

Polarized Deuteron

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Pol.d Beams at RIBF

AVF+RRC

- $E/A = 65 - 135 \text{ MeV}$
- Beam Intensity $\sim 200 \text{ pnA}$



AVF+RRC+SRC

- $E/A = 170 - 440 \text{ MeV}$
- Beam Intensity

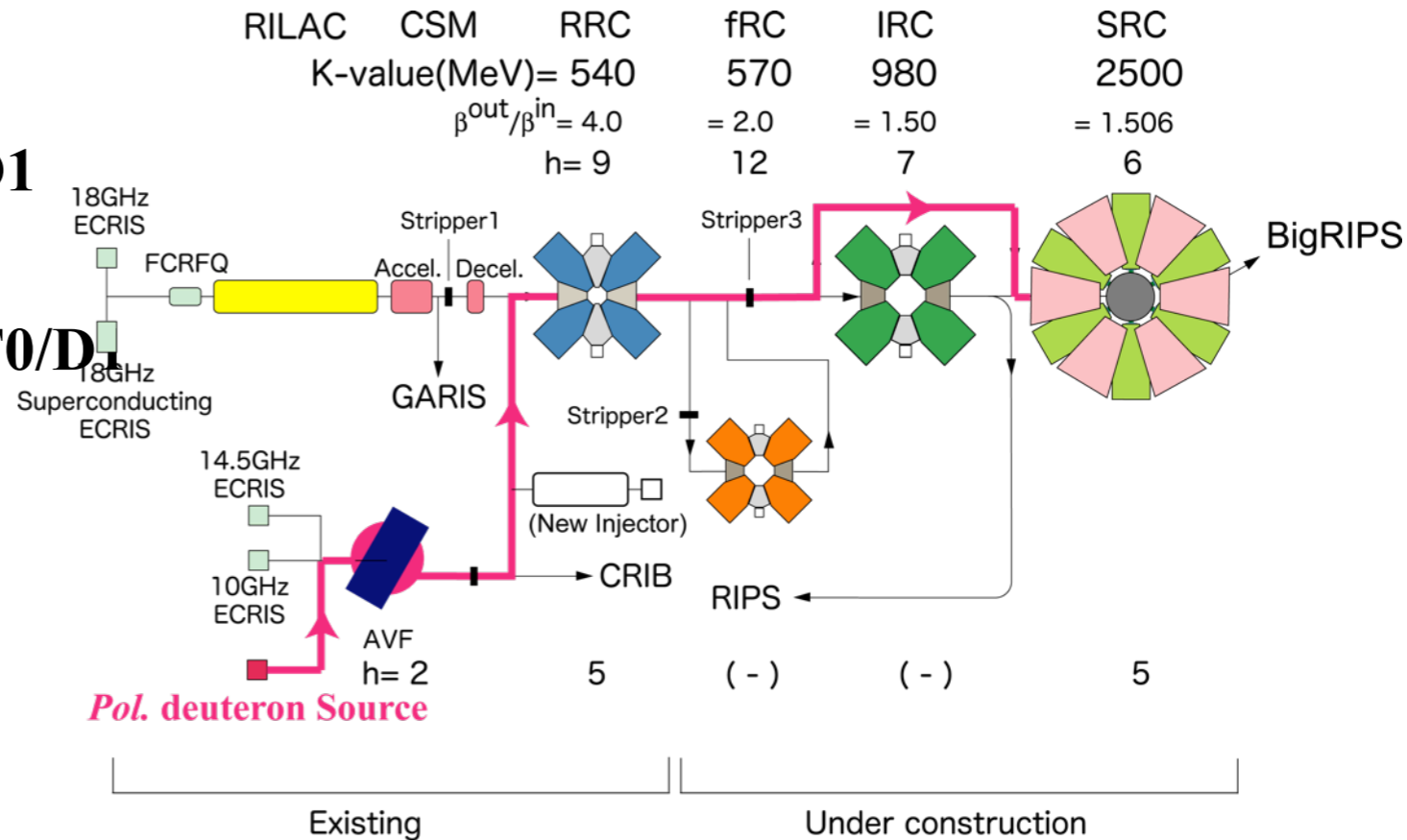
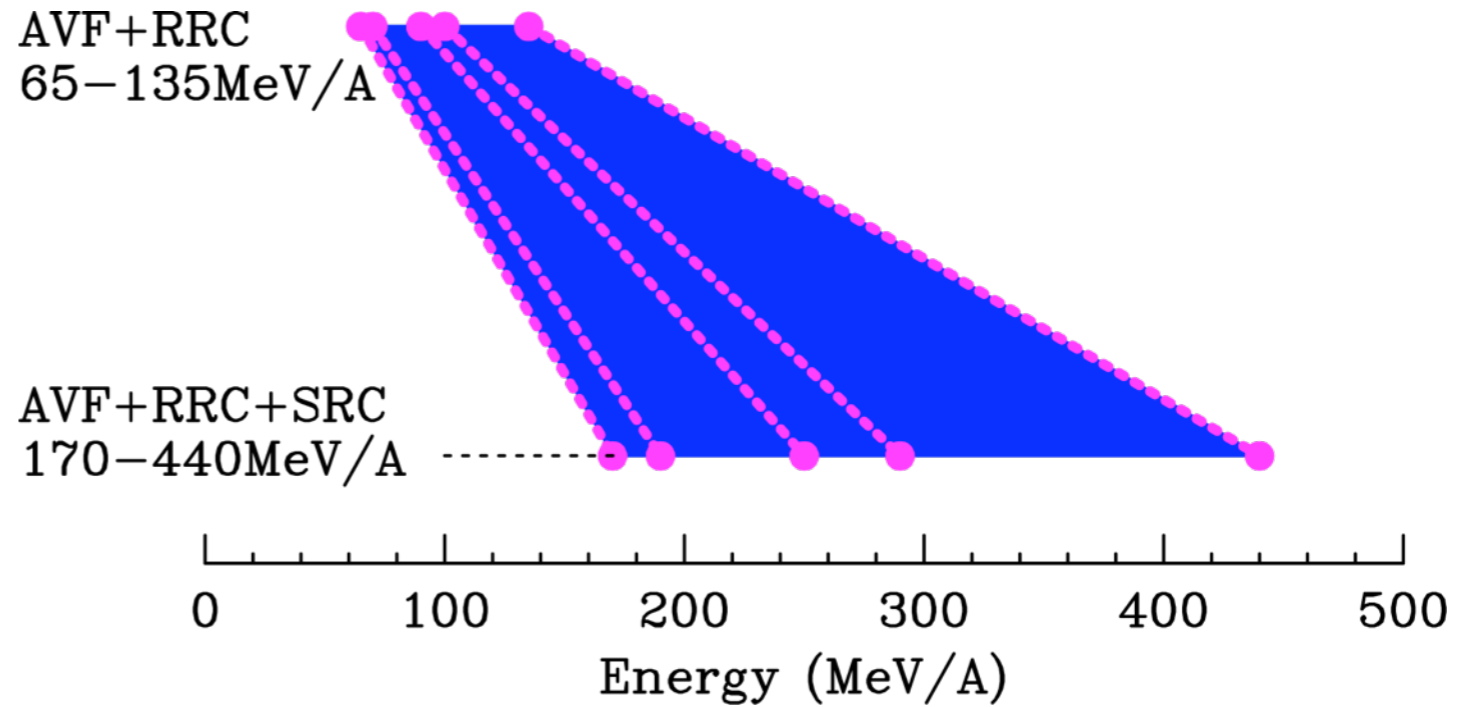
- 100 pnA

up stream from BigRIPS F0/D1

- 1 pnA

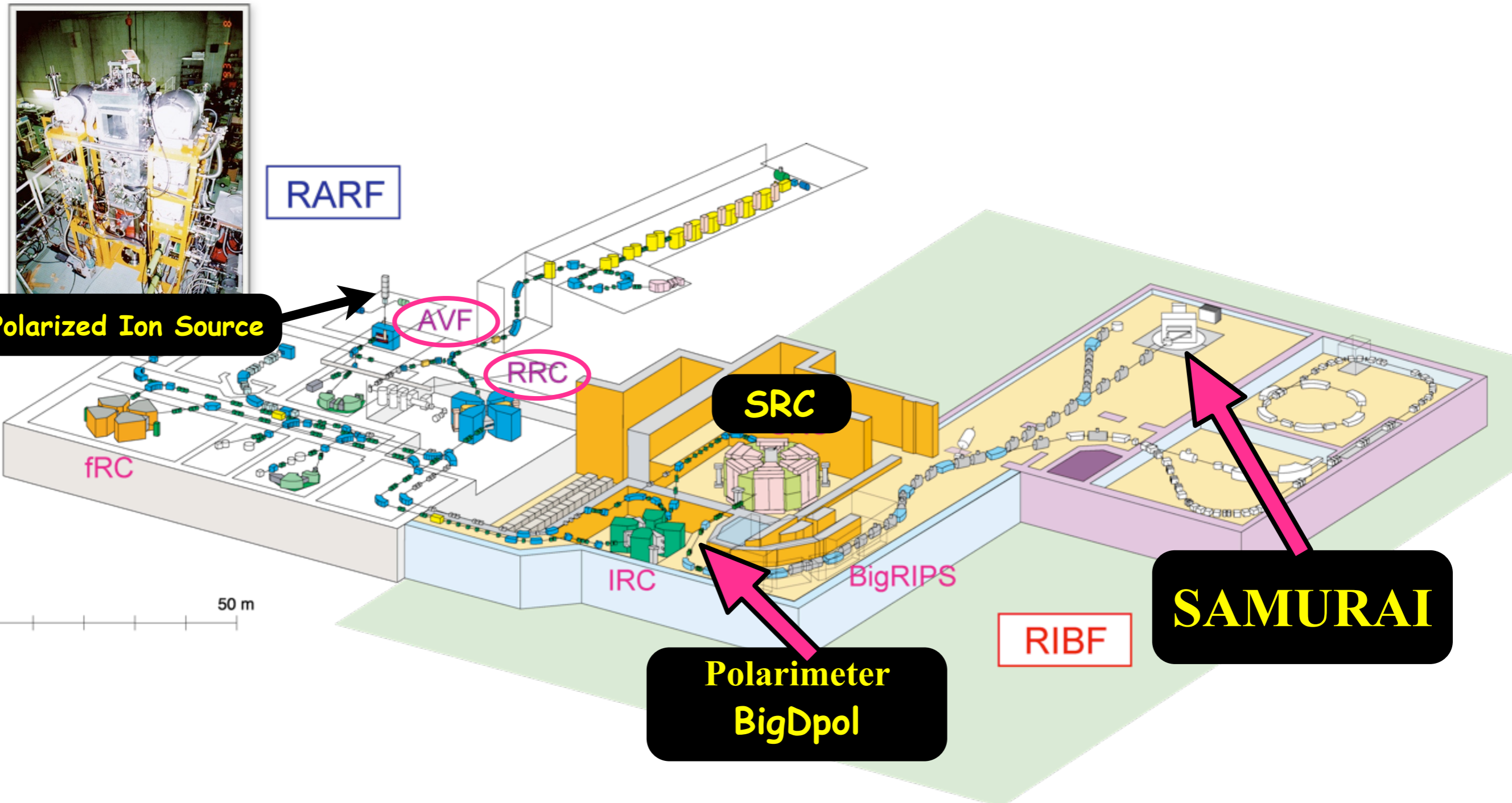
down stream from BigRIPS F0/D1

- Radiation Safety



Experiments with Primary Polarized deuteron beam at RIBF

- RIBF : pol.d beams up to 440 MeV/nucleon are available by “AVF+RRC+ **the new cyclotron SRC** “.
- Physics : Study of Three Nucleon Forces etc.. via few nucleon scattering, e.g. $d+p \Rightarrow$ tomorrow
- First commissioning/experiment of pol.d beams at RIBF was performed with the **polarimeter BigDpol** in April, 2009.



High Resolution Mode of SAMURAI - Q3D mode -

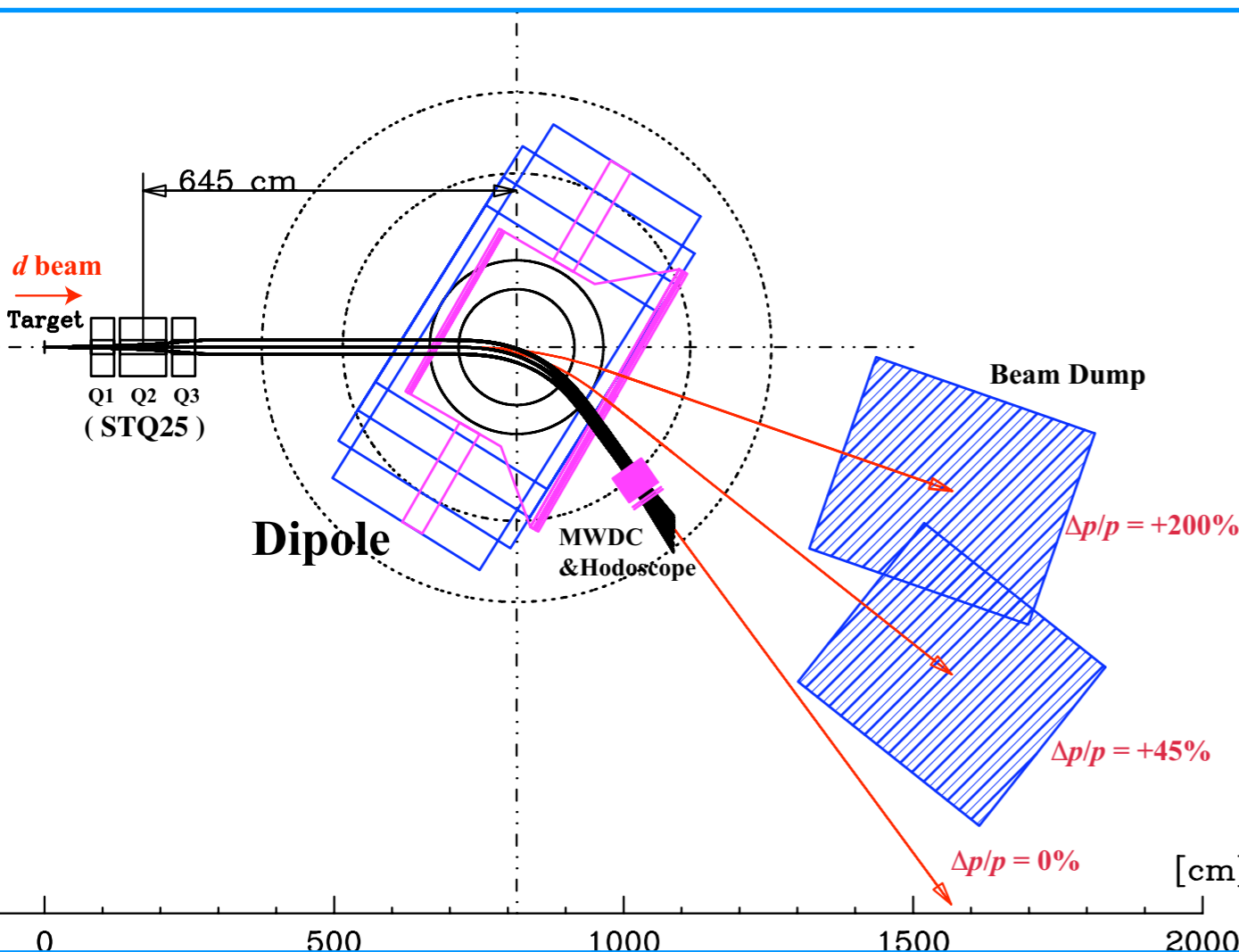
In experiments with polarized deuteron beams **high momentum resolution** $p/\Delta p \sim 1600$ for 1.5 GeV/c proton

is required.

The triplet Q-magnets STQ25 are served as as a analyzer magnet in conjunction with the SAMURAI dipole magnet.

- Dispersion : 2.2m
- Bending Angle : 53.6°
- Magnification
 - $(x|x) = 0.43, (y|y) = -14.2$
 - Angular acceptance
 - $(h,v) = (\pm 20\text{mrad}, \pm 90\text{mrad})$
- Momentum Resolution : $p/\Delta p \sim 3000$

(by OPTRACE)



Movable Beam Dump

- W ($3\text{cm}^\phi \times 20\text{cm}^D$) + Pb ($25\text{cm}^\phi \times 40\text{cm}^D$)
- Volume : 49 m^3 ($4\text{m}^D \times 3.5\text{m}^D \times 3.5\text{m}^D$)
- Movable & Rotary

Detector System

- Multi-wire drift chamber ($70\text{cm}^W \times 120 \text{ cm}^H$)
- Plastic scintillator hodoscope
 - to cover $dP/P = \pm 3\%$

Beam Dump for deuteron beam

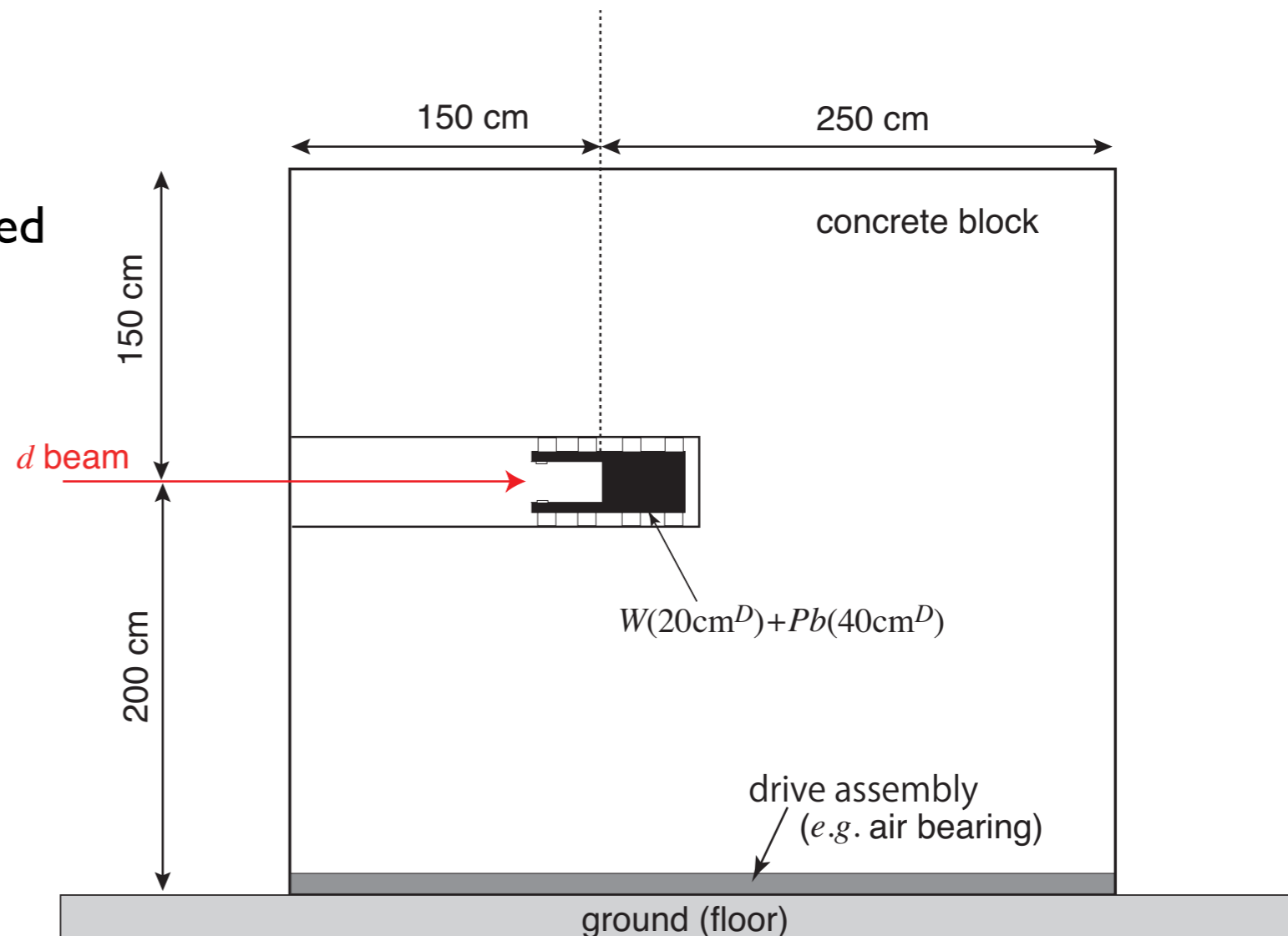
Movable Beam Dump

- **W (3cm ϕ ×20cm^D) + Pb(25cm ϕ ×40cm^D) for stopping *d* beams, & Concrete Blocks for emitted neutrons**
- **Volume : 49 m³ (4m^D × 3.5m^D × 3.5m^D)**
- **Movable & Rotary Drive : Air Bearing (which moves a heavy load with air power)**

Magnetic field is adjusted depending on the momentum of interest for the detected particles.

Correspondingly beam dump is set in an appropriate position.

Open geometry of SAMURAI makes it possible to move and place a large size of the beam dump.



Other equipments

In order to perform the experiments the following equipments should also be constructed.

- a. Scattering chamber and target system for the SAMURAI Q3D mode
- b. Beam monitoring devices for light ions ($Z=1$) at Big RIPS
- c. Exit vacuum window of the SAMURAI dipole magnet

Current status

So far the equipments for the experiments with polarized deuteron beams at the SAMURAI have not been funded yet. The equipments and their costs are listed in order of priority.

1. Beam dump (50 M JYen),
2. Scattering chamber and target system at SAMURAI in Q3D mode (5 M JYen),
3. Exit vacuum window (3 M JYen),
4. Beam monitoring devices for light ions ($Z=1$) at Big RIPS (3 M JYen),
5. Focal plane detectors (16 M JYen)

Acceptance at the exit vacuum window of the dipole magnet

