

Neutron detectors for (p, pn) reactions in SAMURAI75R1

K. Yasumura
Konan University

SAMURAI IWS 2024
Date: July 14-16, 2024
IBS, Dealing
July. 15 (Mon.) 14:00 (15+5)

Quasi-free (p, pn) scattering

~ Systematic study of neutron single-particle states for a wide range of A/Z & S_n ~

★ Two isotopic chains: $^{10-20}\text{C}$ and $^{48-52}\text{Ca}$

★ Observables to be extracted in (p, pn) reaction

🔧 Strength Distribution of the single-particle states as a function of S_n

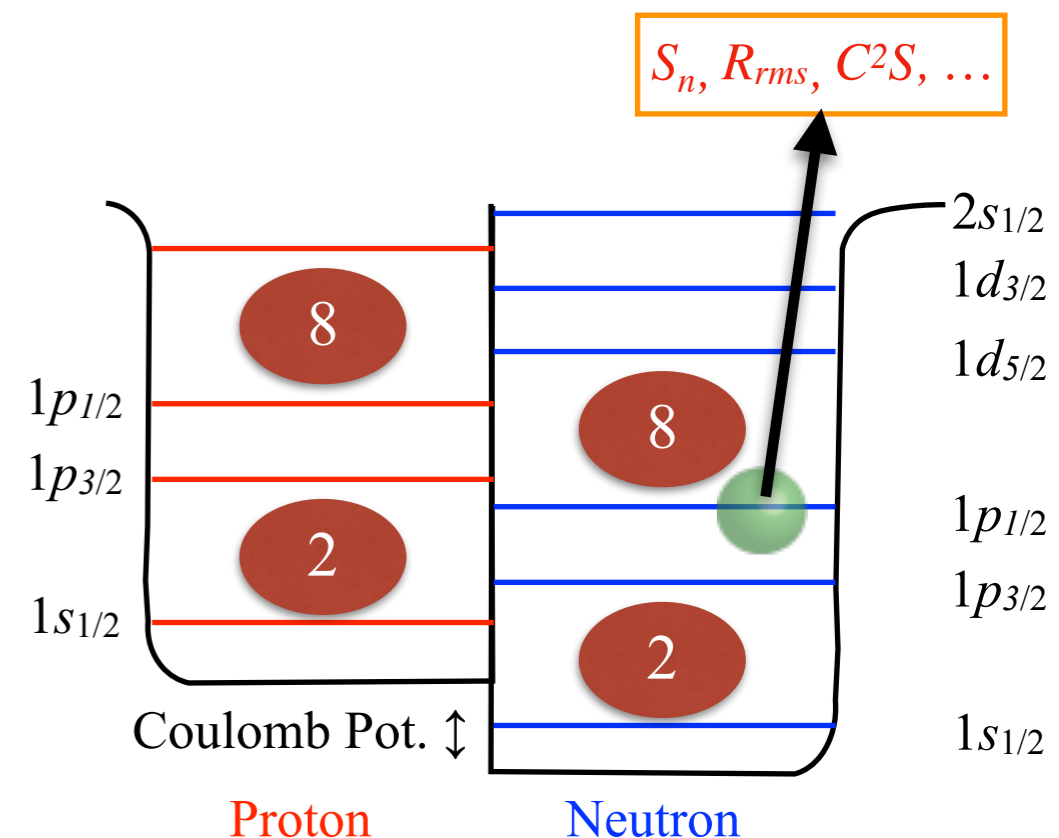
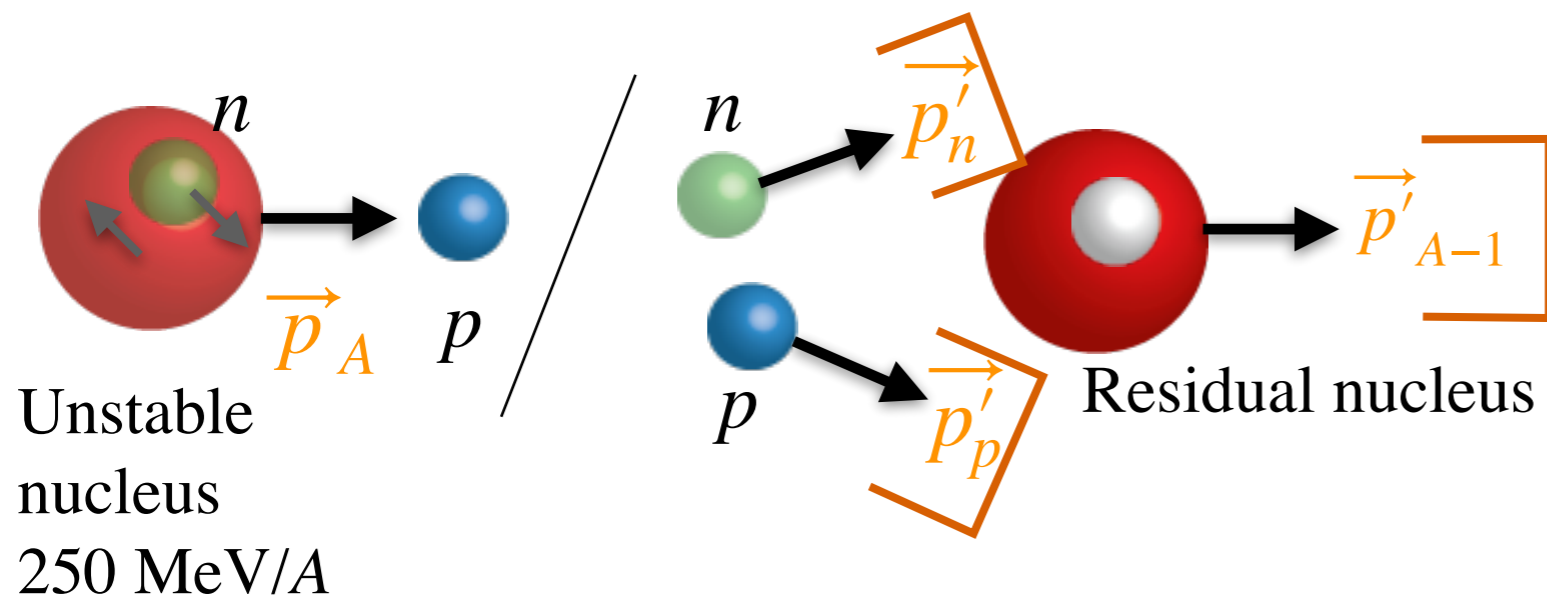
🔧 R_{rms} of each neutron single-particle state

🔧 Distribution of C^2S and R_s (Reduction factor) as a function of S_n

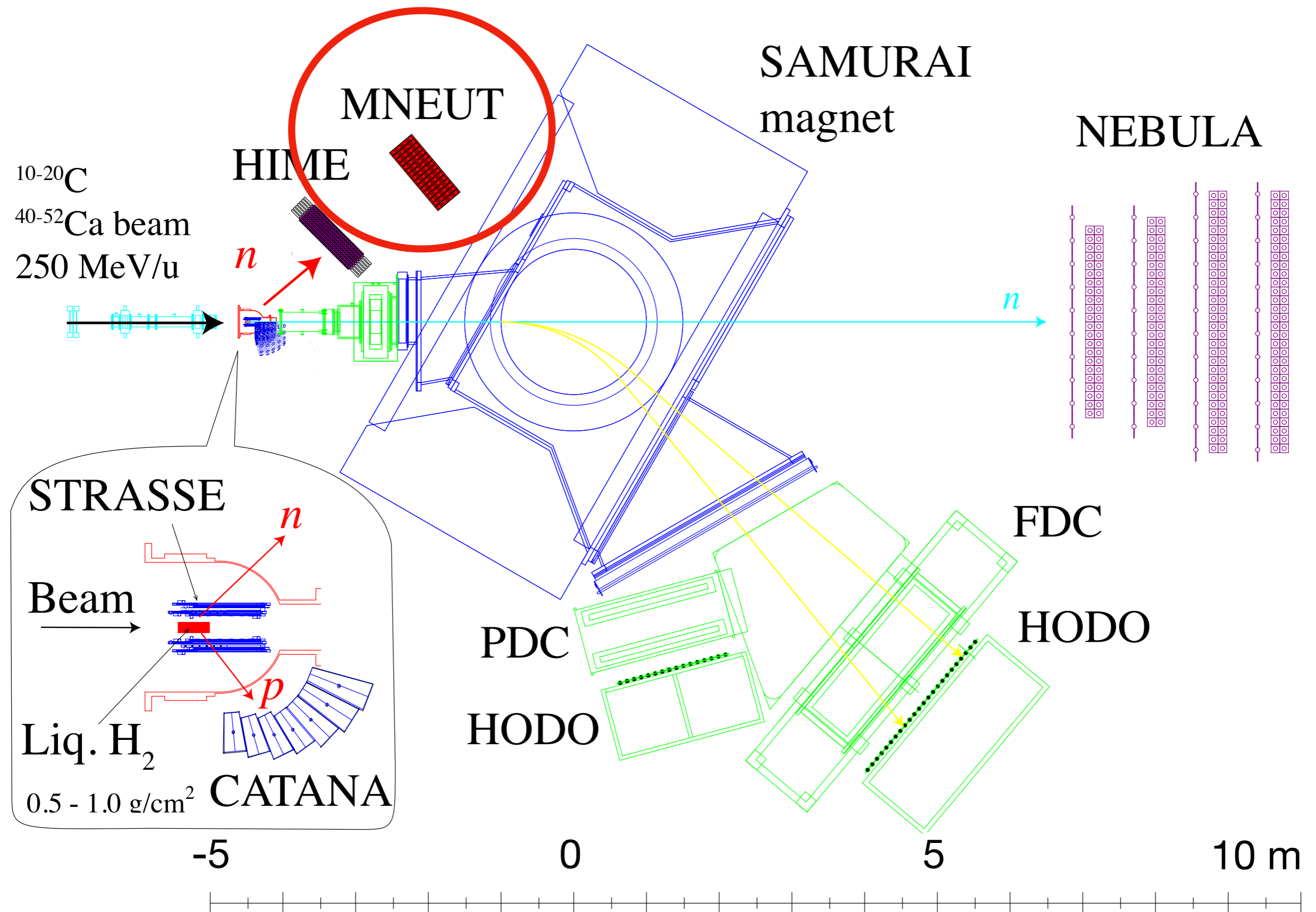
🔧 Decay mode of respective neutron single-particle (hole) states

Note: (p, pn) data are much more scarce even for stable nuclei compared to ($p, 2p$)

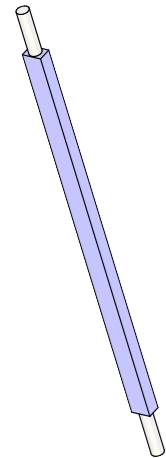
(p, pn) reaction in inverse kinematics



Experimental setup



MNEUT

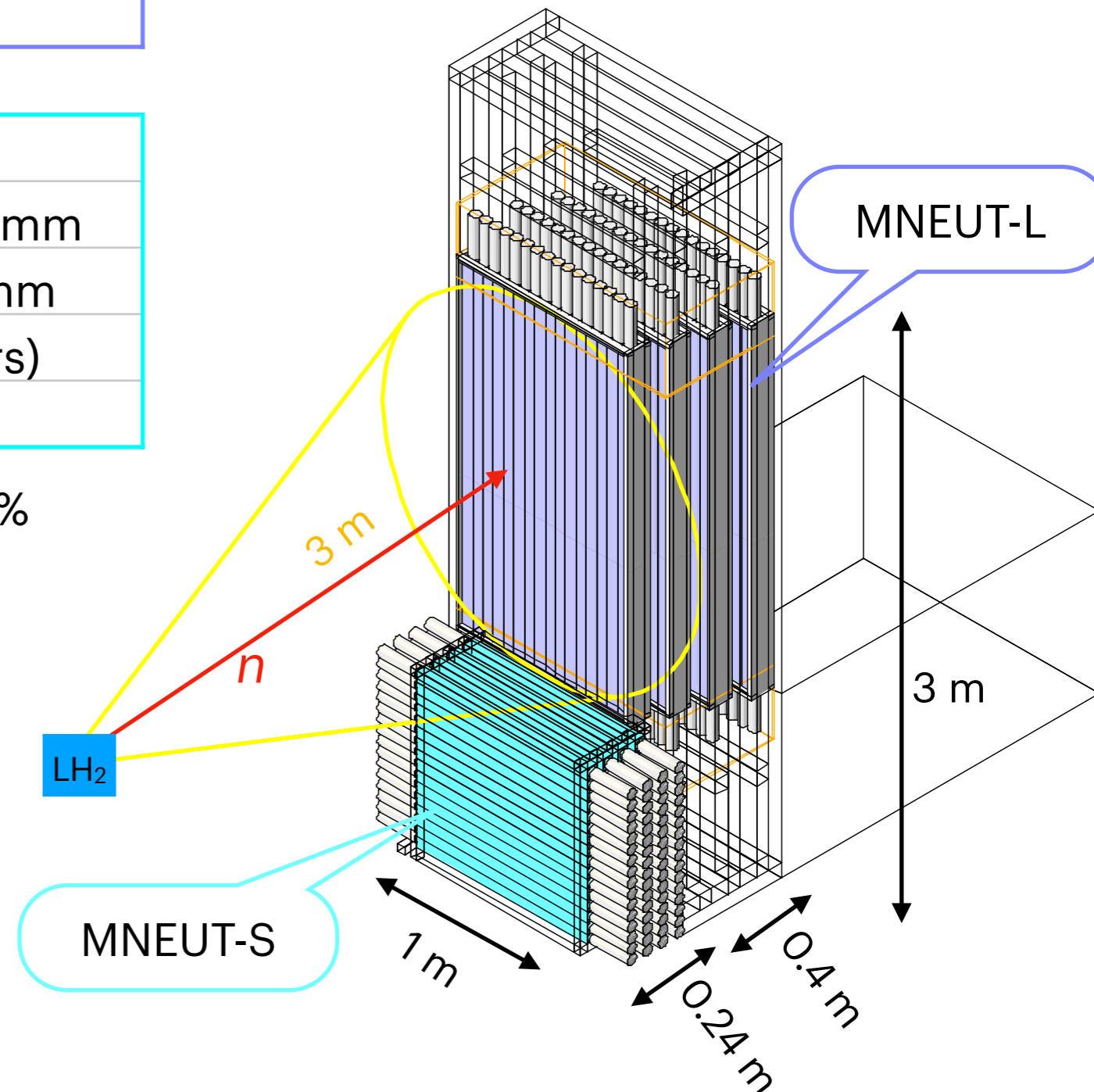


MNEUT-L	
Total size	X:1040, Y:2000, Z:400 mm
Bar size	X:65, Y:2000, Z:10 mm
# Bar	64 (16 bars x 4 layers)
PMT	H1949 + H1161



MNEUT-S (NEW)	
Total size	X:1070, Y:960, Z:240 mm
Bar size	X:1070, Y:60, Z:60 mm
# Bar	64 (16 bars x 4 layers)
PMT	BICRON (R329)

MNEUT-S : Increase of $\varepsilon_n \times \Delta\Omega \rightarrow +30\%$



MNEUT

- MNEUT-L

- ☒ Assembling the bar (-2011)
- ☐ Signal check at SAMURAI (2025)

- MNEUT-S

- ▶ Re-assembling the bar (2024)
- ☐ Signal check at SAMURAI (2025)

- Magnetic shields

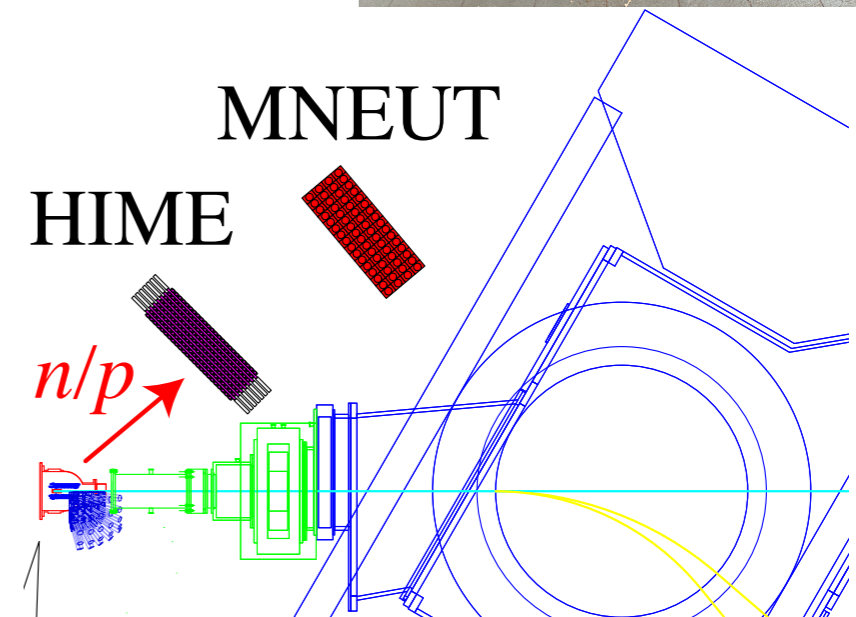
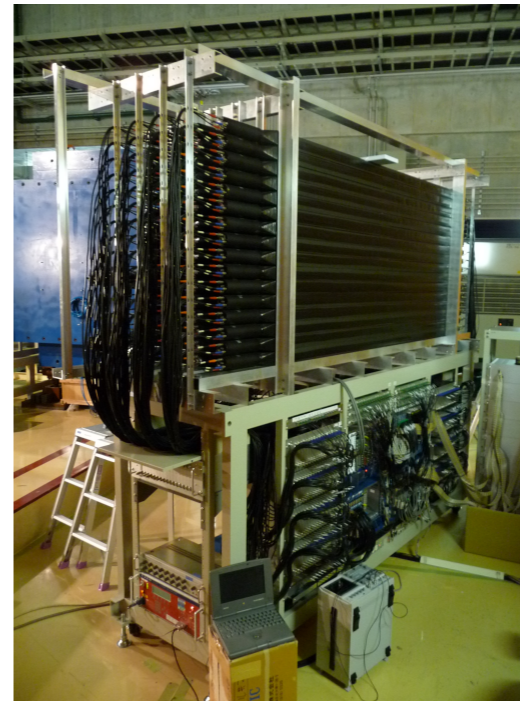
- ☒ Measurement of leakage field of SAMURA (2023)
- ▶ Simulation of the magnetic shields (2024)

- Stands

- ☒ GEANT4 Simulation (-2024)
- ▶ Design (2024)
- ☐ Construction (2025)

- Experiment

- ☐ If MNEUT, STRASSE, and HIME is ready (2025-)



Summary

- ★ **Systematic study of neutron single-particle states for a wide range of A/Z & S_n**
- ★ **(p,pn) in inverse kinematics with the dedicated (p,pn) setup introduced at SAMURAI**

• MNEUT-L

- ☒ Assembling the bar (-2011)
- ☐ Signal check at SAMURAI (2025)

• MNEUT-S

- ▶ Re-assembling the bar (2024)
- ☐ Signal check at SAMURAI (2025)

• Magnetic shields

- ☒ Measurement of leakage field of SAMURA (2023)
- ▶ Simulation of the magnetic shields (2024)

• Stands

- ☒ GEANT4 Simulation (-2024)
- ▶ Design (2024)
- ☐ Construction (2025)

• Experiment

- ☐ If MNEUT, STRASSE, and HIME is ready (2025-)

