TμM and SμM:

Transmission- and Scanning-Muon Microscopy

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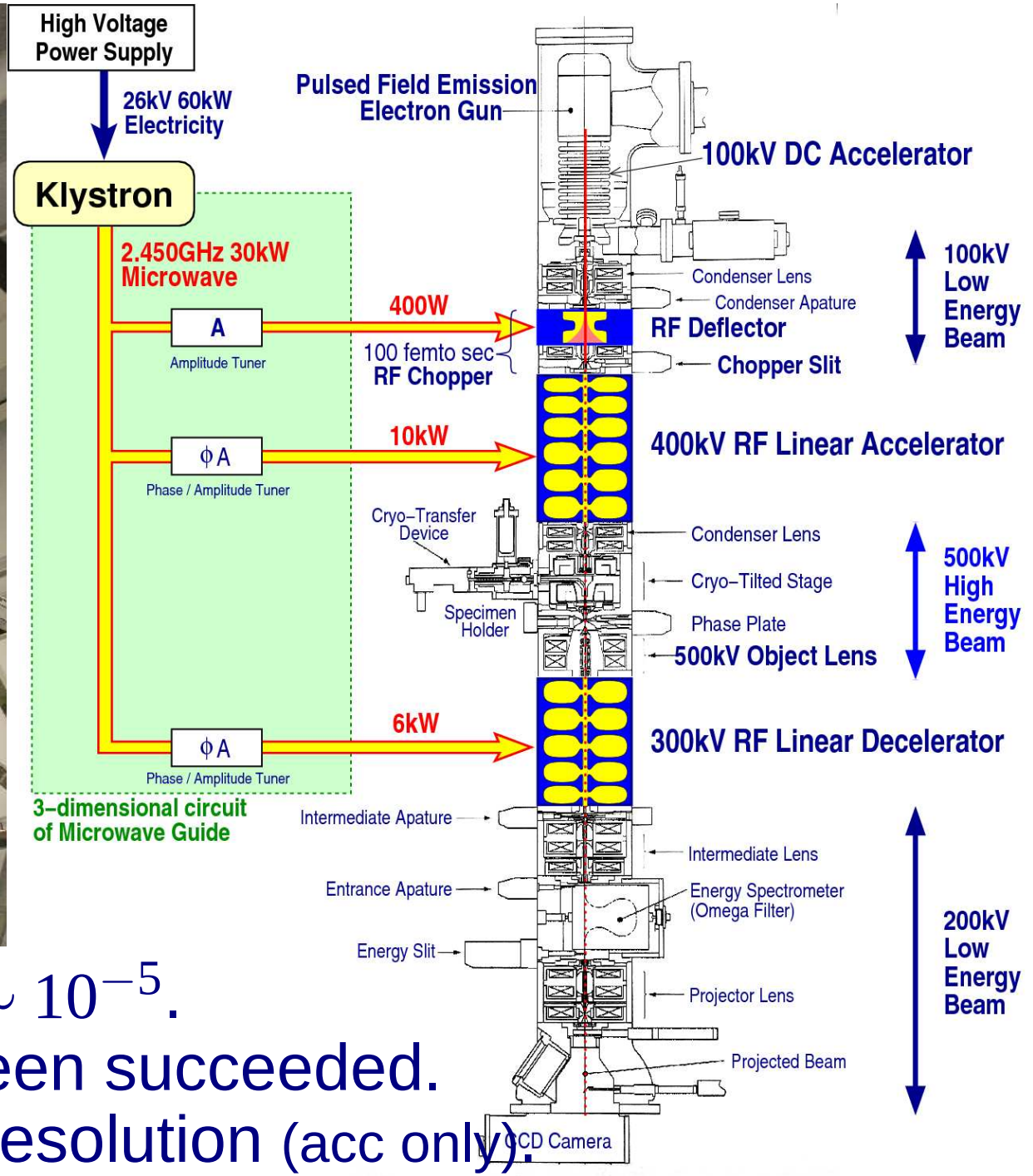
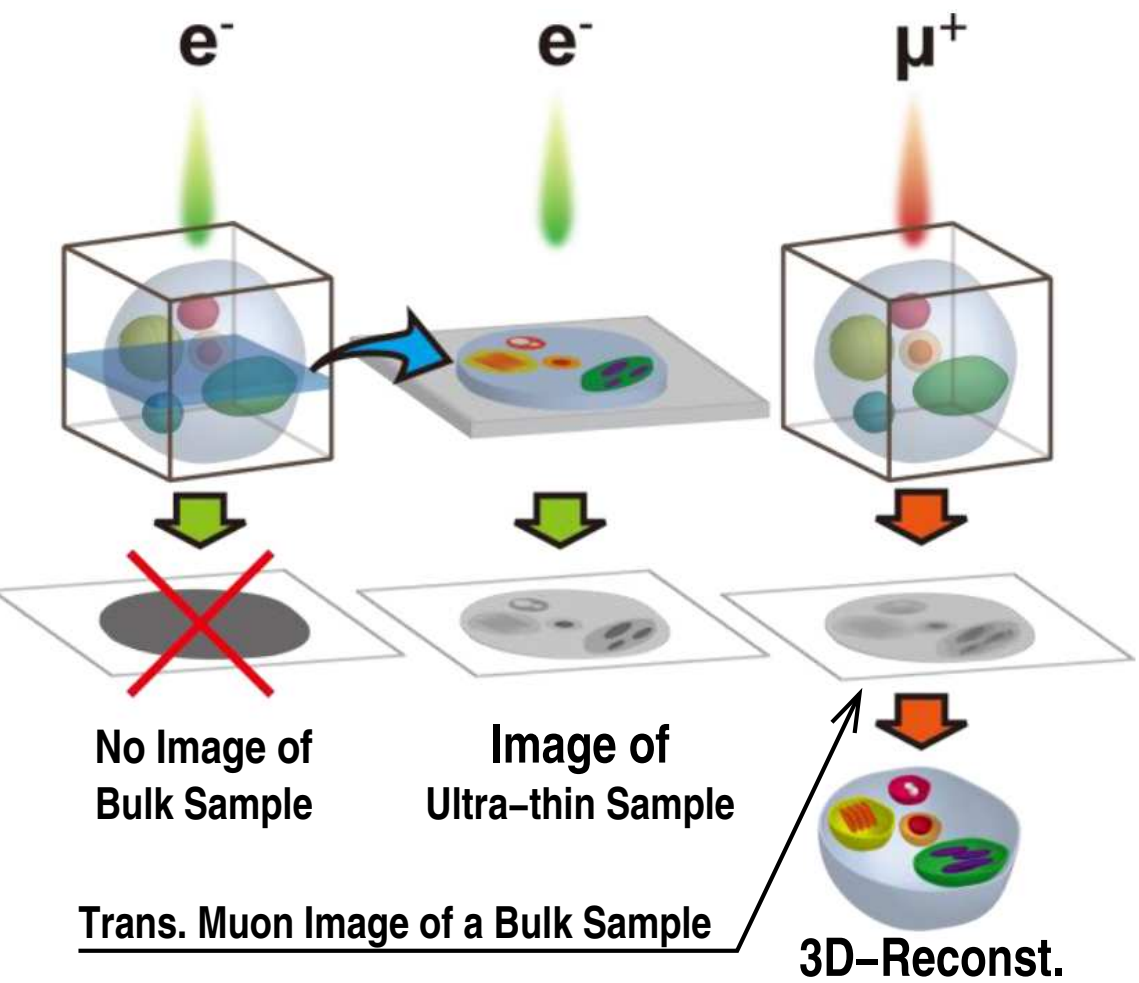
500kV Linac-TEM at NIPS (Okazaki)

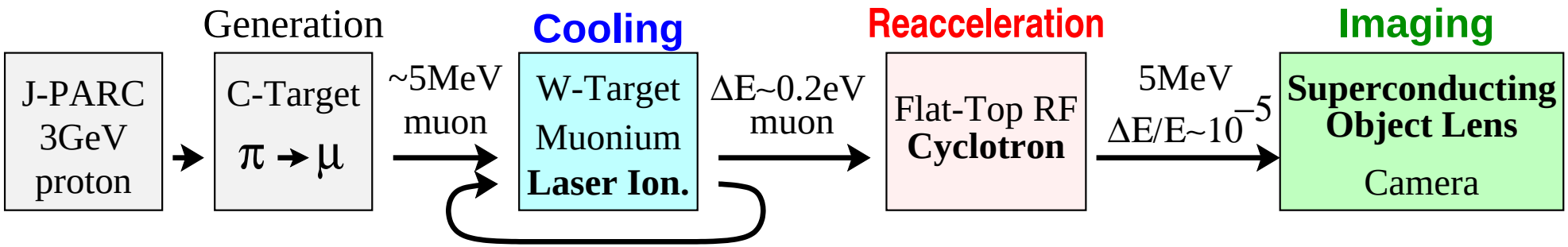


Accelerator with $\Delta E/E \sim 10^{-5}$.
Proof of Concept has been succeeded.
Current status: 0.9 nm resolution (acc only).

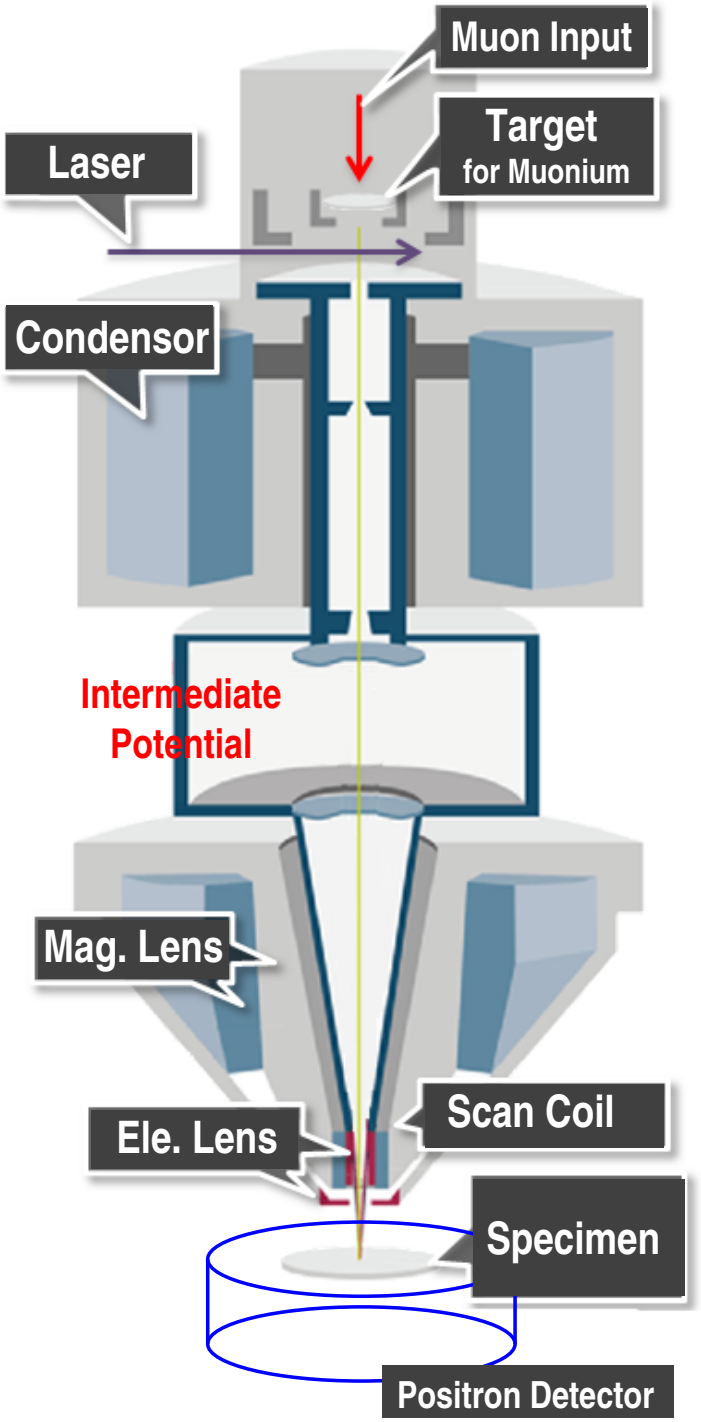
Transmission Muon Microscopy



- **Deep penetration-power** of accelerated muon ($\sim 10\mathrm{MeV}$) is employed for microscopy.
- A cryo/live neurons ($> 10\mu m$) can be directly obserbed.
- Muons are generated by accelerator (J-PARC).
- Cooling down of muons clarifies its **wave-properties**.
- Electric field is visualized.

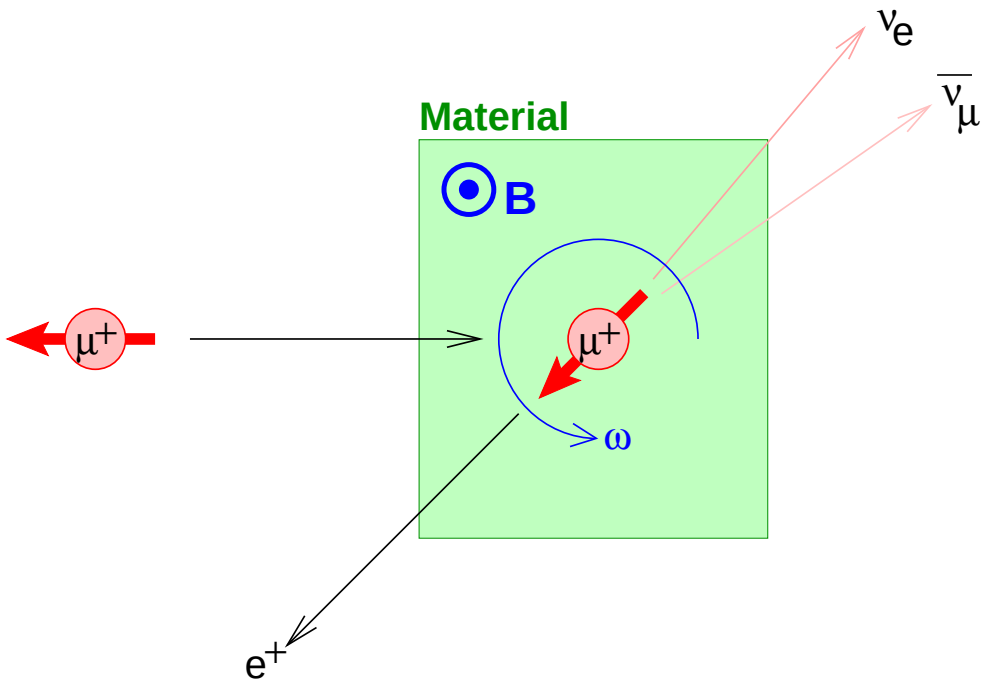


Scanning Positive Muon Microscopy

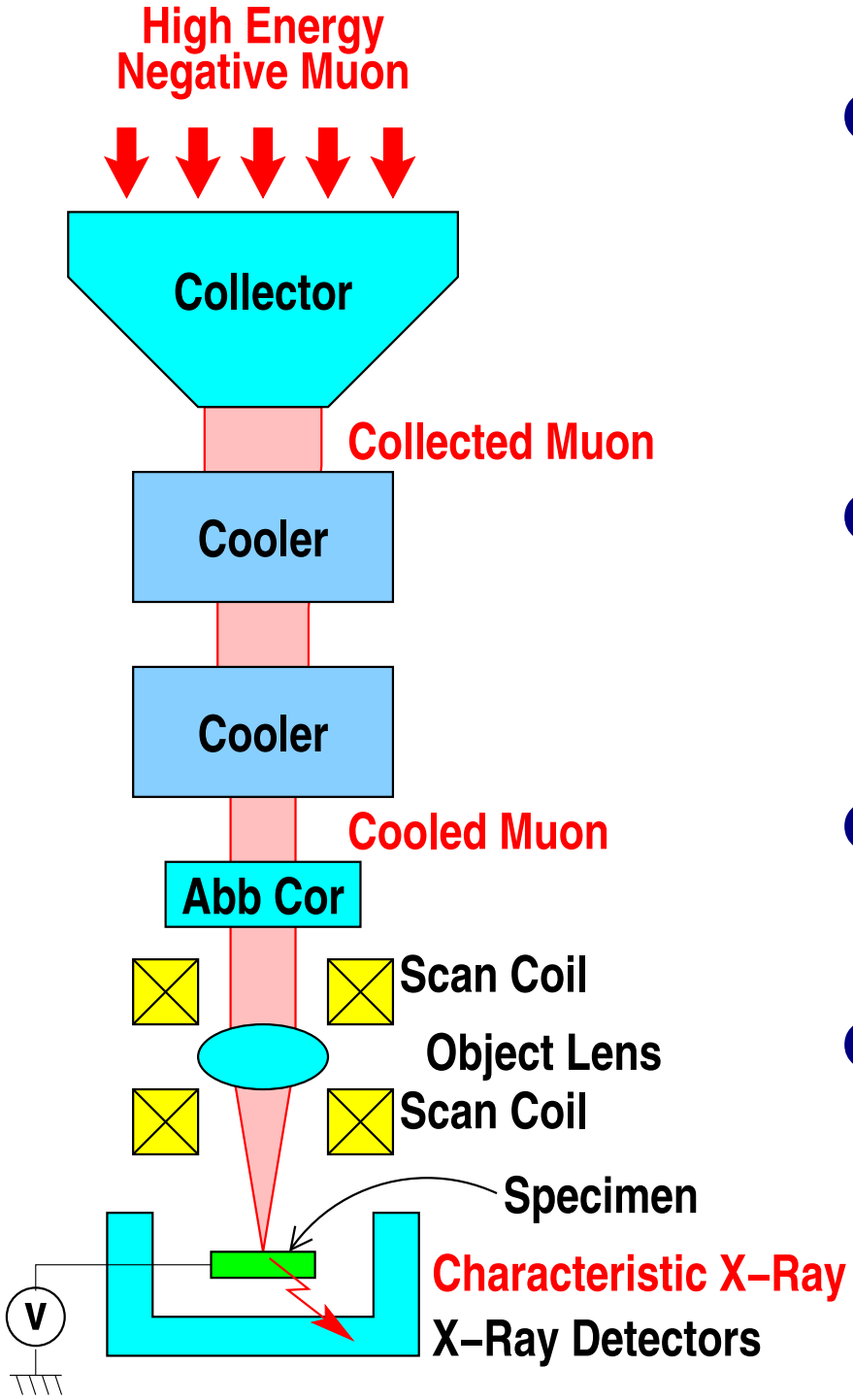


- **It can visualize 3D magnetic field in nanometer resolution.**
  XY-scan (nm resol.) by scan-coil, and Z-scan (nm) by energy-scan.

- Positive muon injected into material plays a high-sensitive magnetic prove by muon spin rotation (μSR).



Scanning Negative Muon Microscopy



- **It can visualise 3D distribution of elements, isotopes and chemical boundings of surface in nanometer resolution.**
- Any element (including H, Li) can be analyzed. (EDX/EDM can analyze elements heaver than Na.)
- Its sensitivity is much higher than EDX/EDM of SEM/TEM.
- Characteristic X-ray induced by μ^- has 200 times energy than one by e^-.

Members of the Linac-TEM Project Team

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- Tadao Shirai (RTS, JEOL-OB)
- Ryuzo AIHARA (JEOL-OB)
- Giichi IIJIMA (JEOL-OB)
- Kuniaki NAGAYAMA
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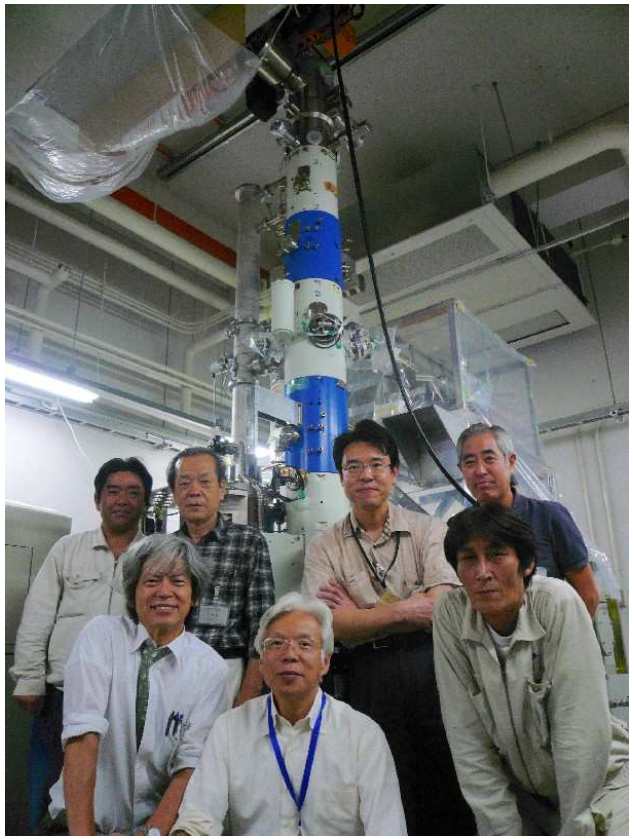

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