

# Neutron Density Distribution of ${}^6,8\text{He}$ and ${}^9,11\text{Li}$ isotopes

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## 1-1. Motivation

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\* NP0906-RIBF16 : "Neutron radii of the inner- & valence-shells in He & Li isotopes"

(p,pn) neutron knockout reactions on proton target

deduce momentum distribution of inner- & valence-shells

Fourier transform --> density distribution of neutrons in each shell

\* Situation

beam time cancelled due to vac. leak

not clear whether "Kappa" can be operated again

interference with Samurai construction, cooling waters

--> possibility at Samurai ?

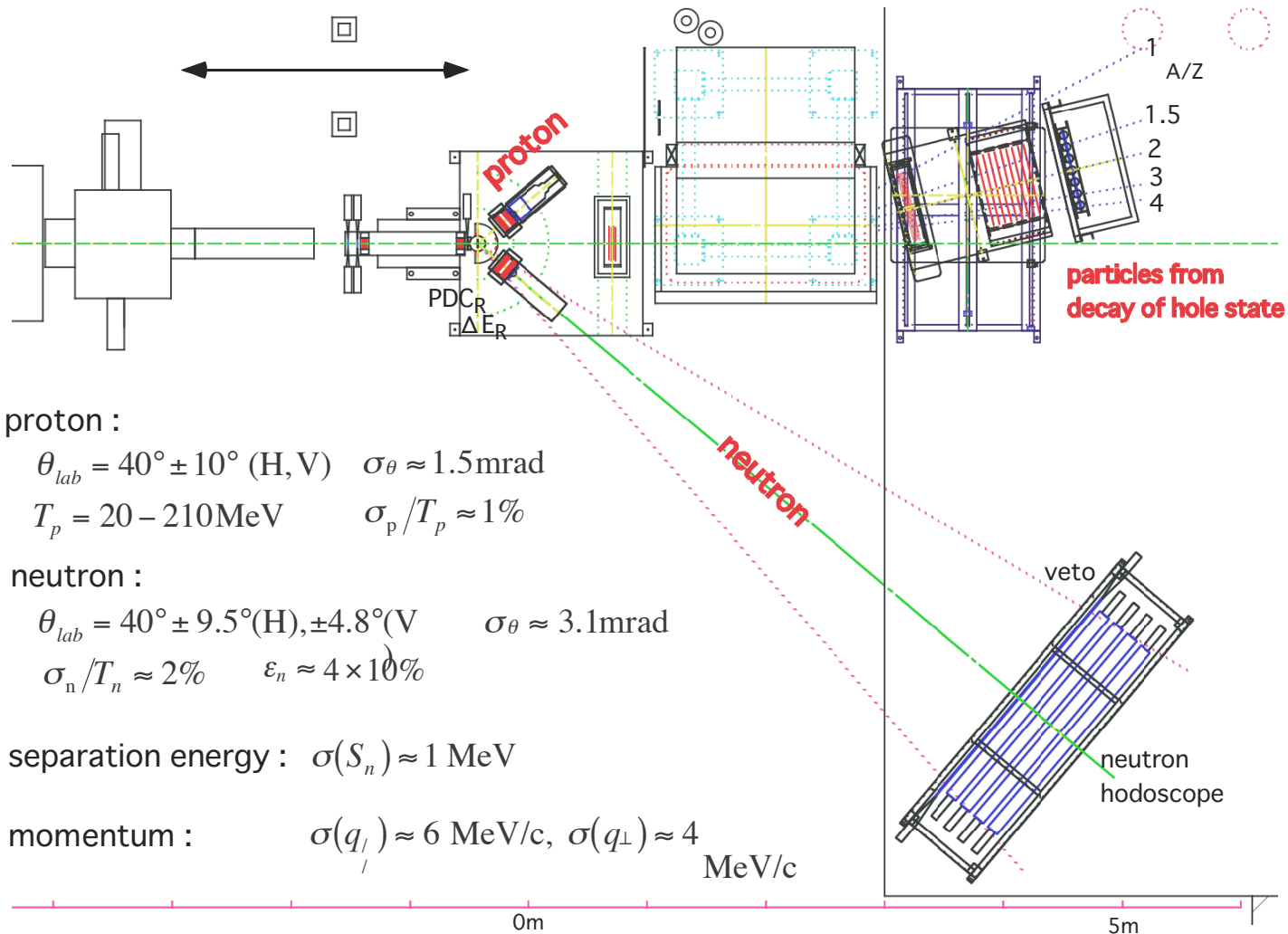
## 1-2. Setup using Kappa

\* Beam :

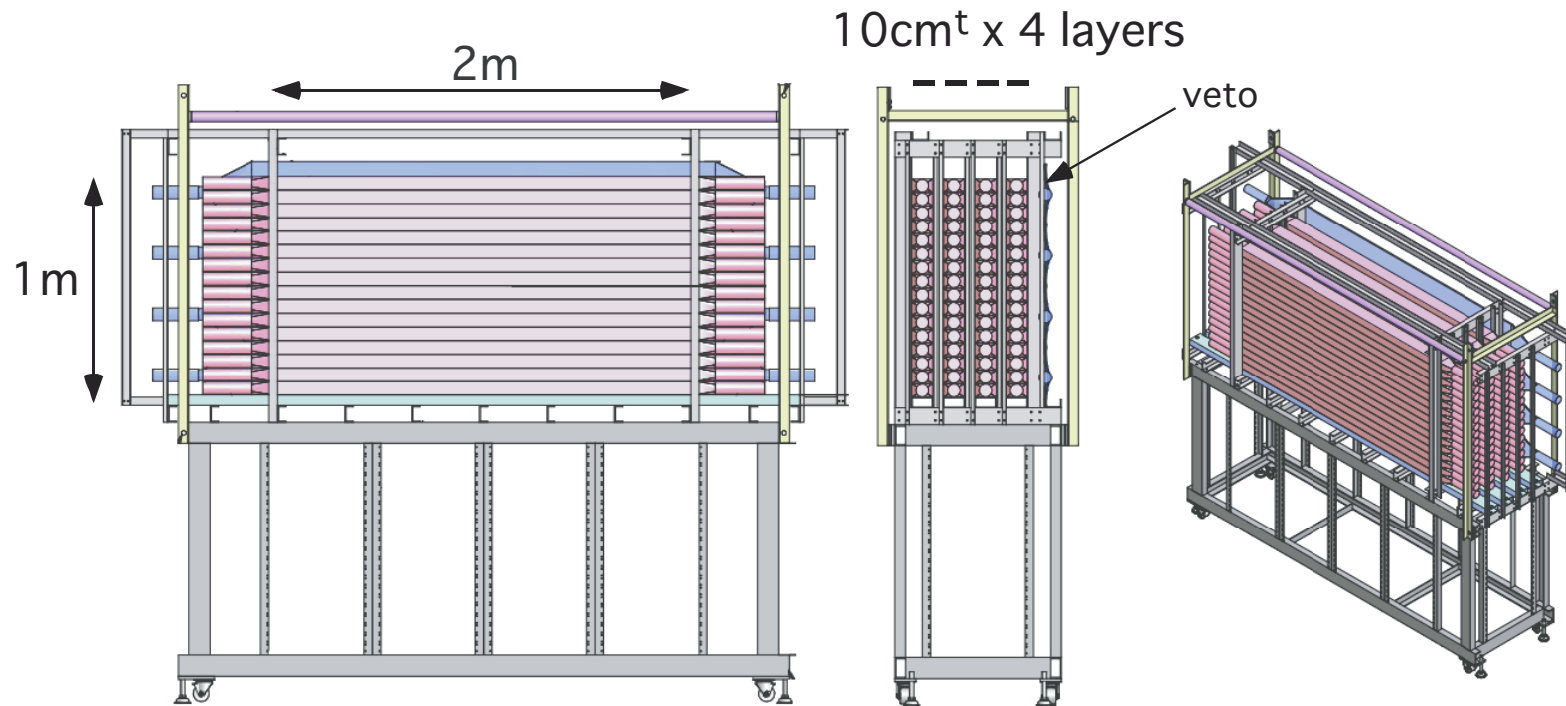
isotopes :  $(6),8\text{He}$  &  $(9),11\text{Li}$  at  $250\text{MeV/A}$   $\leftarrow$   $^{18}\text{O}$  ( $350\text{MeV/A}$ )

intensity :  $\sim 0.3\text{MHz}$

\* target : 5mm-thick solid hydrogen



## 1-3. Neutron hodoscope



neutron :

size : 6.5cm x 10cm<sup>t</sup> x 200cm, EJ200 scintillator, x64

config. : 16 elements/layer x 4 layers

PMT : H1949 x 30, H1161 x34

active area : 200cm(H) x 104cm(V)

veto :

size : 29m x 1cm<sup>t</sup> x 220cm, x4

## 1-3. Yield estimate

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\* (p,2p) proton-knockout reactions from  ${}^6,8\text{He}$  &  ${}^6,8,9,11\text{Li}$

run in Jun-2010

~0.3 MHz intensity

~12-24( ${}^8\text{He}, {}^{11}\text{Li}$ ) hours / isotopes

\* (p,pn) yield estimate by scaling

$Y(\text{pn}) \sim 0.5(\text{vertical acceptance}) \times 0.4(\text{efficiency}) \times 0.5(\sigma_{\text{pn}}/\sigma_{\text{pp}}) \times Y(\text{pp})$

~ **0.1** x  $Y(\text{pp})$

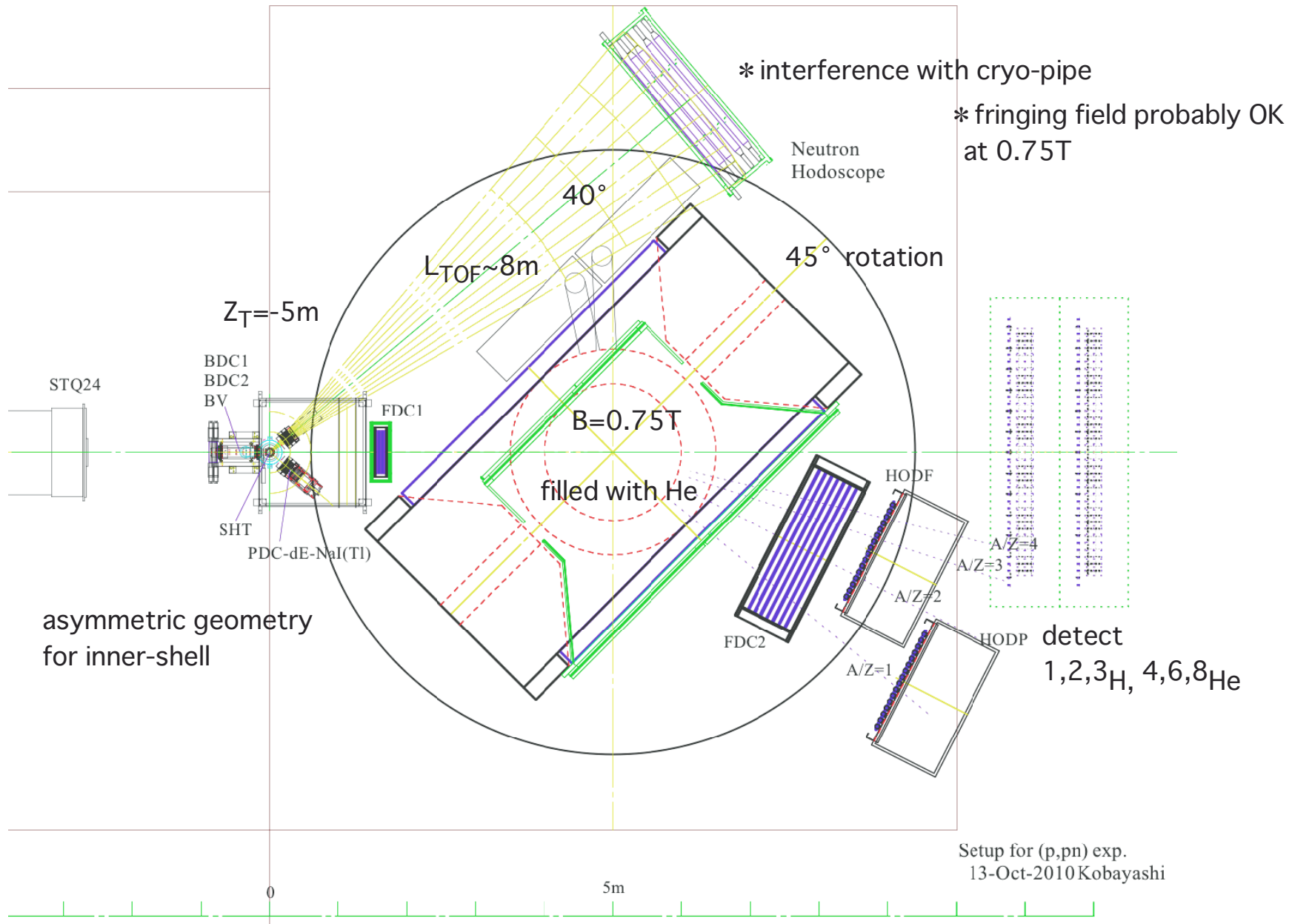
~2(-3) days / isotopes --> 40% - 20%( ${}^8\text{He}, {}^{11}\text{Li}$ ) statistics

\* calibrations

proton beams : NaI(Tl) & neutron hodoscope : ~1 day

detector tuning : ~1 day

# 1-4 : Setup at Samurai



## Summary

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\* (p,pn) neutron-knockout reaction on  $(6),^8\text{He}$  &  $(9),^{11}\text{Li}$  at 250 MeV/A

small problems, but possible at Samurai

$\theta_n > 40^\circ$  & asymmetric geometry