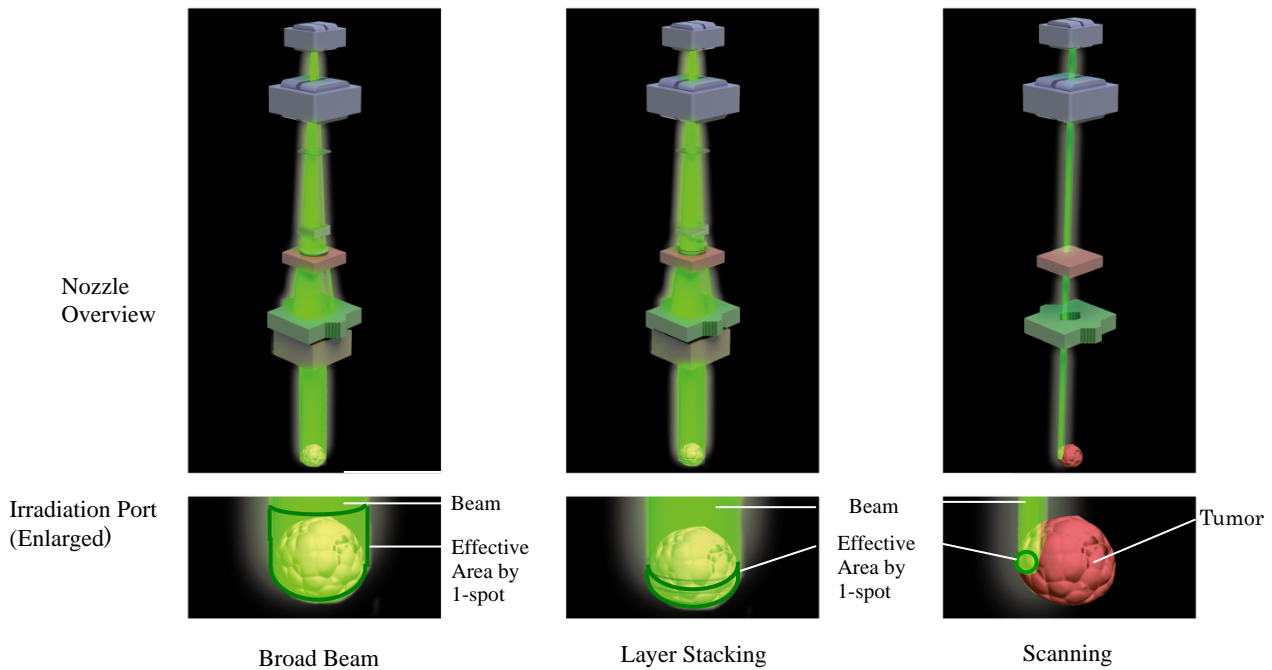


Fig.2 Three types of particle beam irradiation achieved with new nozzle

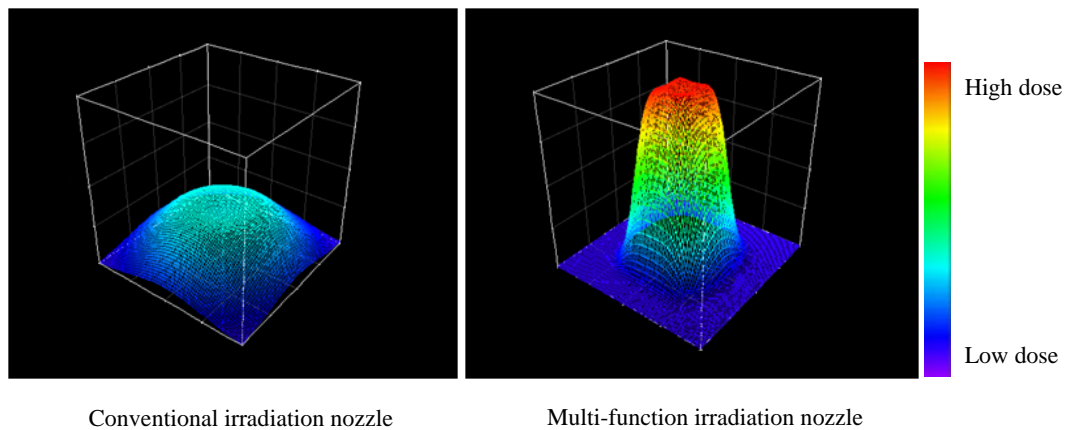


Fig.3 Comparison of beam dose per unit time (vertical axis: dose; horizontal axis: irradiation field)

Particle therapy systems generally offer one irradiation nozzle in one treatment room. In the past, Mitsubishi Electric has integrated its conventional systems with either a double-function nozzle for broad-beam and layer-stacking irradiation, or a single-function nozzle for scanning. In Mitsubishi Electric's conventional system for broad-beam and layer-stacking irradiation, the scanning magnet was used to irradiate a beam along with a prescribed circle orbit and enlarge the beam size. MLC was used to adjust the geometry to produce a beam that conforms to the tumor's shape, and to block the beam from striking any area not requiring irradiation.

Conventionally, the high-speed scanning magnet has been used to create an illumination field by scanning a pencil beam over the tumor shape without using a MLC. Mitsubishi Electric's new multi-function nozzle

makes it possible to use a MLC for scanning to outline the irradiation field more distinctly. As a result, the nozzle can achieve accurate beam irradiation for complicated shapes near vital organs.

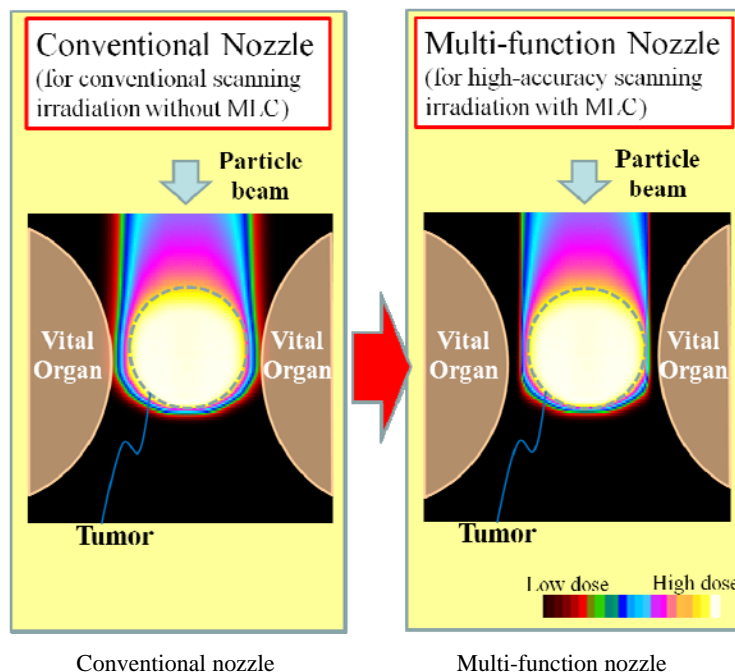


Fig.4 Multi-leaf collimator's effect on scanning irradiation accuracy

Currently, 13 medical institutions in Japan are utilizing particle therapy systems for treatment and clinical research. Mitsubishi Electric has supplied such systems to eight of these facilities, and they have been used to treat some 20,000 people. The medical facilities have requested Mitsubishi Electric's assistance in helping to realize faster and more effective treatments, as well as the ability to switch irradiation method flexibly depending on tumor shapes or locations. In response, the company has now developed its new multi-function irradiation nozzle.

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About Mitsubishi Electric Corporation

With over 90 years of experience in providing reliable, high-quality products, Mitsubishi Electric Corporation (TOKYO: 6503) is a recognized world leader in the manufacture, marketing and sales of electrical and electronic equipment used in information processing and communications, space development and satellite communications, consumer electronics, industrial technology, energy, transportation and building equipment. Embracing the spirit of its corporate statement, Changes for the Better, and its environmental statement, Eco Changes, Mitsubishi Electric endeavors to be a global, leading green company, enriching society with technology. The company recorded consolidated group sales of 4,054.3 billion yen (US\$ 39.3 billion*) in the fiscal year ended March 31, 2014. For more information visit <http://www.MitsubishiElectric.com>

*At an exchange rate of 103 yen to the US dollar, the rate given by the Tokyo Foreign Exchange Market on March 31, 2014