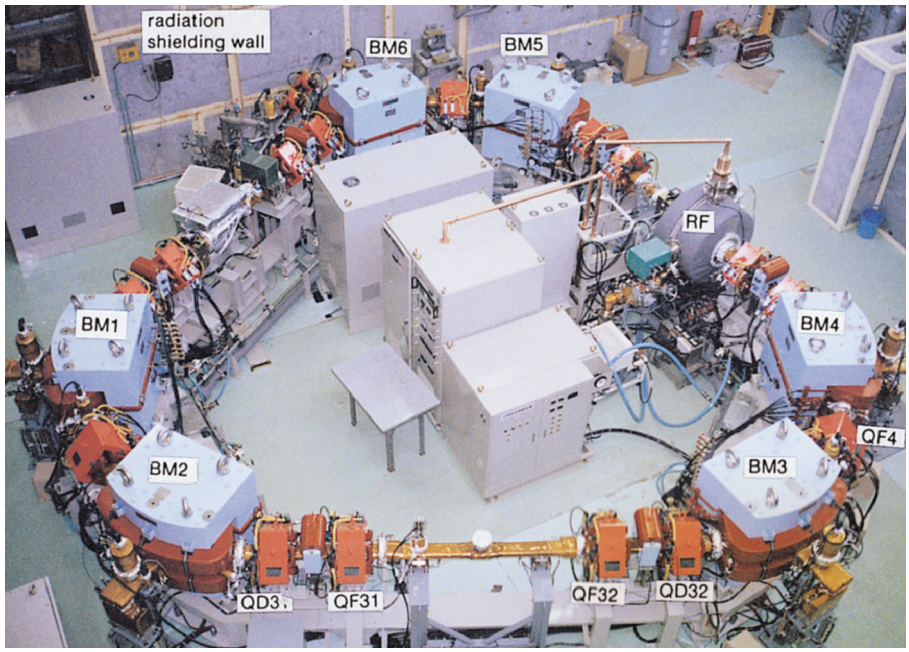
Integrating Mitsubishi Electric Technology to Explore the Unknown and Build the Future

“Matter. What is it made of?” Our generation is currently unravelling the answer to this long-standing question through physics experiments using particle accelerators.

Quarks and gluons are the components of nuclear matter, from which ordinary matter is comprised. Studying the relationships of these constituents and altering their formations makes fascinating new technologies possible. Mitsubishi Electric is using its technical expertise to promote such innovations, integrating various leading-edge technologies to produce subatomic particle accelerator systems that generate a new form of light, the synchrotron radiation beam.

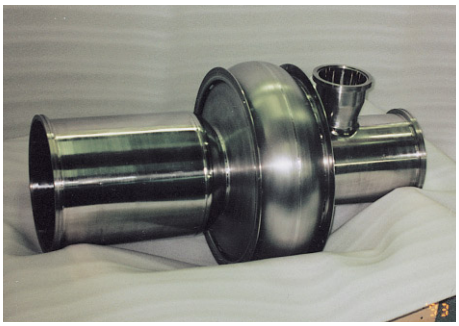
Particle accelerators are playing a key role in introducing dramatic improvements to various technologies, including the fabrication of smaller semiconductor devices, new medical diagnostic methods, cancer therapy, and the molecular structure analysis of proteins and other complex materials that lead to the development of new substances. Mitsubishi Electric has earned an excellent reputation world over for providing accelerator components and systems for such applications.



A Compact Electron-Storage Ring
for Use as a Synchrotron Radiation Source for JAERI

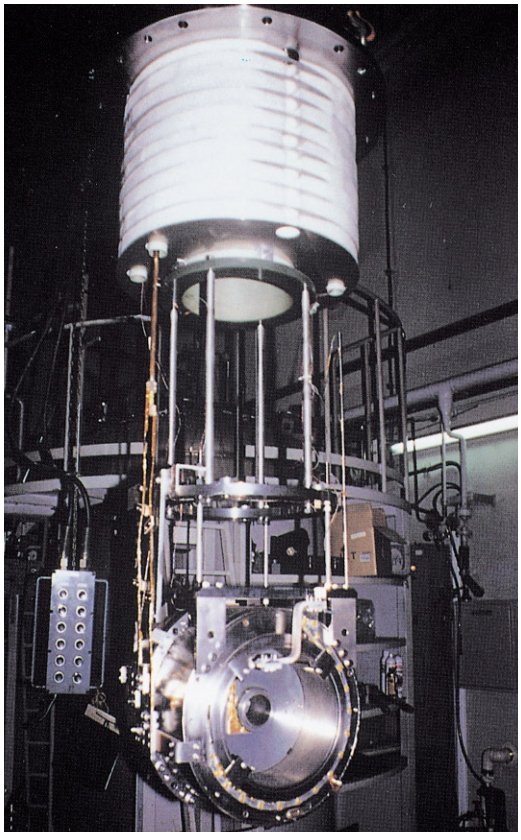
Superconducting Prototype Cavity for KEK B-Factory

The superconducting cavity prepared for vertical testing



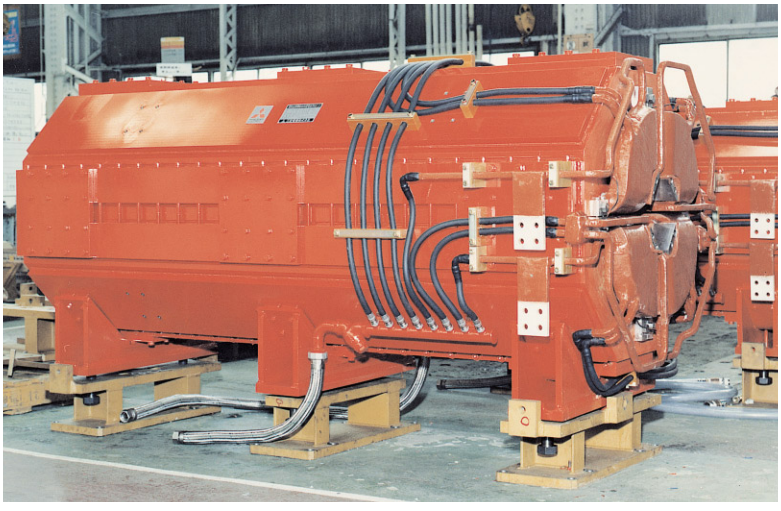
Outline view of the cavity

14-Tesla Hybrid Split Solenoid Magnet



The magnet assembly.

Quadrupole Magnet, Q_{C1}, Q_{C2} for the Laboratory for High Energy Physics, KEK



Mitsubishi accelerator systems

At the Mitsubishi Electric Corporation, we have accumulated considerable experience since the early 1960's in designing and manufacturing accelerators and components at several of our divisions. We have produced electromagnets of various types for a wide range of applications, as well as RF cavities and power supplies for numerous accelerators. We have been building electron linear accelerators of various sizes, the largest one being the 1 GeV electron linac at SPring-8.

Mitsubishi Electric Corporation has also earned a solid reputation in manufacturing electron storage rings such as;

- 600 MeV facility at the Institute of Molecular Science
- 300 MeV storage ring at the Japan Atomic Energy Research Institute (JAERI)
- 1 GeV SR facility at the SORTEC Corporation.

Most recently, our high standards for hardware manufacturing and the proper management approach were demonstrated with the successful completion of the SR facilities, New SUBARU at the Laboratory of Advanced Science and Technology for Industry, Himeji Institute of Technology.

We also manufacture cancer therapy systems, superconducting machines such as superconducting magnets for high energy physics, MHD power generation, fusion research and industrial application for silicon crystal growth and RF cavities for accelerating electron, positron and heavy ion.

The next page shows the history of accelerator products by Mitsubishi Electric Corporation and supply list presents brief specification as well as customer name and year of manufacturing etc.

A list of accelerator products

Year	Products	Customer
System		
1965	Tandem Van de Graaff	Kyoto University
1967	300 MeV electron linac	Tohoku University
1967-	Electron linacs for industrial and medical uses	
1974	45 MeV electron linac	Hokkaido University
1978	35 MeV electron short-pulse linac	Tokyo University
1982	150 MeV electron pulse-beam stretcher, SSTR	Tohoku University
1983	18 MeV electron linac, 600 MeV synchrotron ring and storage ring, UVSOR	Institute for Molecular Science
1984	50 MeV/u heavy ion accelerator	Tokyo Institute of Technology
1987	35 MeV double-sited microtron	Nihon University
1987	13 MeV electron linac for SR facility	Nihon Telegraphand Telephone (NTT)
1989	SR facility at SORTEC 40 MeV electron linac 1 GeV synchrotron 1 GeV storage ring	SORTEC
1989	SR facility at JSR 300 MeV electron storage ring	Japan Atomic Energy Research Institute (JAERI)
1992	SR facility at Mitsubishi 20 MeV linac 1 GeV synchrotron 0.6 GeV superconducting storage ring	Mitsubishi Electric Co. Advanced Technology R&D Center
1993	Heavy ion medical facility 0.8 GeV synchrotron	National Institute of Radiological Sciences
1996	SPring-8 1 GeV linac	Japan Atomic Energy Research Institute (JAERI)
1997	1.2 GeV Stretcher Booster Ring	Tohoku University
1997	1.5 GeV SR facility, New-Subaru	Himeji Institute of Technology
2000	Cancer Therapy Project 0.8 GeV heavy ion synchrotron	Hyogo Prefecture
2000	250 MeV proton synchrotron	Shizuoka Prefecture
Magnet		
1966	2π air-core β-ray spectrometer	Tokyo University
1966	2π air-core β-ray spectrometer	Institute of Physical and Chemical Research (RIKEN)
1967	Electron spectrometers for 300 MeV linac	Tohoku University
1973	Sector-focus cyclotron	Tokyo University
1980	Superconducting solenoid for Muon Channel	National Laboratory for High Energy Physics (KEK)
1981	Superconducting spectrometer, Super-BENKEI	Ditto
1984	Strong-focus quadrupole magnets for 30 GeV electron-positron collider, TRISTAN	Ditto
1986	Superconducting solenoid magnet for TRISTAN detector, VENUS	Ditto
1987	SLD Magnet for SLAC linear collider, SLC	Stanford Linear Accelerator Center
1988	14-Tesla hybrid split solenoid magnet	National Laboratory for High Energy Physics (KEK)
1988	Superconducting Toroidal Magnet	University of Tokyo
1988	Large-Ω magnet	Institute of Physical and Chemical Research (RIKEN)
1989-90	R&D magnet for SPring-8	Japan Atomic Energy Research Institute (JAERI) Institute of Physical and Chemical Research (RIKEN)
1991	Superconducting solenoid for Muon Channel	Institute of Physical and Chemical Research (RIKEN)
1992-4	Sextupole magnets for SPring-8 storage ring	Institute of Physical and Chemical Research (RIKEN)
1994	Quadrupole magnet for SPring-8 synchrotron	Japan Atomic Energy Research Institute (JAERI)
1995	Combined type bending, damping wiggler and sextupole magnets for ATF ring	National Laboratory for High Energy Physics (KEK)
1996	RHIC Muon Magnet South at BNL	Institute of Physical and Chemical Research (RIKEN)
1997	Bending and quadrupole magnet refurbishment of TRISTAN main ring for KEK B-Factory	National Laboratory for High Energy Physics (KEK)
Power supply and controller		
1981	Kicker magnet power supply for SSTR	Tohoku University
1985	Synchrotron power supplies for UVSOR	Institute for Molecular Science
1986	Accelerator monitor and control system for heavy ion accelerator	Institute of Physical and Chemical Research (RIKEN)
1991	RF tuner for SPring-8	Institute of Physical and Chemical Research (RIKEN)
1991-3	Storage ring power supplies for SPring-8	Ditto
1991-6	R&D computer control system for SPring-8	Ditto
1997	Power supplies for Stretcher Booster Ring	Tohoku University
Others		
1965	Radiation monitoring system for 300 MeV linac	Tohoku University
1986	Radiation monitoring system for heavy ion accelerator	Institute of Physical and Chemical Research (RIKEN)
1992	Superconducting RF cavities for heavy ion accelerator	Japan Atomic Energy Research institute (JAERI)
1992-	Superconducting RF cavities for KEK B-Factory	National Laboratory for High Energy Physics (KEK)
1993	Positron analyzer	Japan Atomic Energy Research institute (JAERI)
1996-	Cryogen-free superconducting solenoid magnet	Osaka University National Laboratory for High Energy Physics (KEK)

MITSUBISHI ELECTRIC

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