

# UTTAC



## University of Tsukuba, Tandem Accelerator Complex

The UTTAC (University of Tsukuba, Tandem Accelerator Complex) is one of several research centers at the University of Tsukuba, Japan. The principal apparatus installed is the 12UD Pelletron tandem accelerator made in the National Electrostatic Corp. Wisconsin, U. S. A. The accelerator is in operation since July 1975.

### 12UD Pelletron tandem accelerator

Specifications of the 12UD Pelletron tandem accelerator

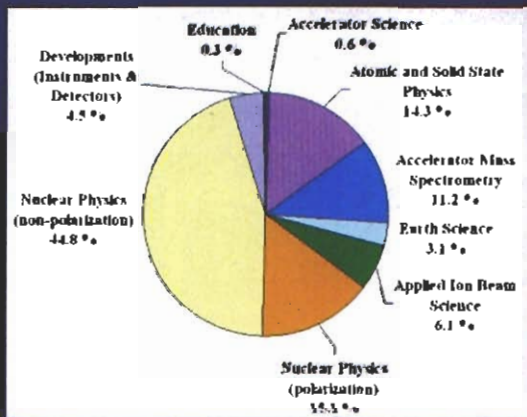
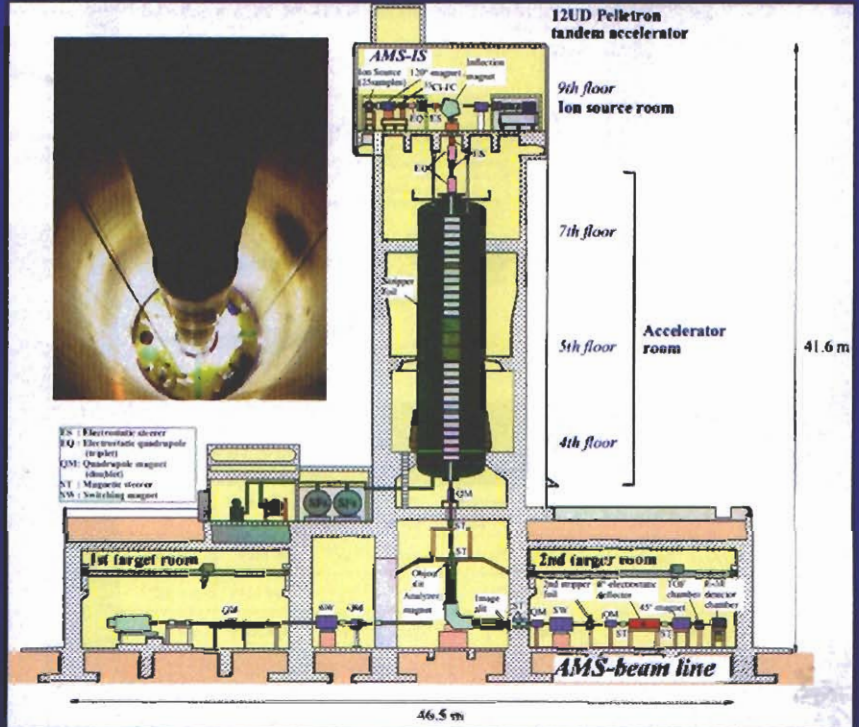
Model	Vertical Tandem Van de Graaff
Terminal Voltage	2.0 – 12.0 MV (max)
Voltage Ripple	±50 V at 50.0 Hz
Insulation Gas	SF <sub>6</sub> pressure: 0.6 MPa
Proton beam Intensity	3.0 μA (max)
Accelerator Tank	Height 17.9 m Diameter 4.83 m Volume 350 m <sup>3</sup> Total Weight 120 ton

Analyzing magnet

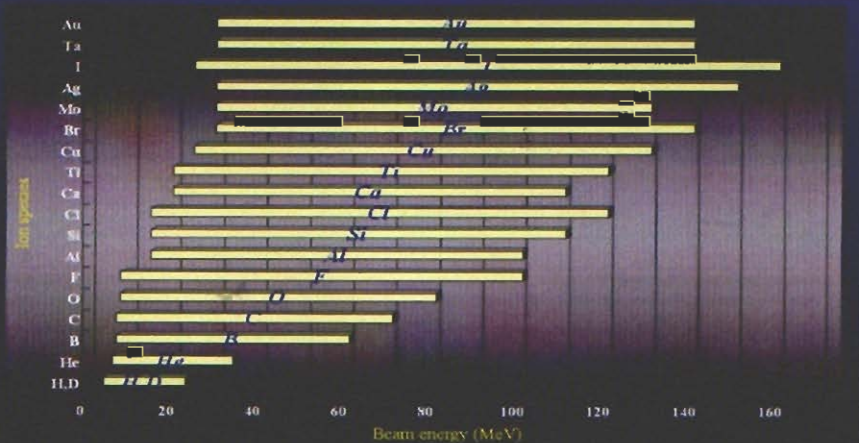
Max. Magnetic field	1.67 T
Mass Energy Product	200 MeV • amu



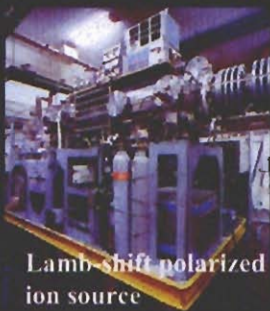
Control room



Percentage of beam time distributed to the several research fields



Ion species v.s. available energies



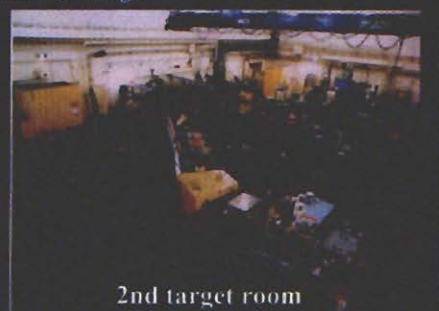
Lamb shift polarized ion source



Analyzing mag.



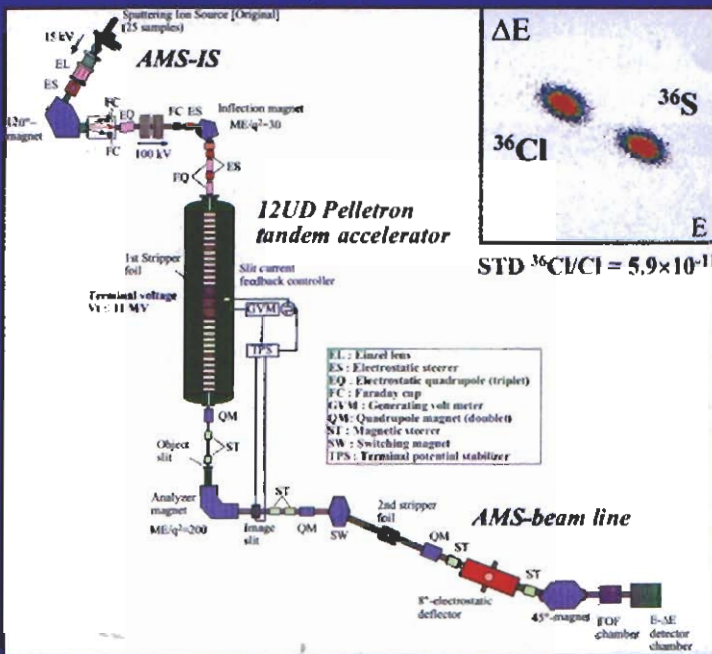
1st target room



2nd target room

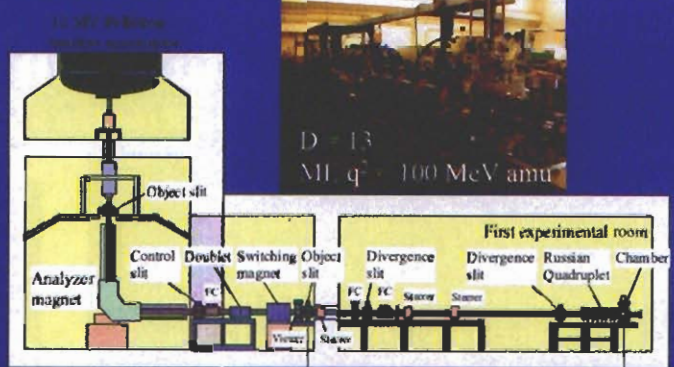
The accelerator provides accelerated ions in which ion species cover from hydrogen to bismuth. In addition, polarized proton and polarized deuteron are also accelerated by means of a Lamb shift polarized ion source. The maximum voltage is 12 MV. The total operating times is about 3000 hours in a year. Various fields of researches such as physics, material science, chemistry, geoscience, environmental science, microbeam analysis and AMS are being performed both from fundamental and applied aspects.

## Tsukuba AMS system

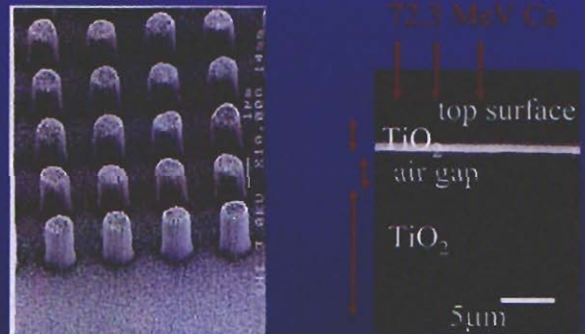


## High-energy nuclear microprobe

Hydrogen analysis in thick natural samples (0.2 mm) is performed by a proton-proton Elastic Recoil Detection Spectroscopy method. A minimum beam spot size is 10 μm for a 20-MeV proton beam with a beam current of 0.1 nA.



## Nanoscale and high aspect ratio patterns on SiO<sub>2</sub> and TiO<sub>2</sub> created with fast heavy ions



### Specifications of <sup>26</sup>Al, <sup>36</sup>Cl and <sup>129</sup>I-AMS

	Sample material	V <sub>r</sub>	Injection ion	Pilot beam	Detection ion	Particle energy	Background
<sup>26</sup> Al-AMS	Al <sub>2</sub> O <sub>3</sub> + <sup>26</sup> MgO <sub>2</sub> + Ag	10.2 MV	<sup>26</sup> AlO <sup>+</sup>	<sup>26</sup> MgO <sup>+</sup>	<sup>26</sup> Al <sup>11+</sup>	78 MeV	< 5 × 10 <sup>-15</sup>
<sup>36</sup> Cl-AMS	AgCl + C <sub>60</sub>	10 MV	<sup>36</sup> Cl <sup>+</sup>	<sup>13</sup> C <sub>3</sub> <sup>+</sup>	<sup>36</sup> Cl <sup>14+</sup>	100 MeV	~ 5 × 10 <sup>-15</sup>
<sup>129</sup> I-AMS	AgI + MoO <sub>3</sub> + Sb	9.7 MV	<sup>129</sup> I <sup>+</sup>	<sup>97</sup> MoO <sub>2</sub> <sup>+</sup>	<sup>129</sup> I <sup>20+</sup>	126 MeV	~ 5 × 10 <sup>-13</sup>

## 1 MV Tandetron accelerator

In 1999, the 1 MV Tandetron accelerator was installed in UTTAC. Main research fields are listed below.

- PIXE
  - microbeam PIXE for mineral samples
- RBS
  - material analysis
- Cluster physics
  - C<sub>1</sub>-C<sub>8</sub> clusters can be accelerated to 0.24 MeV/amu



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