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 2025.05.07

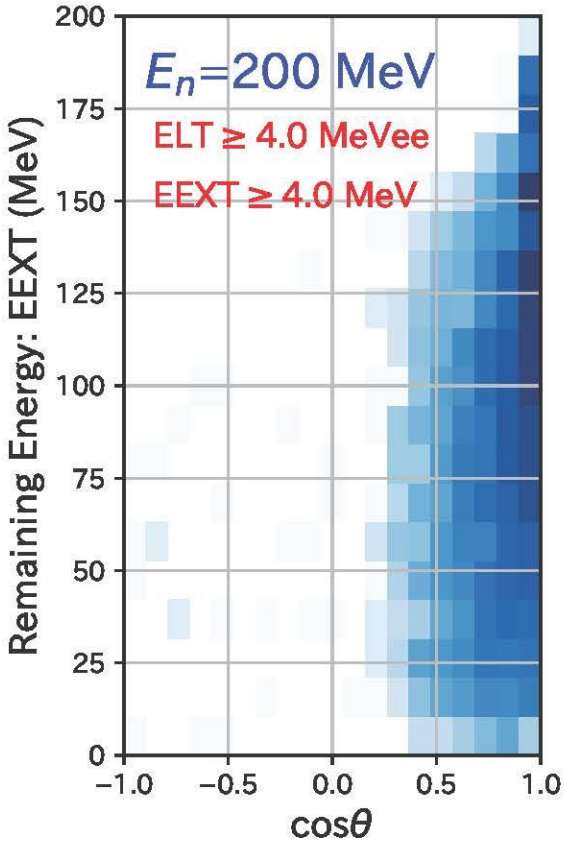
Experimental outline

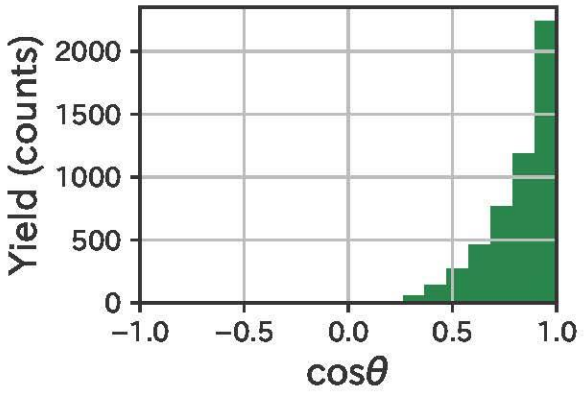
- Date：End of June~early July(June 29~July 4)
- Purpose：Examine the response of Neolith-s (second proto-type) on the incidence of high energy neutrons
- Carry out the measurement as a parasite experiment of the Kubota experiment at the samurai installation of RIBF
  - Place the setup downstream of the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

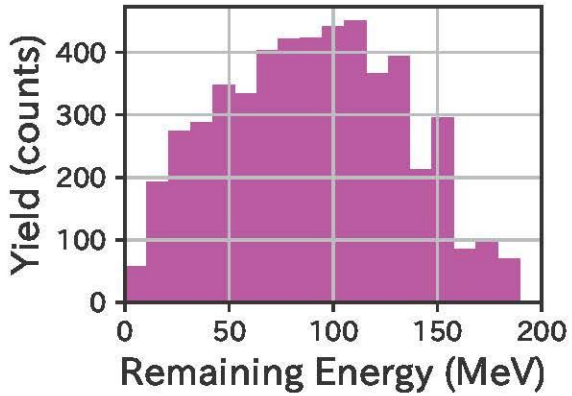
Response evaluation of Neolith-s for the incidence of high-energy neutrons by using simulation codes ←to be confirmed by the measurement

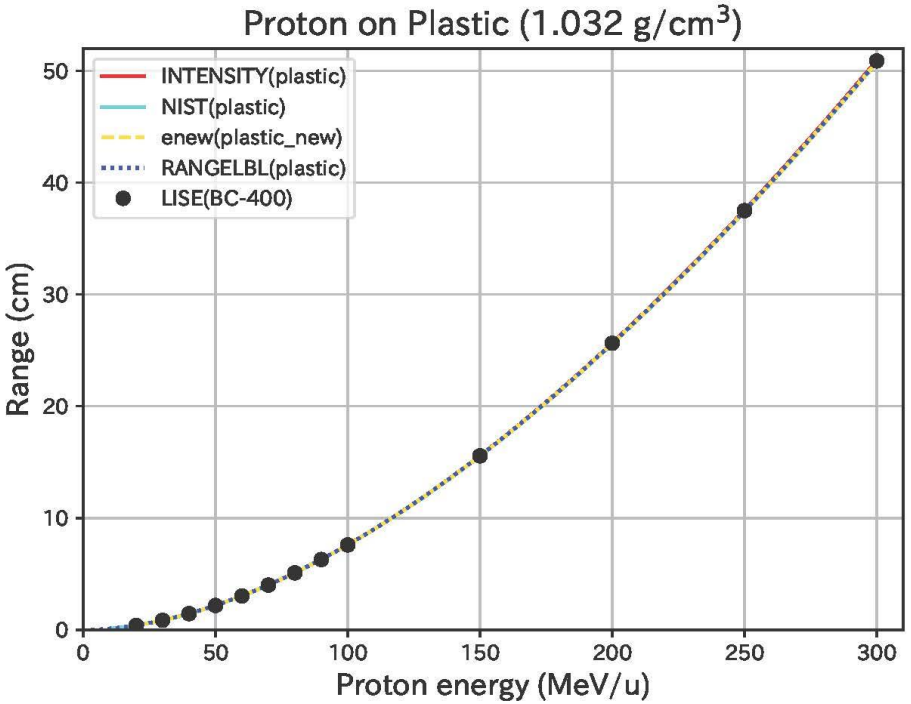
- Ex. Charged particles escaping the scint. boundary

Code: CECIL
Scintillator thickness: 15 cm
Document:
http://be.nucl.ap.titech.ac.jp/~satou/docs/neutron_detector/neut2024_ed.pdf







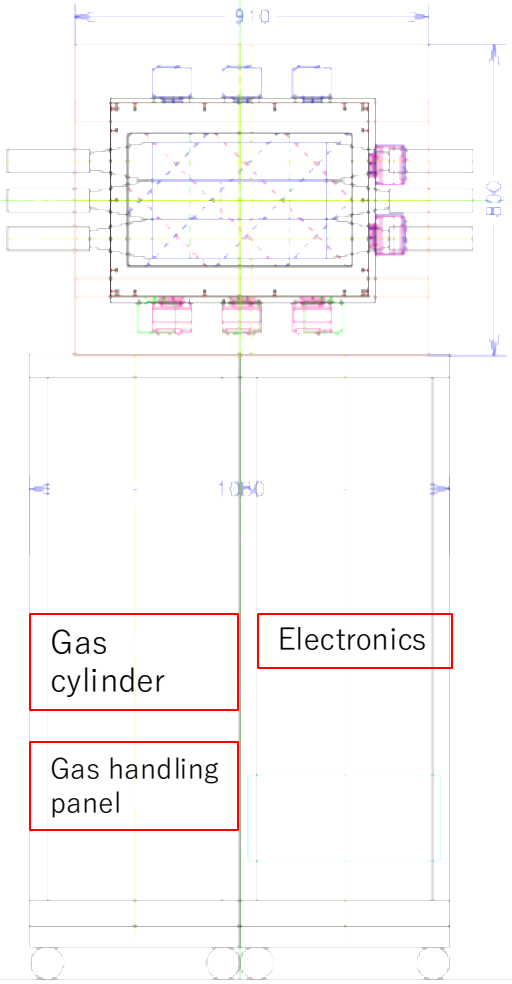


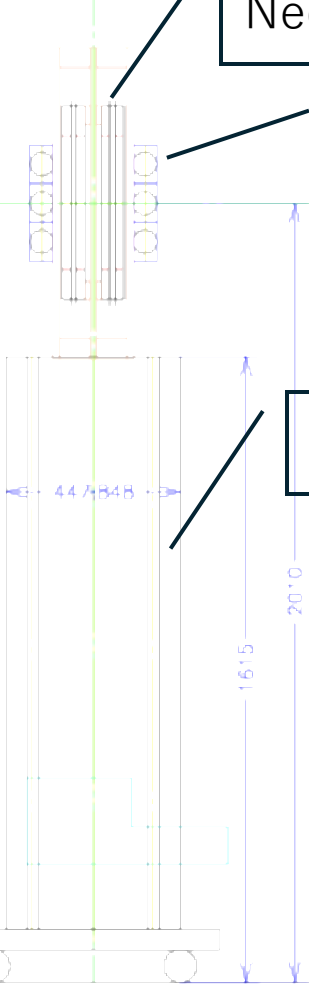
Setup outline

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=16x13x2=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]





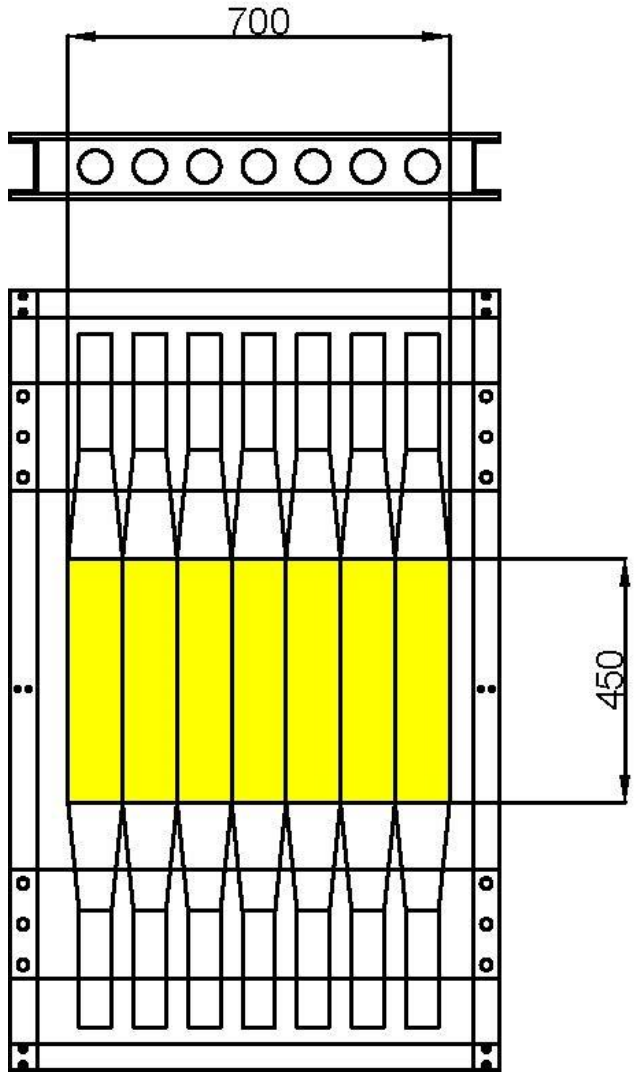
"No idea"

Veto counter candidates

- A 2007 model of HOD designed at TITech Nakamura-lab. Consisting of 7 plastic scintillators with a thickness of 5 mm

- 1 cm-thick former RIPS HOD (if placed not normally to the beam, the passage of charged particles through the gap can be avoided.)
  - Needing tests: light protection, gain adjust etc.

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 mm^2.

2007 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 45x688cm^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, Nebula cables as well→ enough amount of BNC cables are available in the Nebula stock 2024.05.01)
- ☐ Data transfer flat cables ~~(6~8 m)~~ (26+4=30 PSC, 4 m)
  - MISUMI、fusion splicing (融着), crimping operation by ourselves
- ☐ Pre-amp power cables ~~(6~8 m)~~ (26+4=30 PSC, 4 m)
  - Crimping operation by ourselves, existing 26 PSC are all 4 m; they tend to be short in length.
- ☐ V1190 adapter (16chx2→32ch) (16 PSC, including those for reference signals)
  - Asking quotation 2025.04.16
  - Make ourselves
- ☐ 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 $ArCH_4$(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 correlation, 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)→would be ready 2025.05.01
- ☐ 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
- ☐ Secure P20 gas 10Lx1 2025.05.07 asked quotation

V1190用アダプターケーブル（2x16ch→32ch）

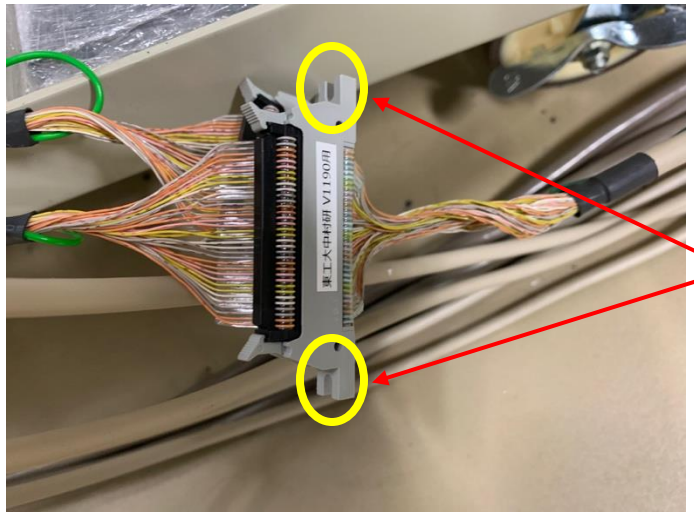
ケーブル：UL20276-SB(MA)-28AWG-34P
本数：10 本
※34ピン側コネクターは 3M オスコネクター（パネル取り付け用の構造のあるもの）、
それ以外の仕様は CAEN Model A967 Cable Adapter に準じる

ch.17-32

ch.1-16

ノーマルピッチコネクター(オス、34 pin)
ASD からの信号を受ける

ハーフピッチ
コネクター(68 pin)
CAEN V1190 TDC
の入力部に接続



パネル取り付け用
の構造

~5 cm

~10 cm

100 cm

This slide was used to request a quote from REPIC.

Data transfer flat cable

- MISUMI FNA20276-1.27FF-17P-4-1E 13 PCS（adjacent leads are spliced）purchased

Length：4 m
Splicing：both ends
Shield lead：one side
price：3064 yen (1 piece)