

MOPOGE09

Commissioning status of the iBNCT accelerator



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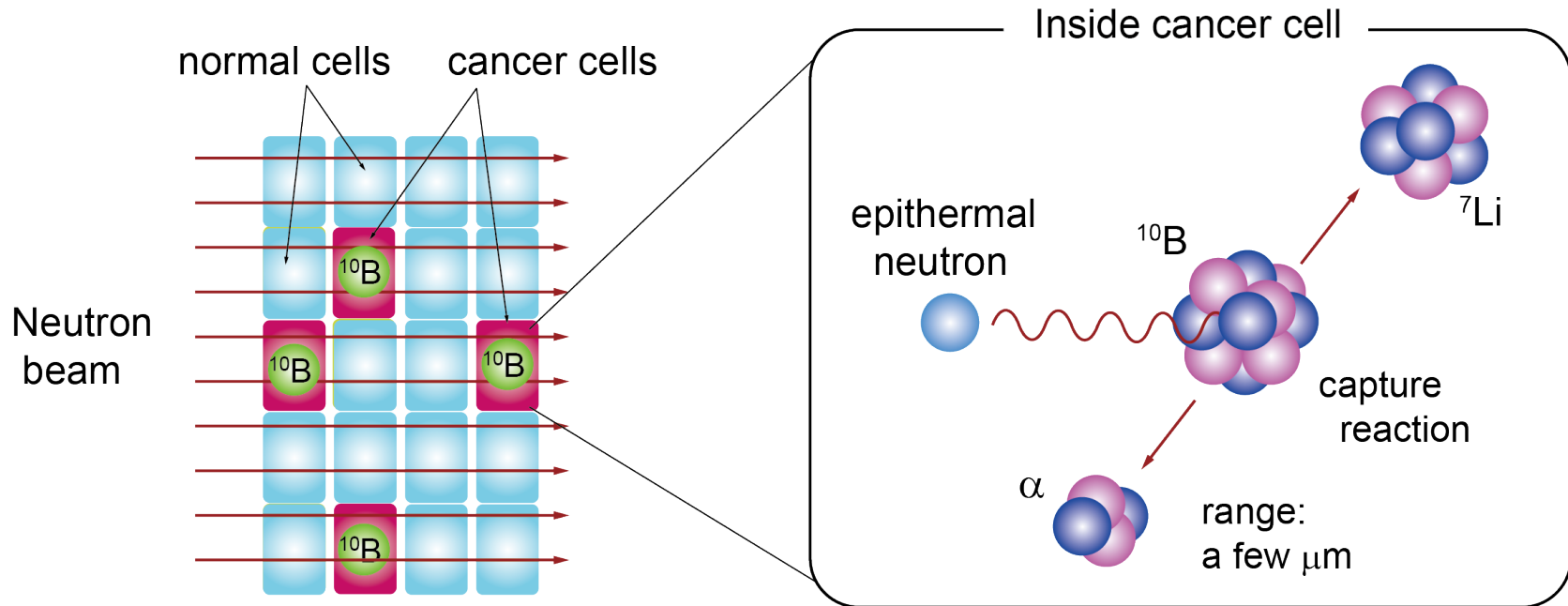
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The iBNCT project

□ BNCT : Boron Neutron Capture Therapy

- ✓ Administer a boron drug that is selectively absorbed in cancer cells.
- ✓ Irradiate thermal neutron, secondary products (α and ${}^7\text{Li}$) destroy cancer cells



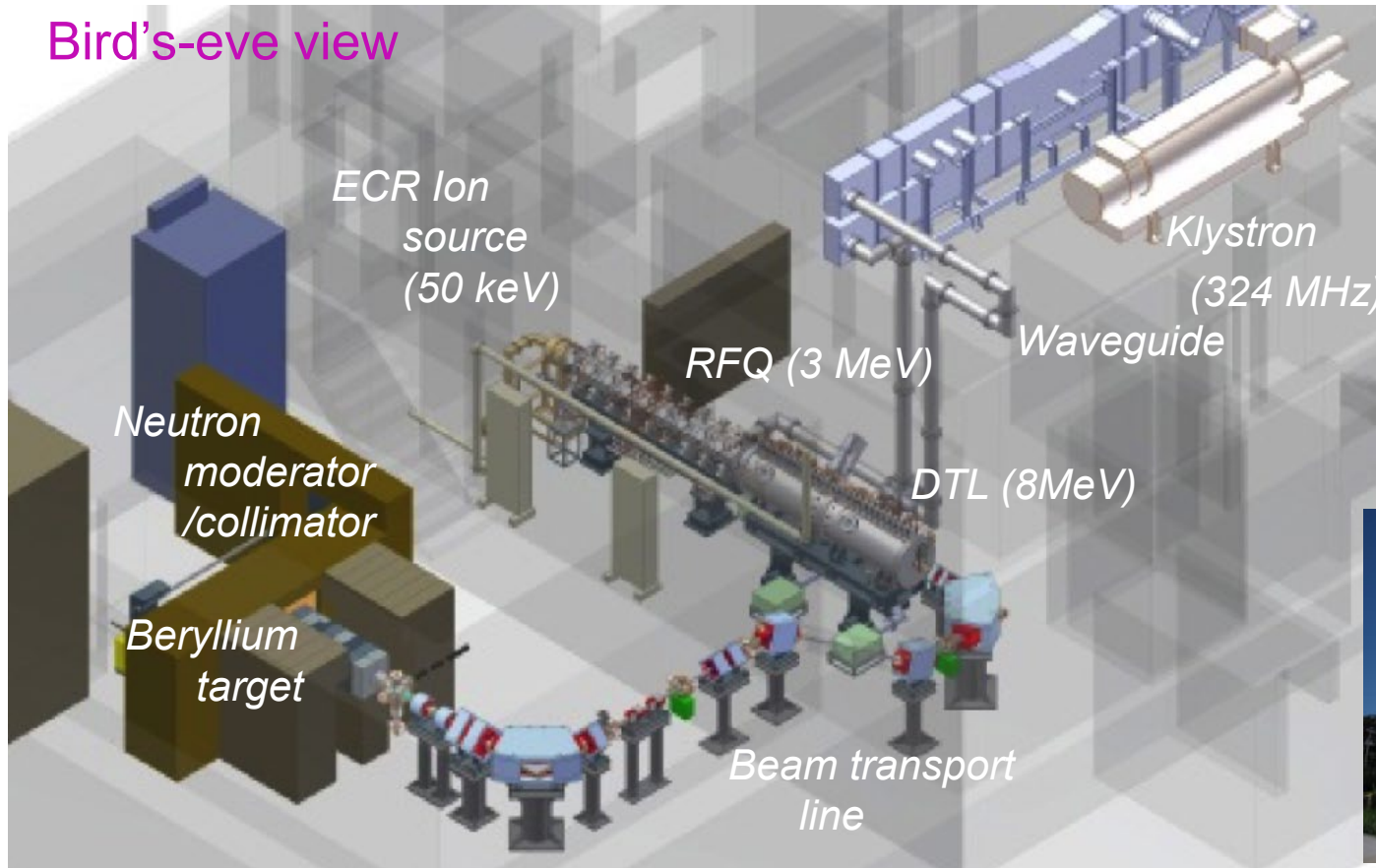
Long history of clinical studies with neutron from a nuclear reactor
→ [accelerator-based neutron generation](#)

□ The iBNCT (Ibaraki BNCT, 2010 ~) project :
[aiming to achieve linac-based BNCT](#)

Accelerator configuration

ECR IS (50 keV) → RFQ (3 MeV) → DTL (8 MeV) → Be target
based on J-PARC linac

Bird's-eye view



Ibaraki prefecture in Japan



Installed in an existing building

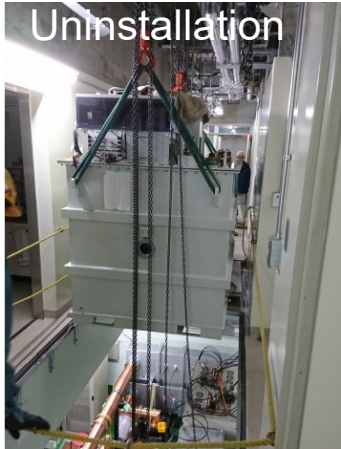


For BNCT treatment : neutron flux > 1×10^9 n/cm²/sec (IAEA TECDOC)

→ In the iBNCT configuration, an average beam current of > 1 mA is necessary

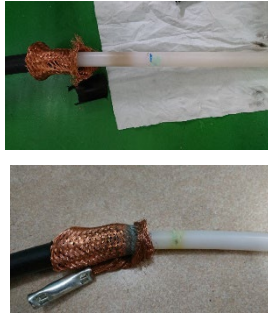
Facility status

- ❑ Klystron PS high-voltage switch failure

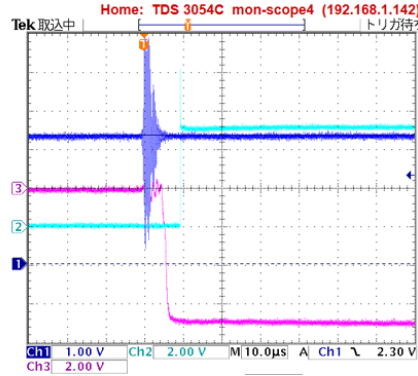


Uninstallation

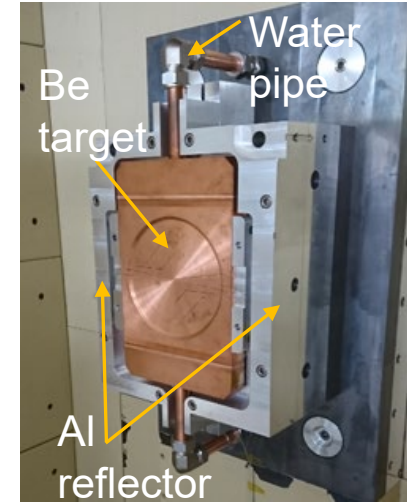
Breakdown of HV cable



Switching noise problem



- ❑ Replacement of the beryllium target



- ❑ Accelerator cooling-water upgrade

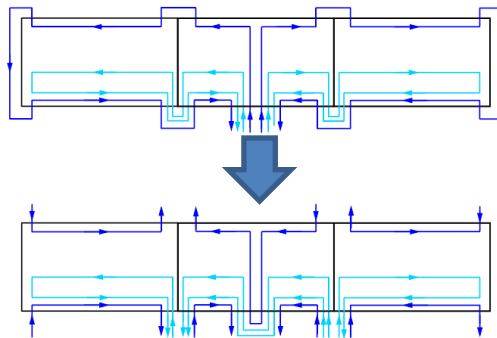
Increase of RFQ cooling water flow for its stability

Circulation pump



5 → 22 kW

Water path rearrangement
RFQ water path (tank/vane)



Improvement of RFQ cooling-water flow rate

path	design	present
tank	37 L/min	385 L/min
vane	53 L/min	385 L/min

Beam commissioning status

Present accelerator parameter

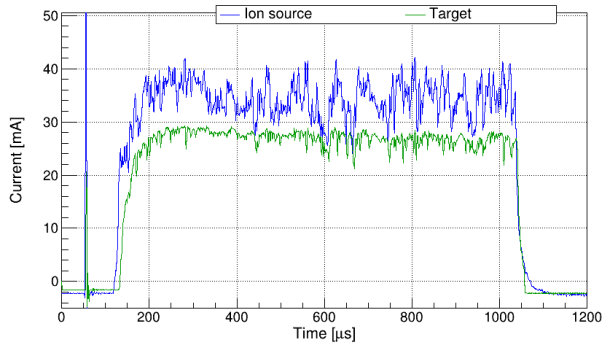
Repetition : 75 Hz

beam width : 920 μs

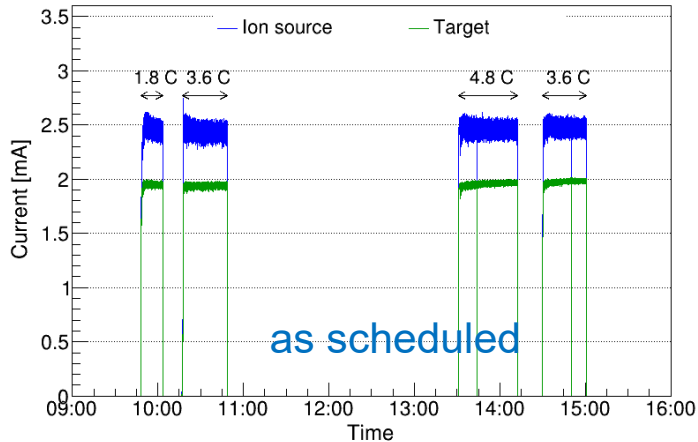
peak current : 25-30 mA

~2 mA
(at the
target)

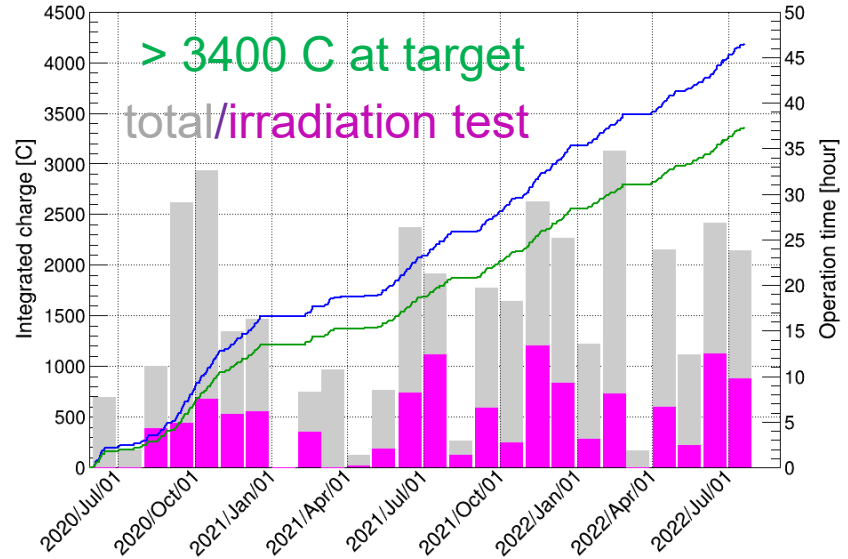
Waveform



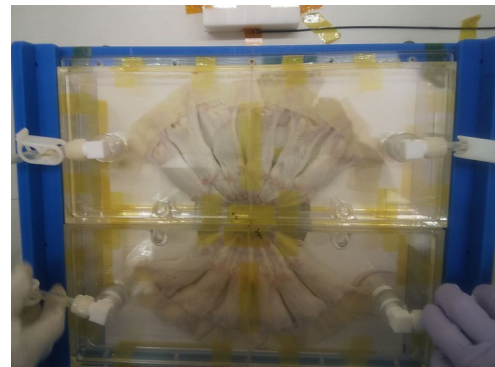
Daily trend of averaged current (beamtime of non-clinical study)



Operation history (May 2020~)



Non-clinical studies (Nov. 2021~)



After completion of non-clinical studies within FY2022, the iBNCT project will proceed to clinical studies in 2023.

photo of a non-clinical study