The Cascade Target Design for Muon Facility

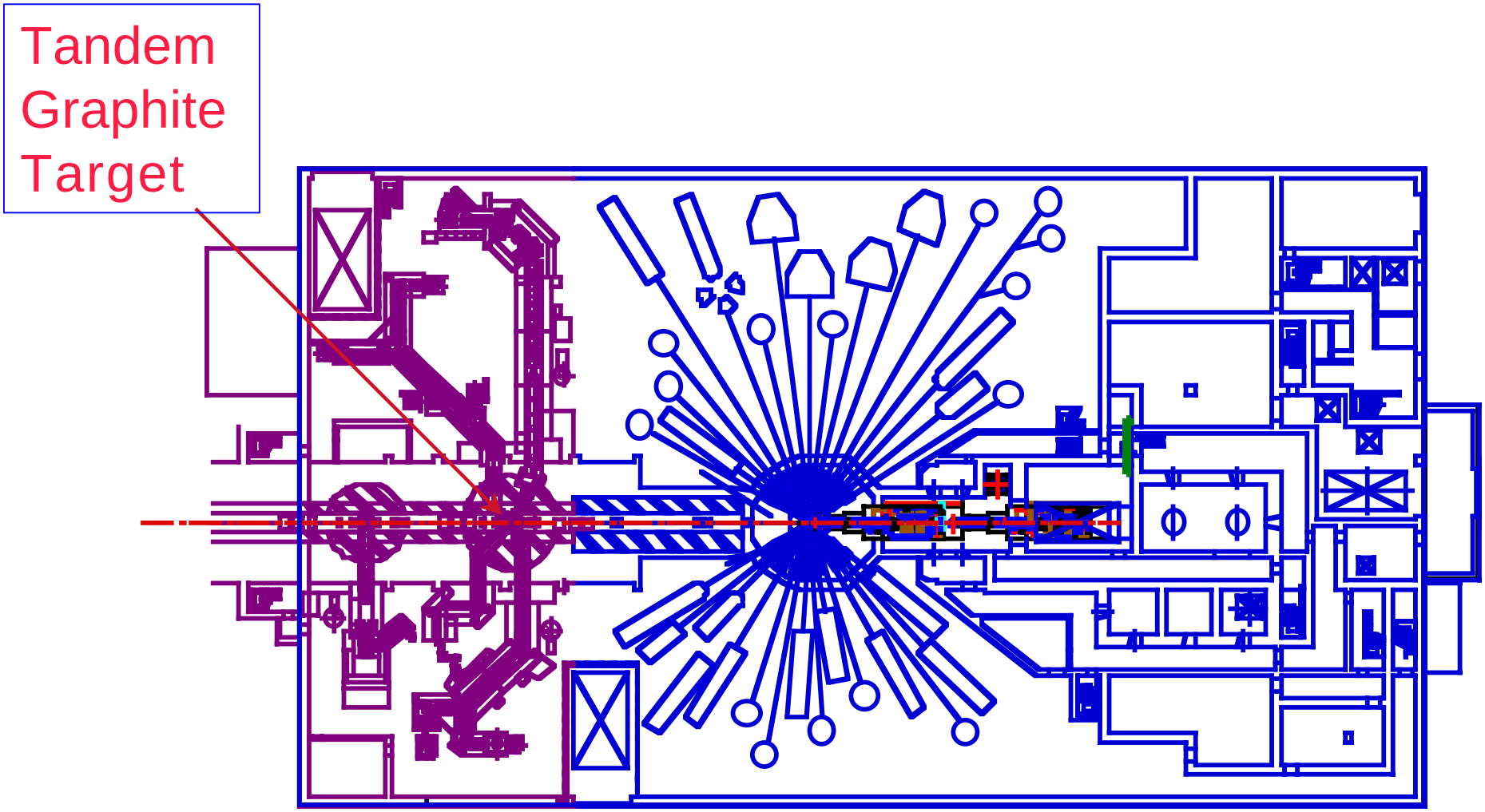
KEK Y. Miyake

- Tandem target for Muon Facility
- Influence of the Muon Target
  - Beam Loss as much as 60 kW for 20mm Graphite
  - Installation of three set of Collimators
  - Maintenance/High Radiation

    (Learning a lot from PSI experience)
    - Tunnel Structure
    - Shield Design
    - MIC Magnet
    - Pillow Seal
    - Design of the Air Handling System
      - NO_X Production
      - Ar-41etc. Production
- Summary

Material Life Science Facility

Muon Science Facility



Comparison between Tandem Type Target & Separate Facility

	Tandem Type Target	A separate Facility with our own Dump
Beam Sharing	Always１００%	？% : ？%
Building	Common Building	A separate Building
Crane	Common Crane 60ton for Target, Scraper Maintenance	Separate Crane 60ton for Target, Scraper Maintenance
Beam Dump	Not necessary	Required For hot TritiumWater
Cooling Facility	Common Facility	Separate Facility
Air Condition	Common Facility	Separate Facility
Proton Beam Line	1 line	Separated by Kicker Magnets 2 lines
Magnet for the primary line	Maintenance can be done commonly	Separate maintenance
RI Storage	Common Facility	Separate Facility
Accident	Beam Stop	Independent Operation
Scraper	Required for Neutron Target and Magnet	Required for Magnet
Beam Loss	１０% loss at the targets	None but Beam sharing ？% : ？%

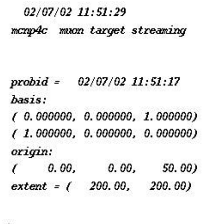
Dedicated Design for the Tundem Muon Target

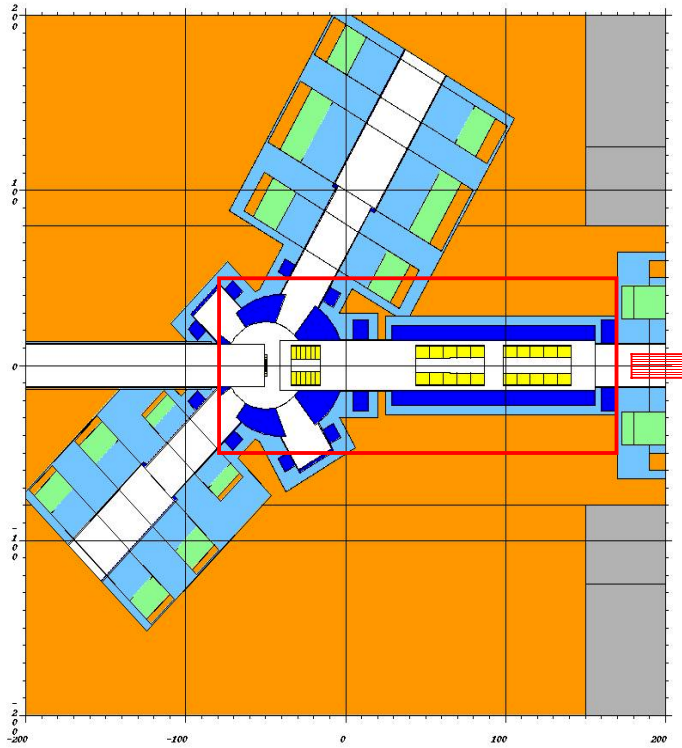
- Beam Loss as much as 60 kW for 20mm Graphite
  - Heat, DPA, Radiation
- Collimators and Target
  - How to Cool
  - Stress
- Maintenance/High Radiation

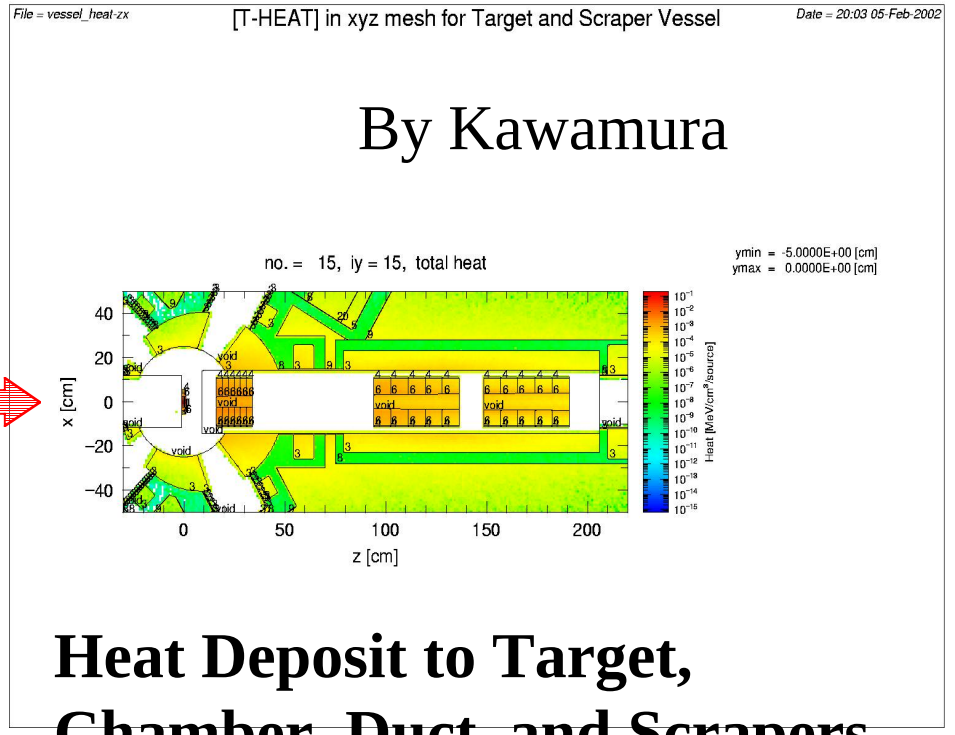
  (Learning a lot from PSI experience)
  - (MIC Magnet,)
  - Shield
  - (Pillow Seal
  - Design of the Air Handling System
    - NO_X Production
    - Ar-41etc. Production

Heat, DPA, Radioactivity

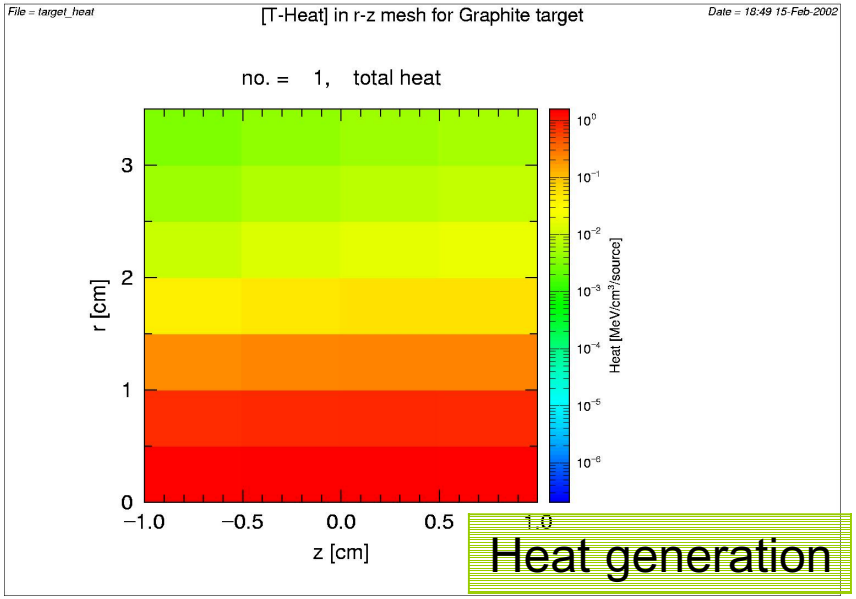
- Heat generation, DPA, Radioactivity production induced by proton beam and secondary particles are estimated by NMTC/JAM, MCNP and DCHAIN-SP.







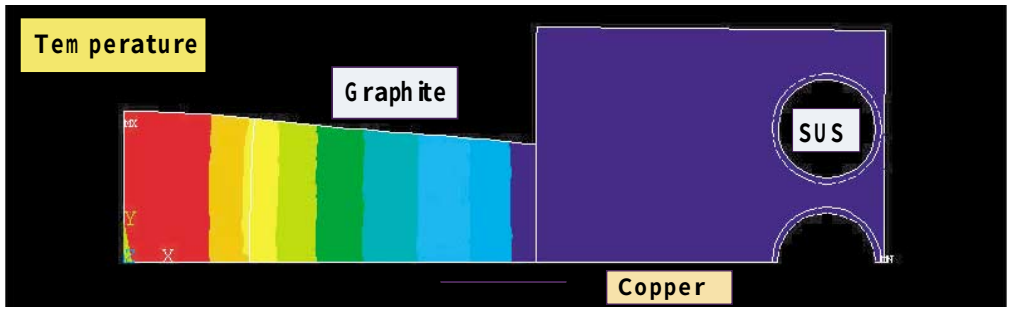
Simulations of graphite target

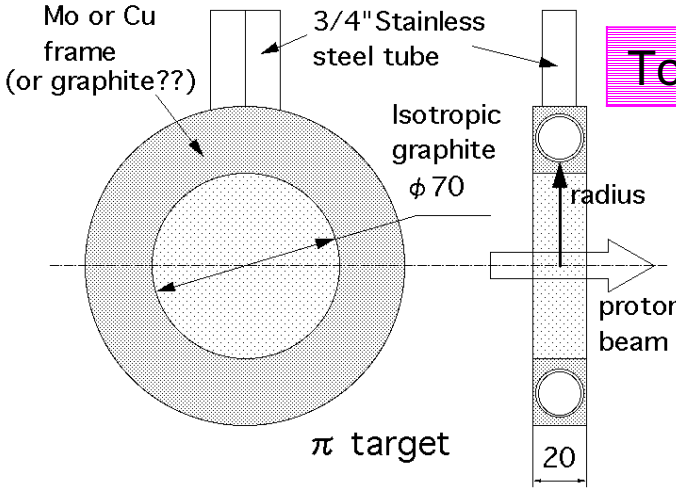


Heat generation

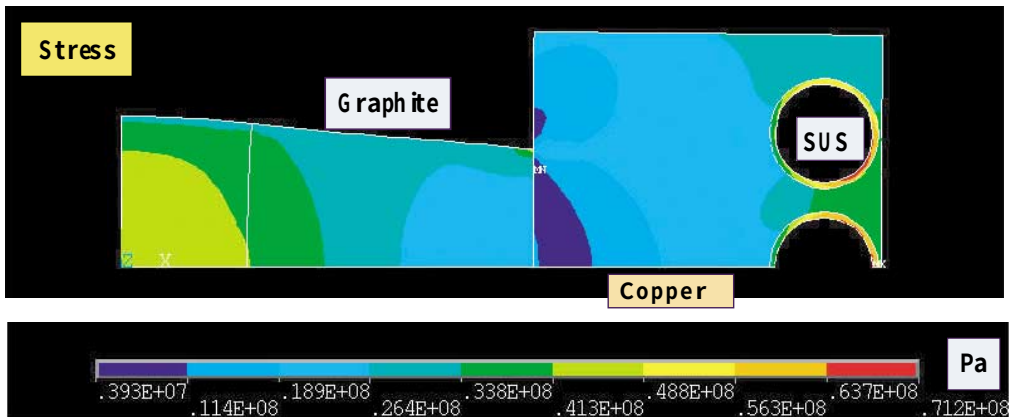
Target System
- Target chamber
- Plug shield
- Cask

Evaluation by ANSYS
- Thermal Properties
- Stress By Makimura





Total 3.3kW



Collimators

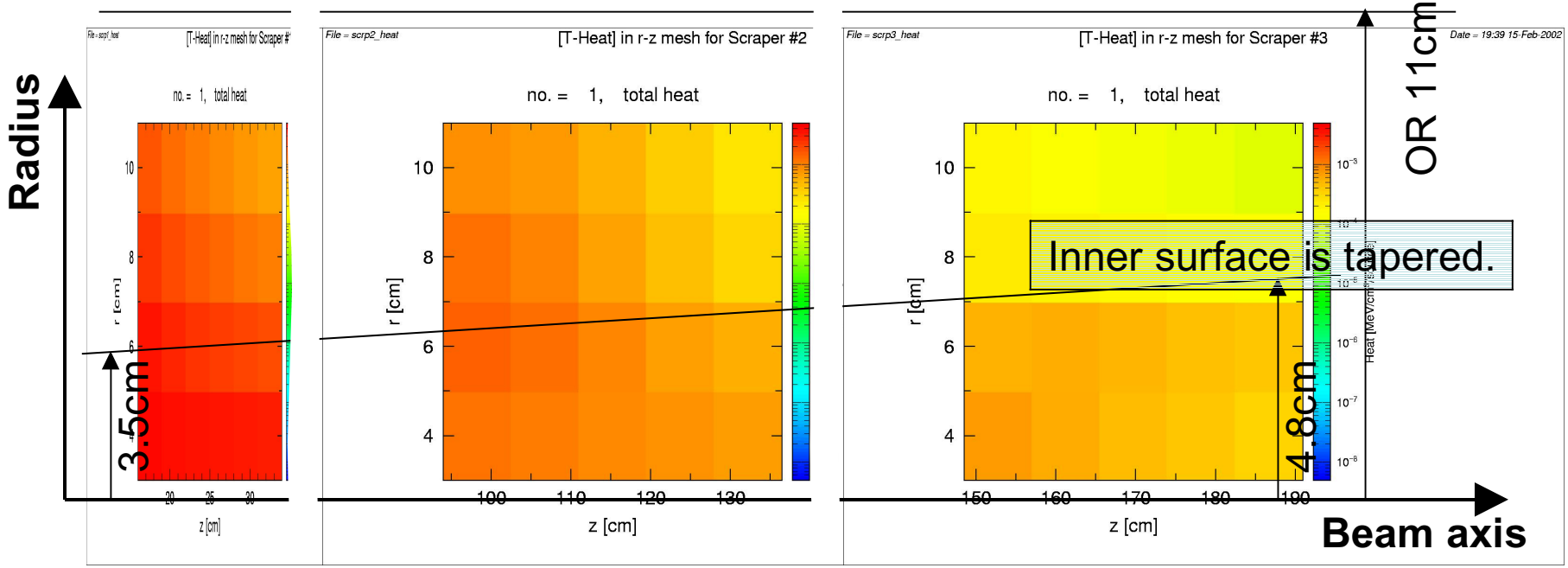
- Beam Loss less than 10 % --> **10, & 20 mm Graphite**
- No Window
- Installation of Collimators
- No Significant Effect to the Neutron Source
- **Heat generation in** Collimators **#1 - #3.**

By Kawamura

#1 5.7kW

#2 5.0kW

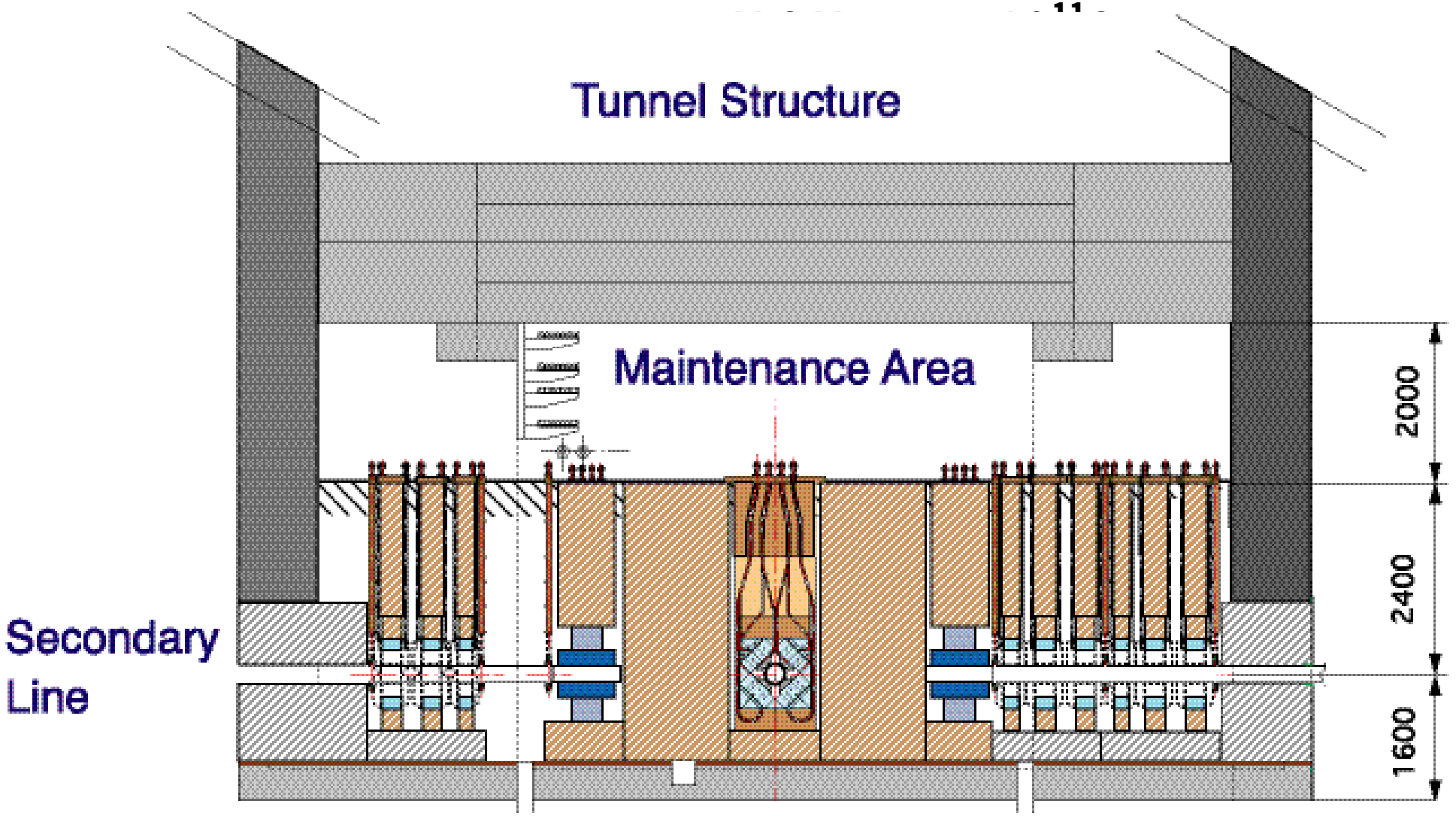
#3 1.8kW



Tunnel Structure

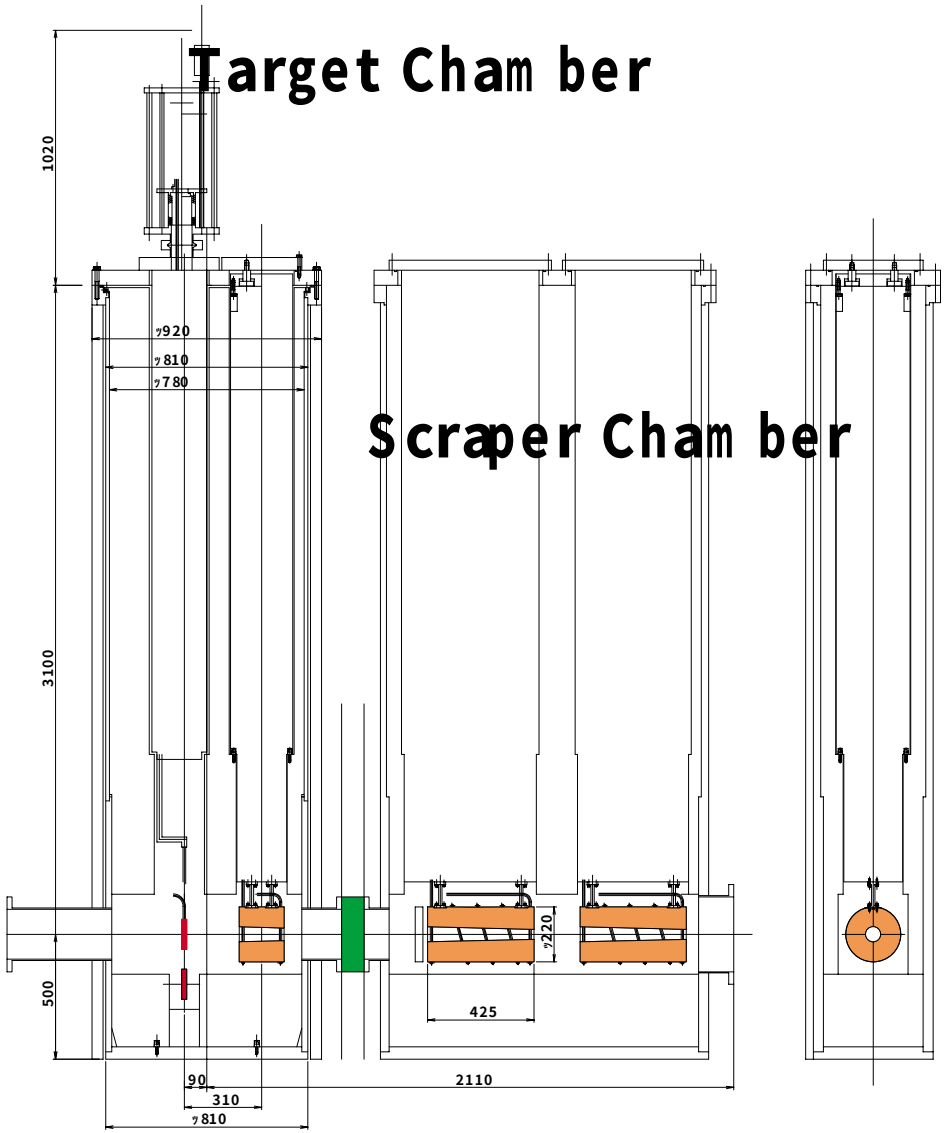
(maintenance)

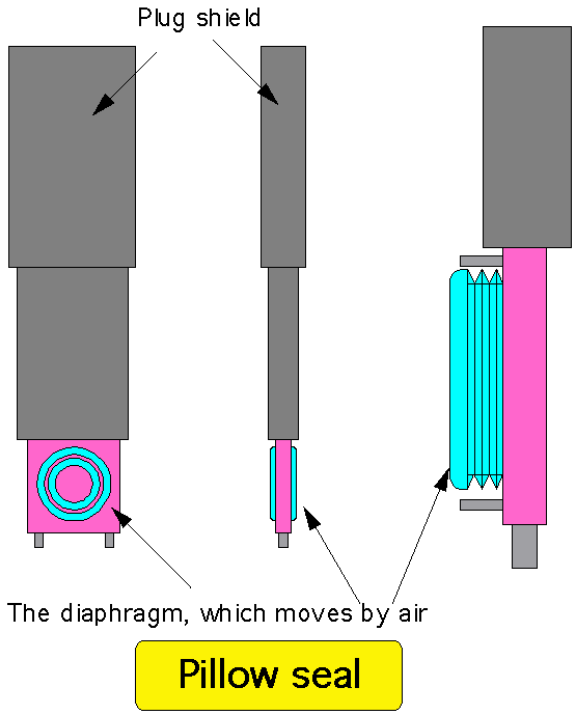
- Beam Height 1.6m
- Maintenance Area 4-6m

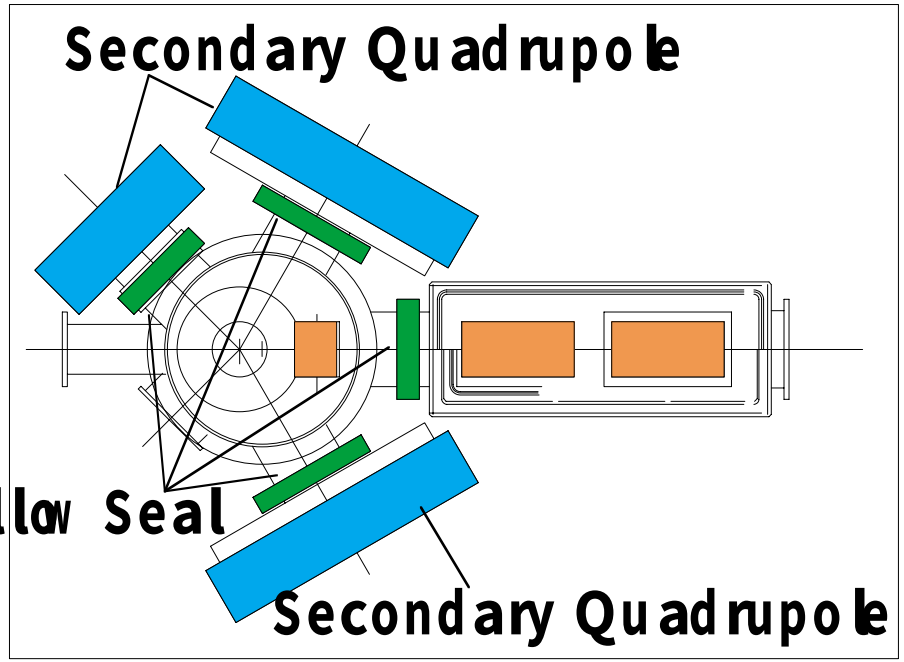


Target chamber

(maintenance)



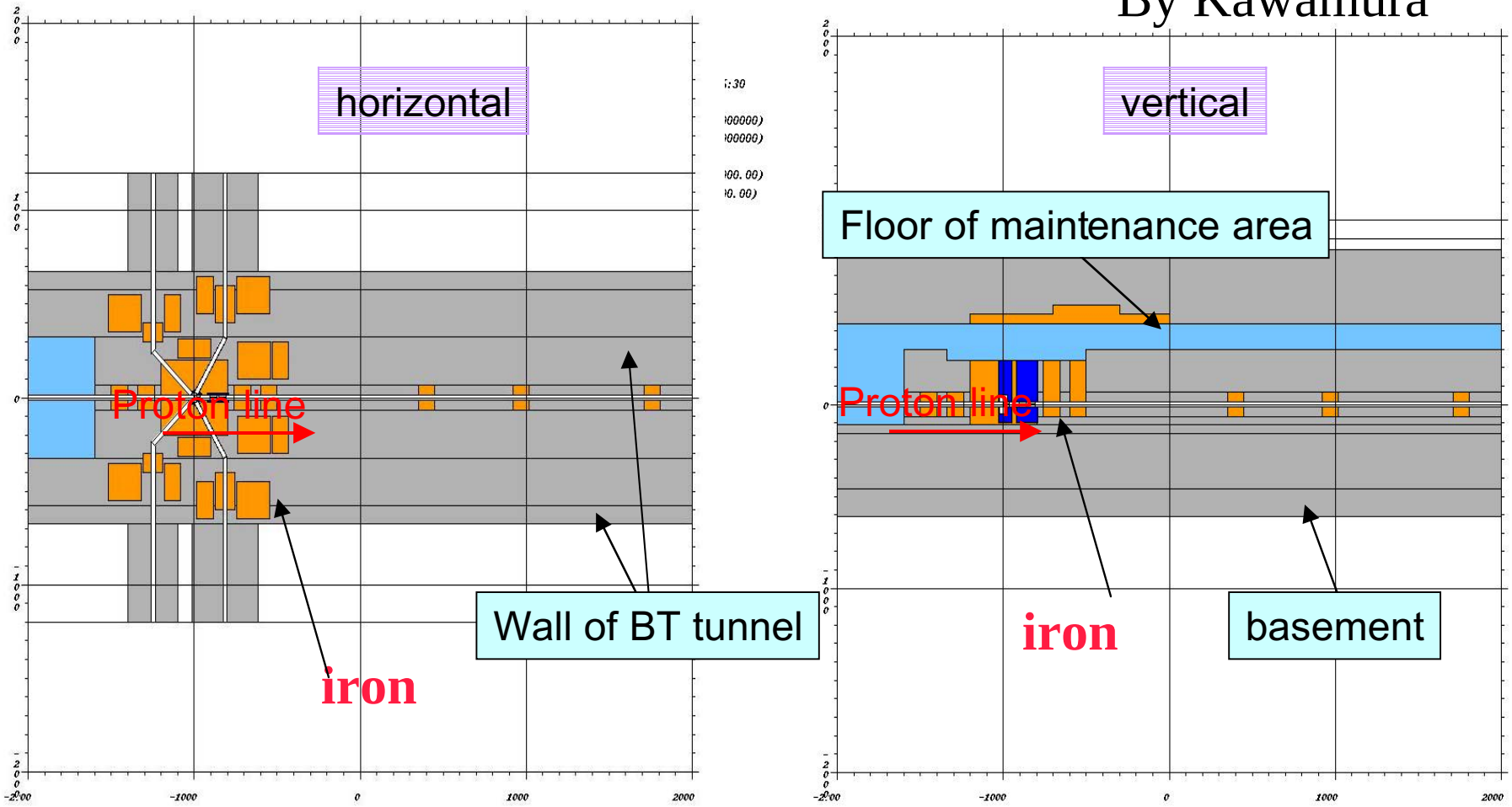




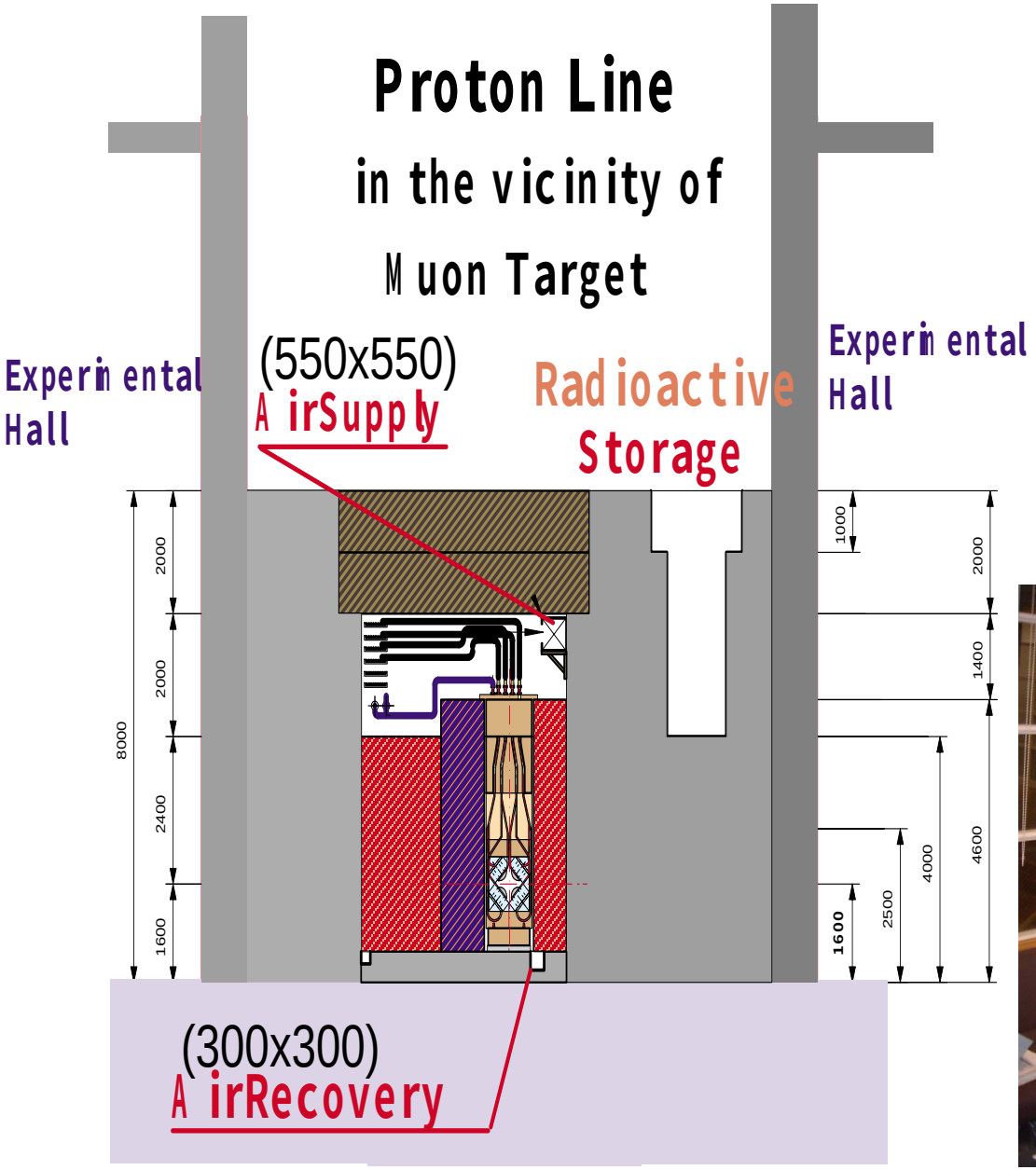
Radiation & Duct streaming shield structure

- From 10-m upstream to 30-m downstream, we estimate the surface doze on the wall of 3NBT tunnel and so forth, by using MCNPX.

By Kawamura



M2 Line Air Handling System

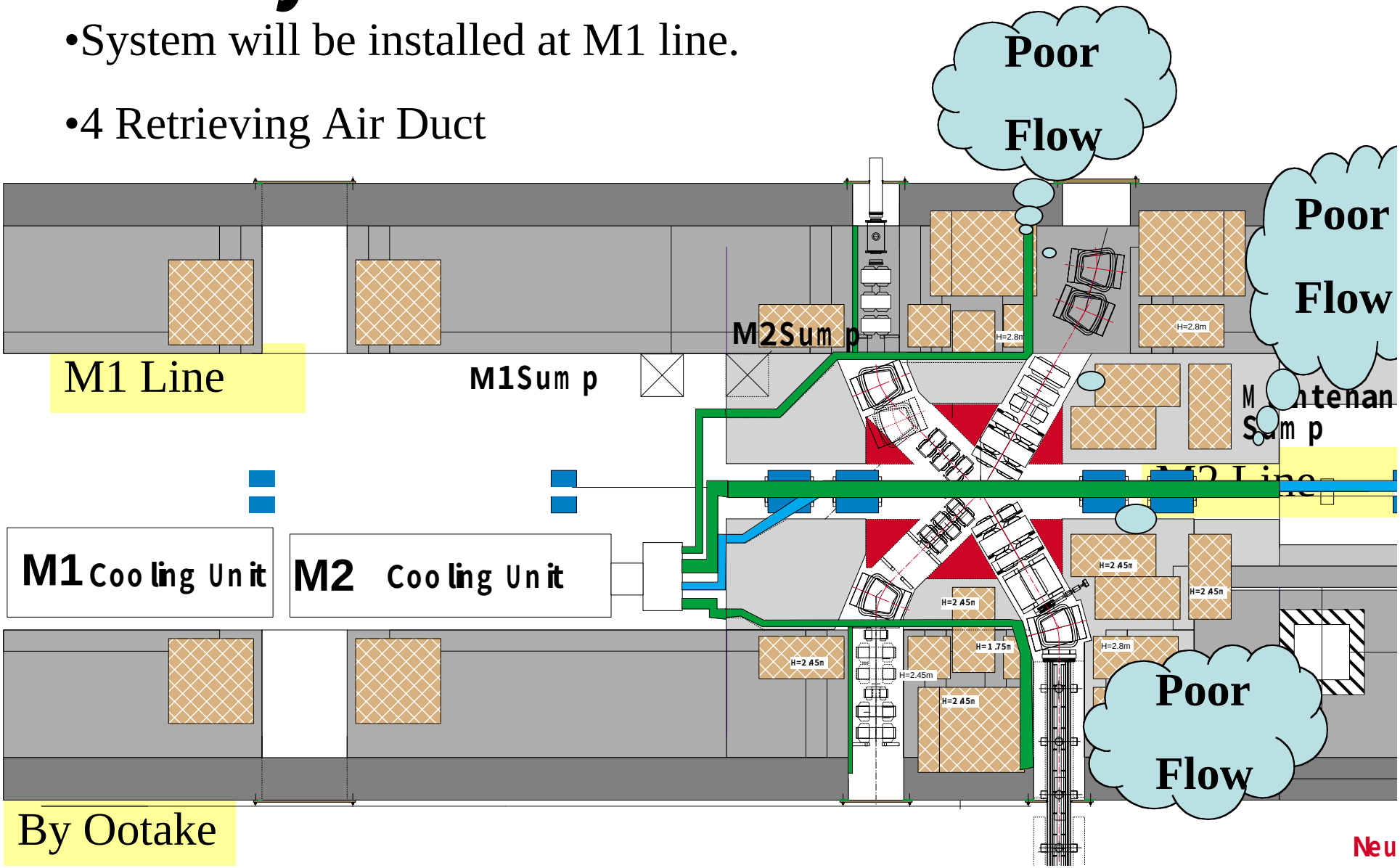


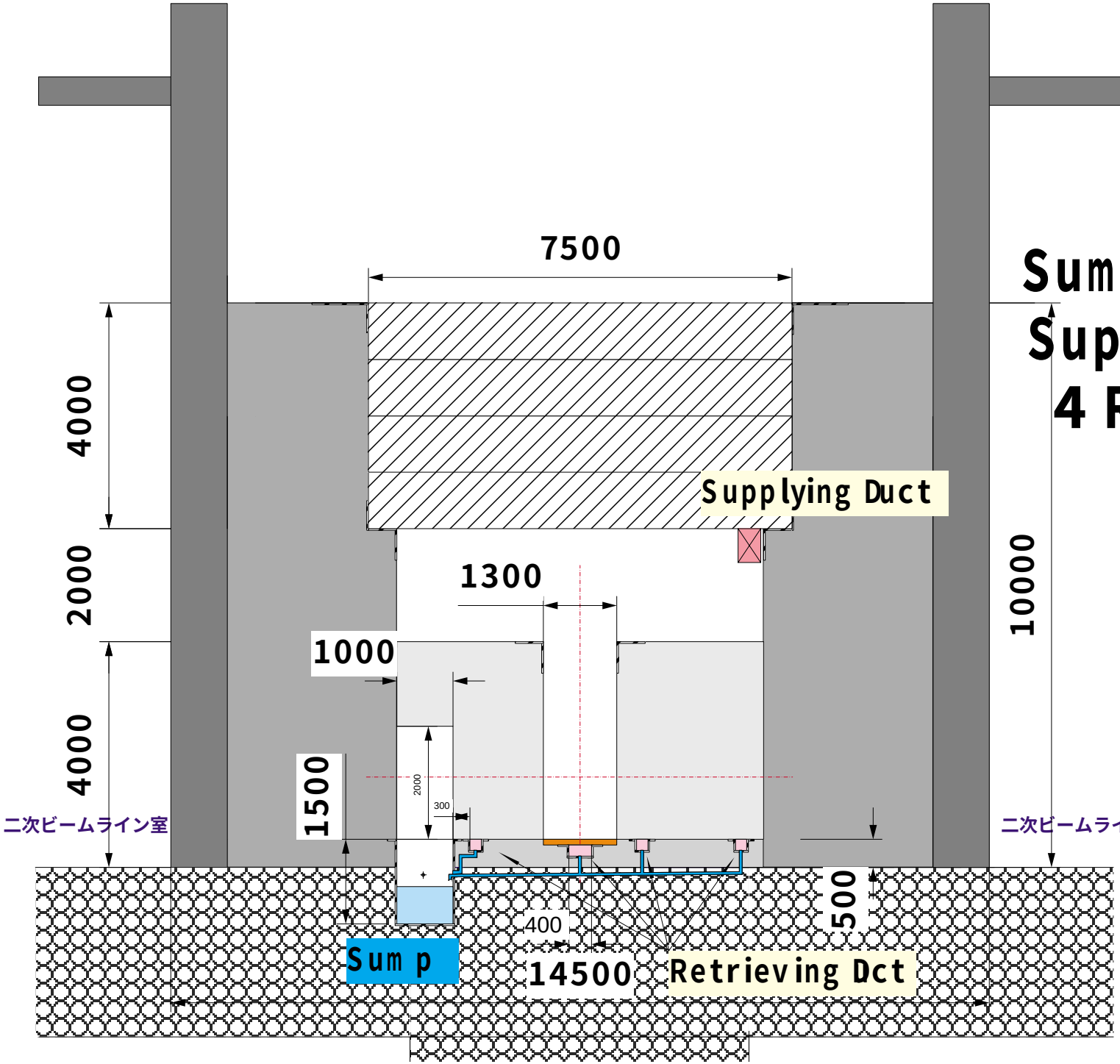
Refering to the
PSI(> 1MW) System

- Supplying cold air
  - –from Maintenance Area
- Retrieving
  - –from the 0.2-0.5mFL

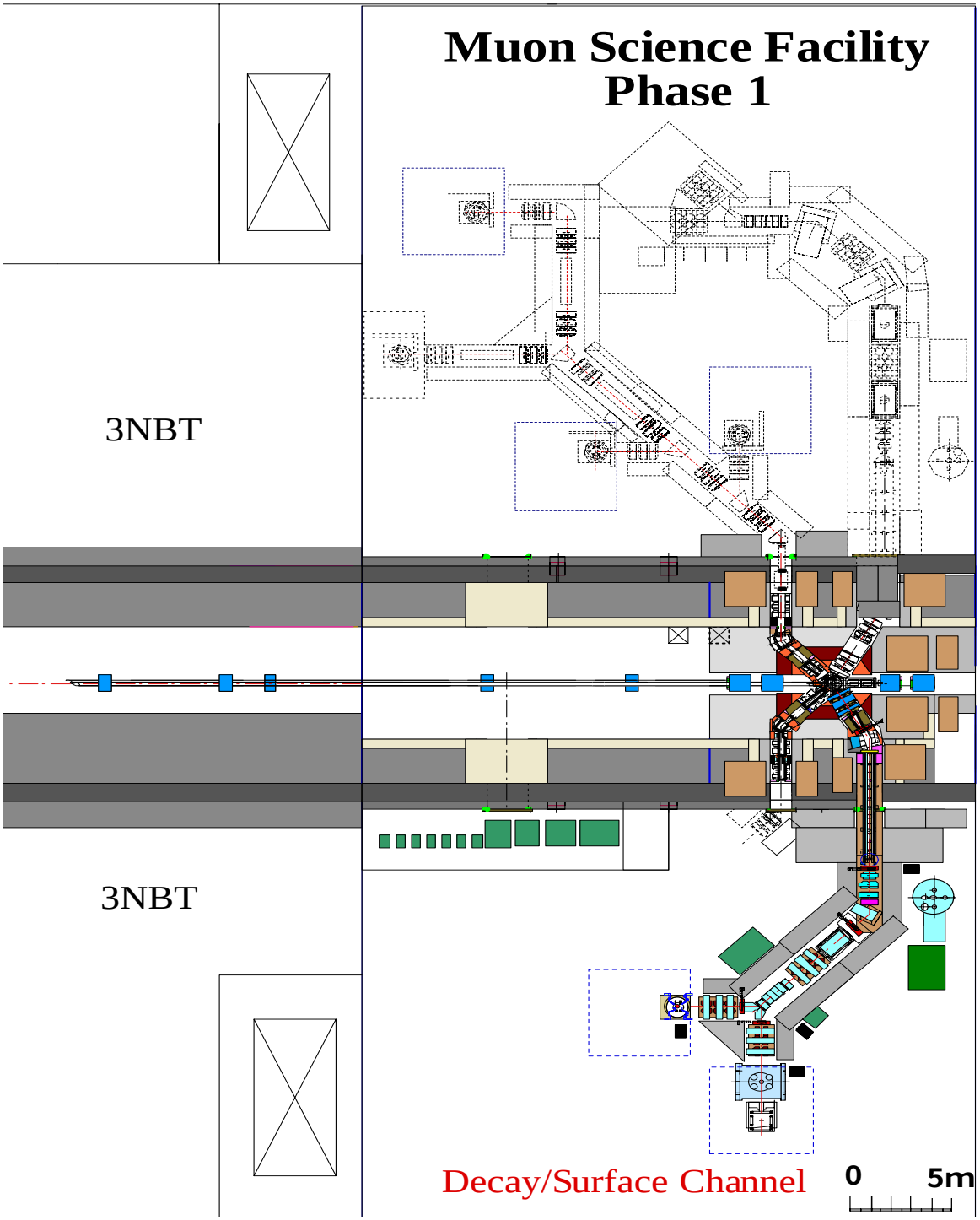
Air-Circulating/Ventilating System at M1・M2 line

- System will be installed at M1 line.
- 4 Retrieving Air Duct





Sumps and Air Supplying and 4 Retrieving Ducts

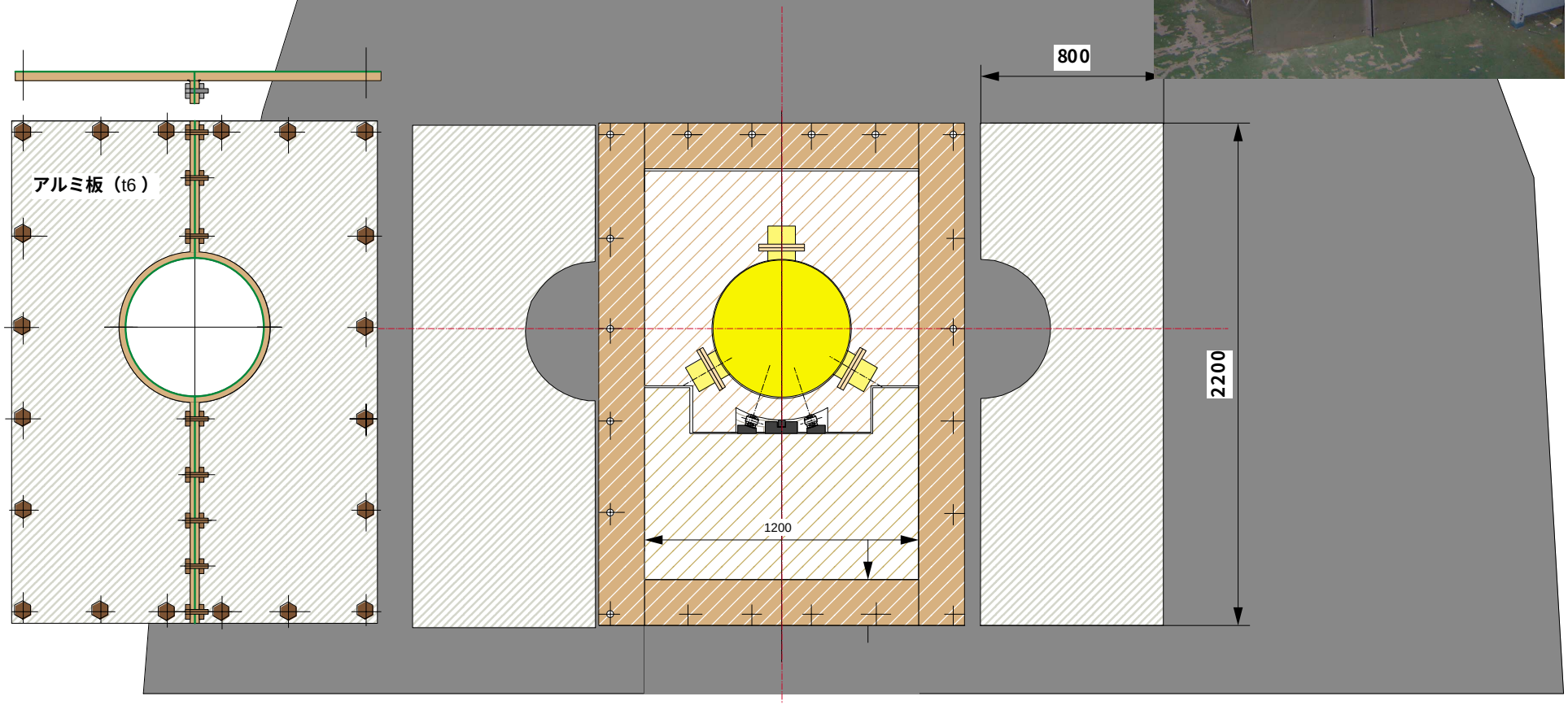


No Ventilation will be done, but just circulating air for a while for NM Tunnel

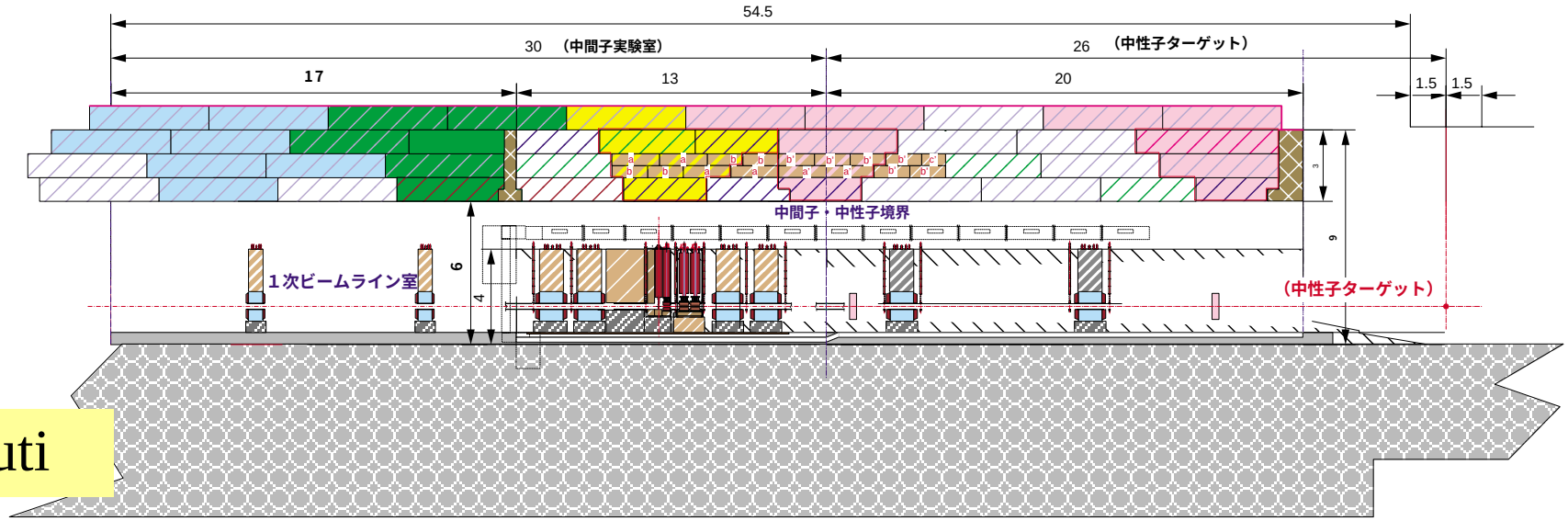
Sealing is important

Exit of the 2ndary Line on the wall

Fukuchi

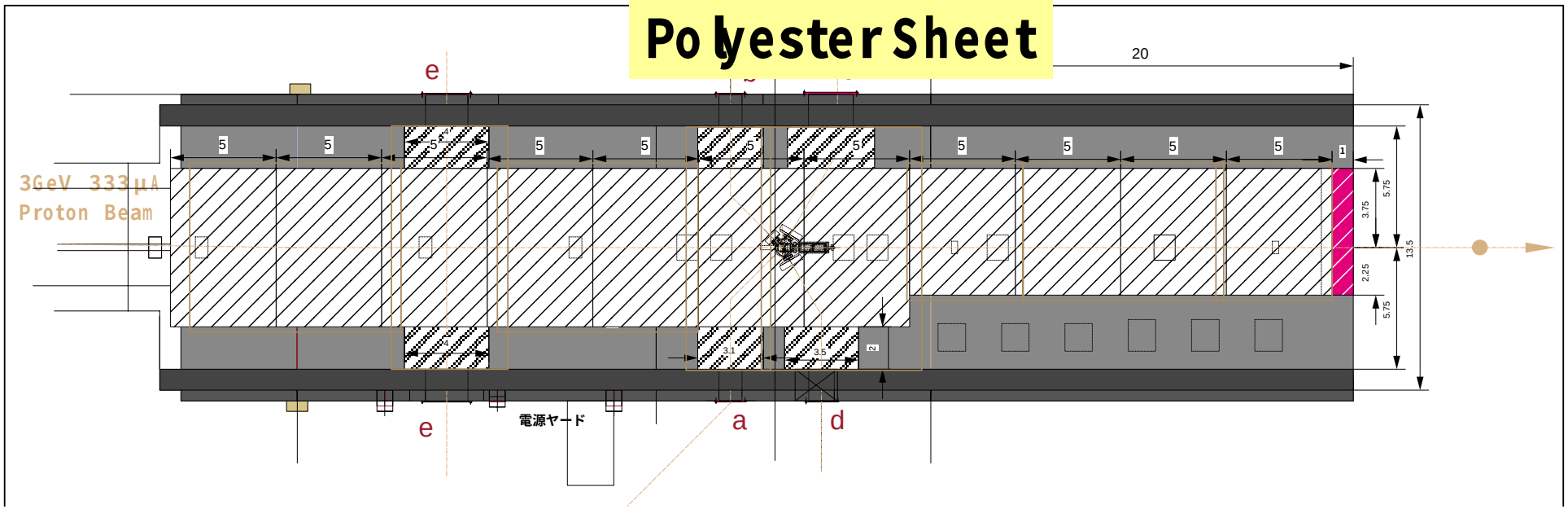


Sealon the top of the concrete b bcks



Fukuti

Po lyester Sheet



Polyester Sheet

Summary of Cascade Target Design for Muon Facility

- Tandem Target Layout was adopted.
- Radiation / Duct-streaming by MCNPX
  --> Optimization of Collimators and Shield
- Heat, DPA & Activation by NMTC
  --> Design of Collimators and Target
- Maintenance from the Maintenance Area
- Design of Air Handling System

Thanks for the great experience at PSI.

Thanks for the Cooperation from 3NBT group.