

NEOLITH-s parasite experiment preparation

Reports on Neolith project (Sato prepared)

http://be.nucl.ap.titech.ac.jp/~satou/docs/neutron_detector/neut_det.html

2025.04.16

As of 2025.04.30

Experimental outline

- Date : End of June~early July(June 29~July 4)
- Purpose : Examine the response of Neolith-s (second prototype) on the incidence of high energy neutrons
- Carry out the measurement as a parasite experiment of the Kubota experiment at the samurai installation of RIBF
 - Place the setup downstream of the beam dump

Response evaluation of Neolith-s for the incidence of high-energy neutrons by using simulation codes

←to be confirmed by the measurement

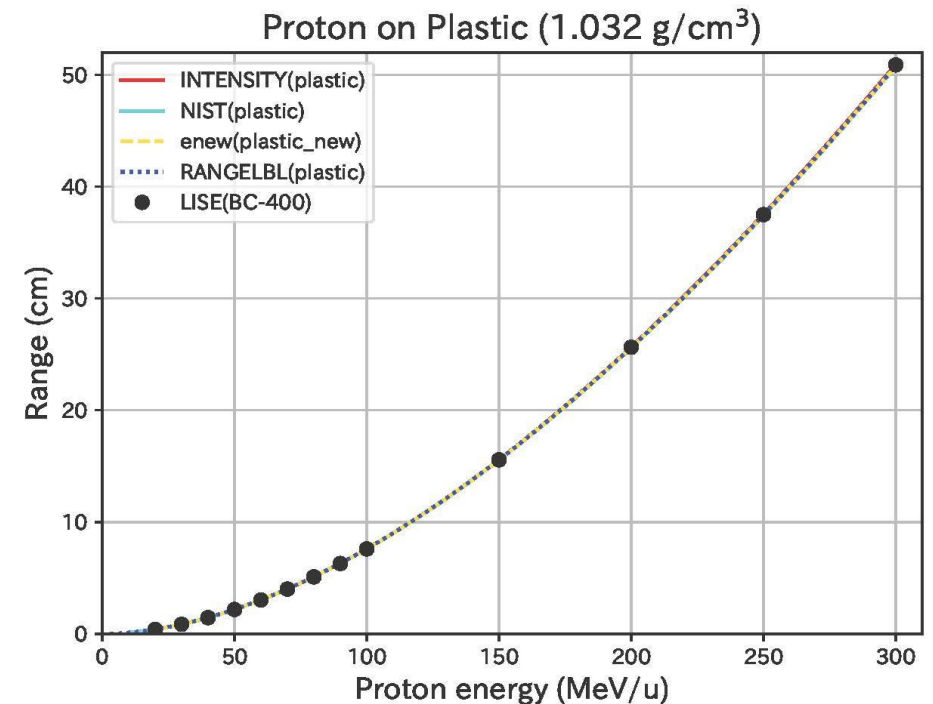
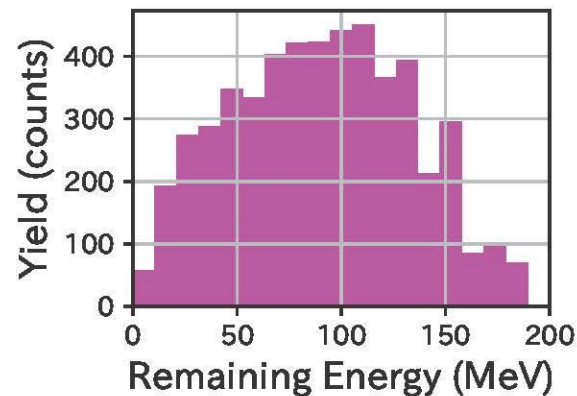
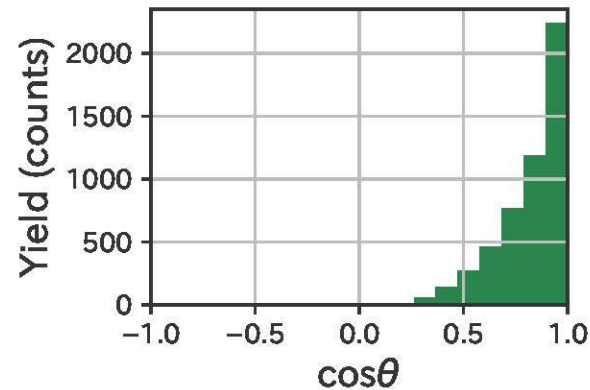
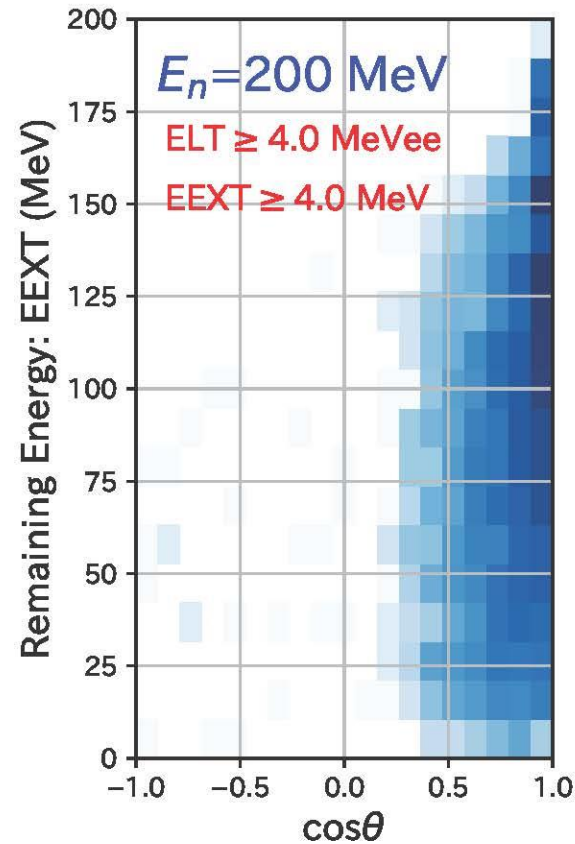
- **Ex.** Charged particles escaping the scint. boundary

Code: CECIL

Scintillator thickness: 15 cm

Document:

http://be.nucl.ap.titech.ac.jp/~satou/docs/neutron_detector/neut2024_ed.pdf

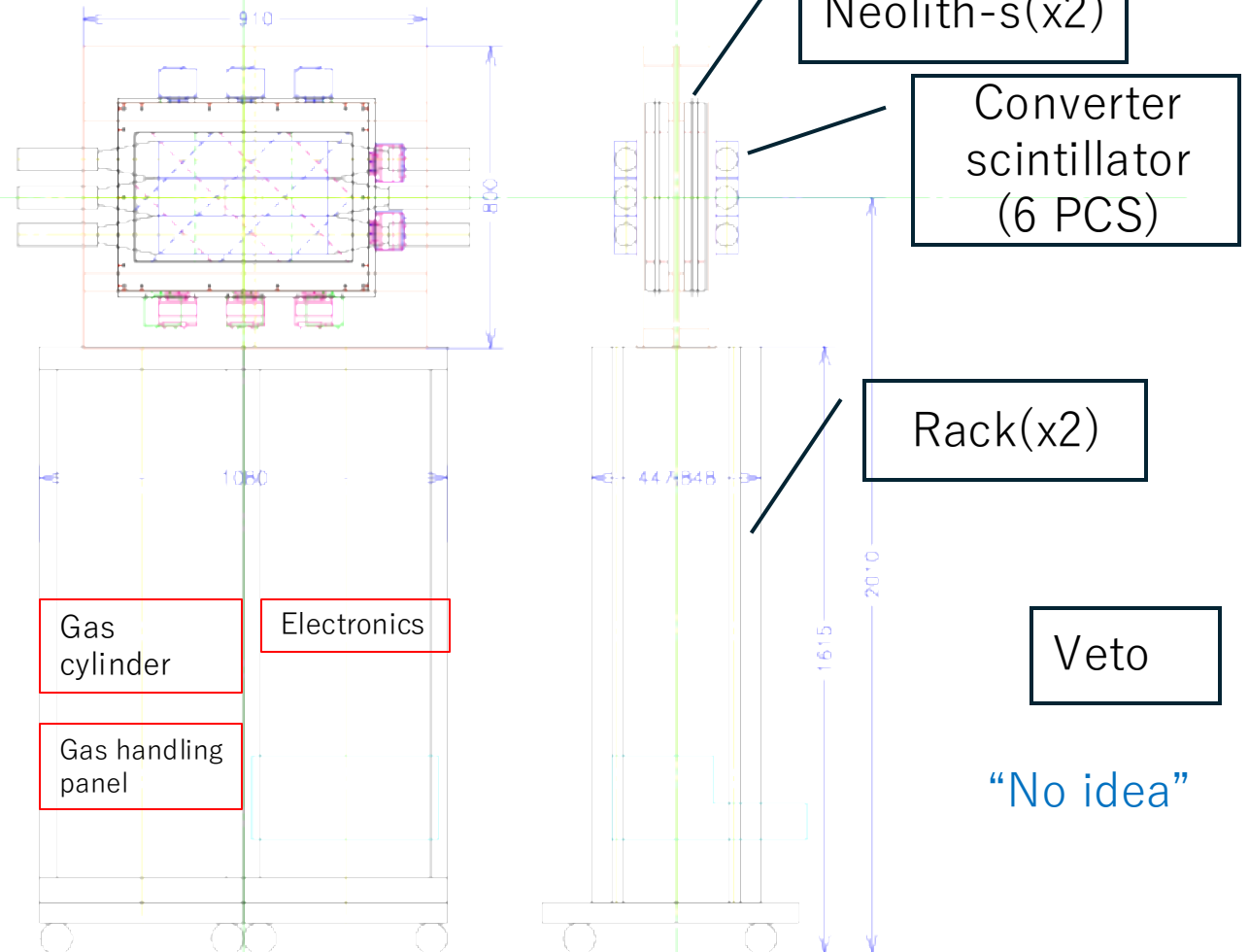


Setup outline

By T. Kobayashi
2025.03.17/21

✖ Emphasis is placed on
ease of setup transfer

Rack (x2)	lead ox-30u	
Neolith-s (x2)	Sensitive area 577x342 mm ²	#ch=16x1 3x2=461
Converter scintillator (x6)	450(L)x100(W) x60(D) mm ³ 3本x2 Sensitive area 450x300 mm ²	#ch=2x6= 12
Veto [(x7)]	Larger than 600x360 mm ²	[#ch=2x7 =14]

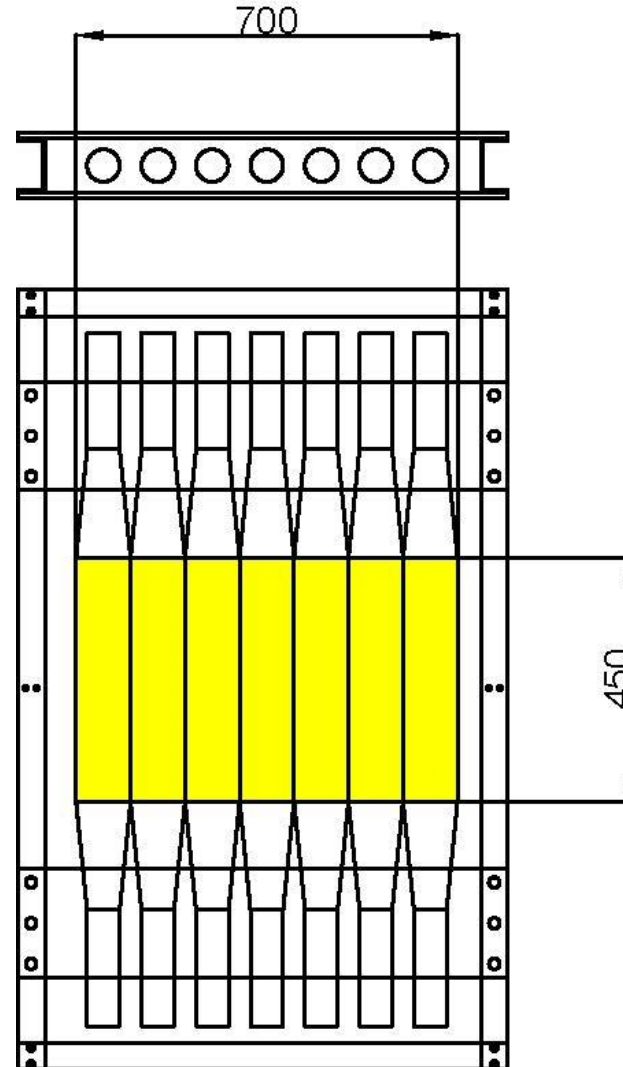


Veto counter candidate

A 2007 model HOD designed at
TITech Nakamura-lab.

Consisting of 7 plastic scintillators
with a thickness of 5 mm

By Makimura



※ Adjacent plastics can be repositioned so that they overlap each other by 2 mm. This is necessary to eliminate the slip-through of charged particles and to provide a veto function.

※ Fulfilling the required sensitive area of more than 600x360 mm².

HOD specification document:
http://be.nucl.ap.titech.ac.jp/~satou/docs/neutron_detector/hodo_sasae_buhin.pdf

Things to do (design)

▣ Veto frame support

- Divert HOD manufactured by TITech in 2007, consisting of seven 5 mm-thick scintillators.
- Adjacent scintillators can be arranged so that they have 2 mm-wide overlap regions (confirmed in 2025.04.14).
- Sensitive area becomes $45 \times 688 \text{ cm}^2$

▣ NEOLITH-s support (including the support of the converter scintillators)

- Base will be provided by Lead OX-30U racks (proposed by T.Kobayashi)
- HIMAC CATANA base is another choice

▣ Gas handling panel (design & manufacturing)

Things to do (purchase)

- ❑ Necessary amount of BNC • SHV cables (CATANA cables are available, Nebura cables as well)
- ❑ Data transfer flat cables (6~8 m) (26 PSC)
 - MISUMI、 fusion splicing (融着), crimping operation by ourselves
- ❑ Pre-amp power cables (6~8 m) (26 PSC)
 - Crimping operation by ourselves, existing 26 PSC are all 4 m; they tend to be short in length.
- ❑ V1190 adapter (16chx2→32ch) (10 PSC)
 - Asking quotation 2025.04.16
- ❑ Lead OX-30U rack, 2 PSC (One exists in the room 109)

Things to do (operation)

- ☑ Securing photo-multiplier tubes (PMTs) (13 PSC as of 2025.04.14)
- ☑ Finding out a veto counter candidate (2025.04.14)
- ☑ Veto scintillator signal test (14ch) (done 2025.04.14)
- ☐ Attaching 12 PMTs to the 6 PSC of the converter scintillators (using optical grease), signal test.
 - Black light protecting sheet may have holes; light shielding reinforcement is required.
- ☐ Reattachment of veto scintillators (HOD-1D & HOD-3D) that have been unglued (using optical cement).
- ☑ Evaluating the power consumption
 - By Sisir-kun: for the ISCT setup (7.31 A), the RIKEN setup (8.37 A)

Things to do (Operation, continuation)

- ❑ Dr. Kondo is in charge of creating the detection efficiency monitoring software
 - Efficiency measurement data, in the ridf format, taken with the $\text{ArCH}_4(10\%)$ gas at ISCT was shipped to him 2024.04.16
- ❑ Beam trajectory calculations
- ❑ Consider the usage of QTC (charge to time converter) for better estimation of the deposited charges inside the converter scintillators (We want to know the ToT Charge correction, Deploy as discriminator)
- ❑ Build a remote control environment for iseg's high-voltage power supply
- ❑ Evaluation of Neolith's responses (upon incidence of neutrons) using simulation codes
- ✓❑ Comparison of the Y resolution between 8 mm wide and 10 mm wide cathodes (Cathode exchange: 8→10 mm, start cosmic ray run 2025.04.24)
- ❑ Electronics modules collection and trigger circuit assembly

Things to do (Operation, continuation)

- ❑ Keep accommodation in advance (let Ohno-san know the price)
- ❑ Make timeline
- ❑ Secure HV modules (as early as possible, find a fluke 5 kV, 50 mA power supply)
- ❑ Newcomers can work as temporary visitors (in May, but until 24H before beam irradiation, an MT starts from 5/11)
- ❑ Take efficiency curves of Neolith-s at samurai using cosmic rays
 - cf.) ISCT efficiency results

V1190用アダプターケーブル (2x16ch→32ch)

