Weekly_MT_20250509

- Gas study with test chamber : Status update
- Status of E80-CDC : No progress
- ToDo list
- Schedule

Yuto Kimura (RARiS, D1)

Gas study short summary

Ar-CO2(90:10) and Ar-C2H6(50:50)
→ Ar-CO2 and Ar-C2H6, omitted gas ratio

Ar-C2H6	55Fe	90Sr	Cosmic
test chamber	Gas Gain(Our standard)	ToT, Efficiency	Took data 2025.4
E15-CDC	None	None	ToT, Efficiency

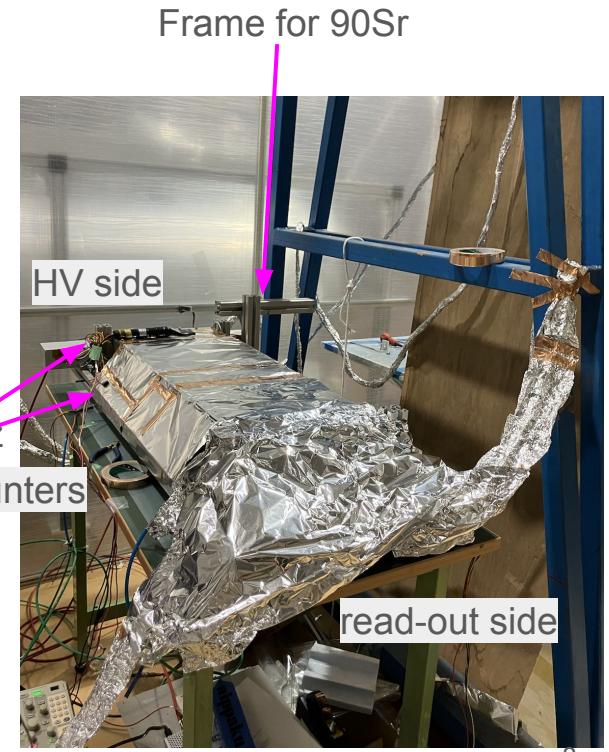
Ar-CO2	55Fe	90Sr	Cosmic
test chamber	Gas Gain(Our standard)	ToT , Efficiency (small..)	Now data-taking (continue ~next Friday)
E15-CDC	None	None	ToT, Efficiency (very small..)

- **In Ar-CO2 case, ToT of 90Sr is relatively smaller** than that of the Ar-C2H6 case, when comparing the same gas gain point.
- Checking **Cosmic-ray data, the difference becomes even more serious**.
- **The Ar–CO_2 gas mixture shows broader QDC and ToT spectra**, and exhibits **more noise than Ar–C_2H_6**, resulting in lower detection efficiency, even under sufficiently high voltage.

Gas study w/ test chamber : status update

Data taking with **Ar-C2H6(50:50)** was completed Apr. 2025.
→ Now **Ar-CO2(90:10) data taking, until next Friday.**

- Condition when taking TDC data
  - ASD Vth = -1.5 V
  - Trig counter (up, thickness=~0.5mm)
    - PMT(KA88??) HV = 1600V
    - NIM Discri Vth = - 25mV
  - Trig counter (down, thickness=~5mm)
    - PMT(KA88??) HV = 1300V
    - NIM Discri Vth = - 25mV
  - Trig Rate (Coincidence rate of the two trig counters) = ~300Hz
  - Gas Flow
    - 2024.12 : maybe 30~50ml/min
    - 2025.4 : 10~25ml/min

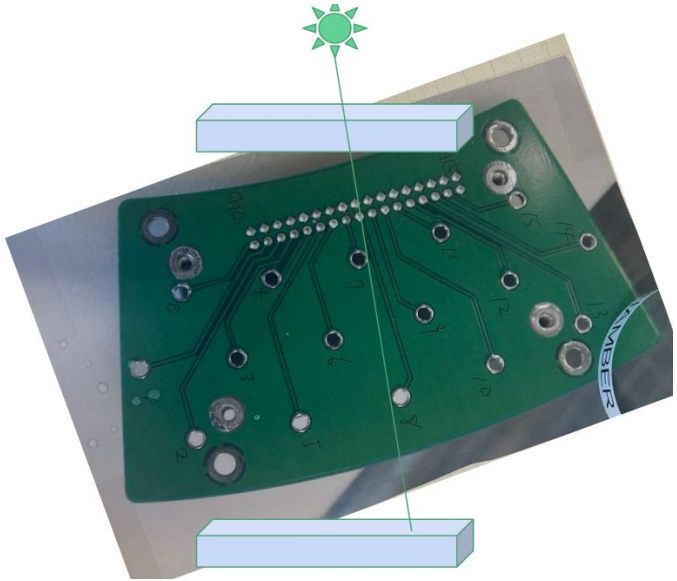


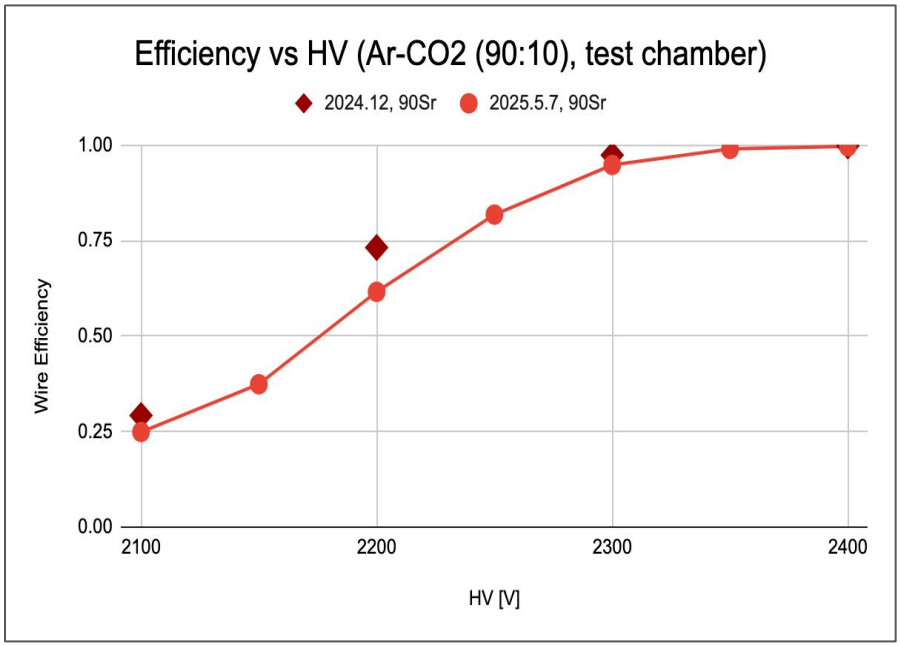
Gas study w/ test chamber : status update

Ar-CO2, 90Sr, TDC : **Check of reproducibility** by rough efficiency

$$\mathrm{WEff} = \frac{(\mathrm{hit6\ or\ hit9})\ \mathrm{and}\ (\mathrm{hit}(7,8)\ \mathrm{and}\ !\mathrm{hit}(4,5,10,11))}{\mathrm{hit}(7,8)\ \mathrm{and}\ !\mathrm{hit}(4,5,10,11)}$$

(only using the hits with TOT greater than 30 [ch])

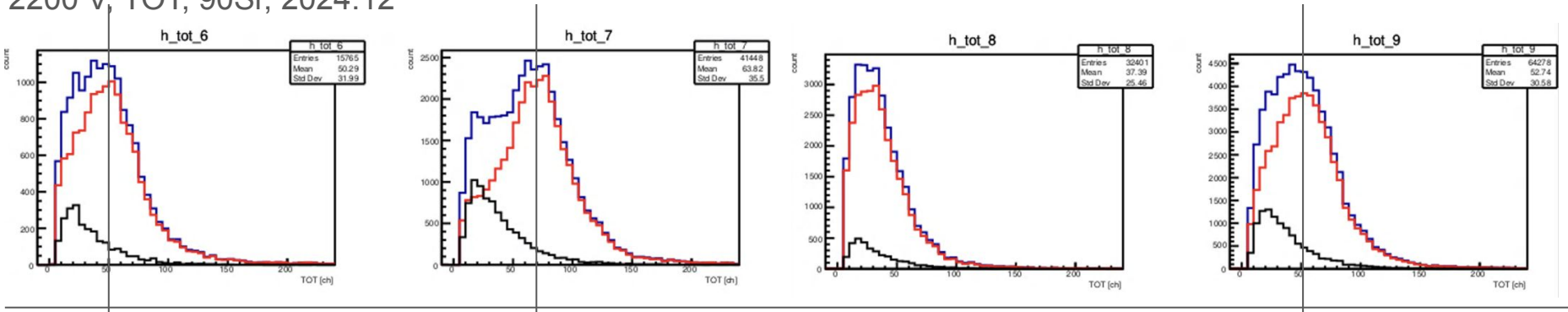




Gas study w/ test chamber : status update

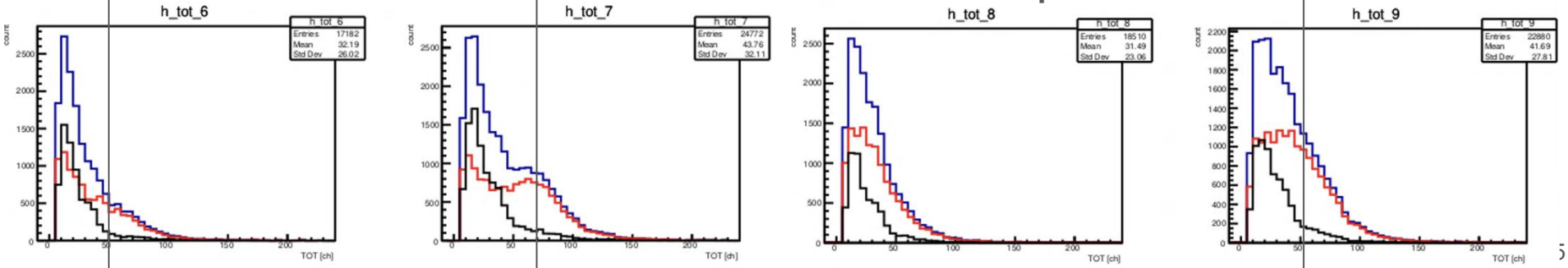
Ar-CO2, 90Sr, TDC : **Check of reproducibility** by rough efficiency

2200 V, TOT, 90Sr, 2024.12



2200 V, TOT, 90Sr, 2025.5.7

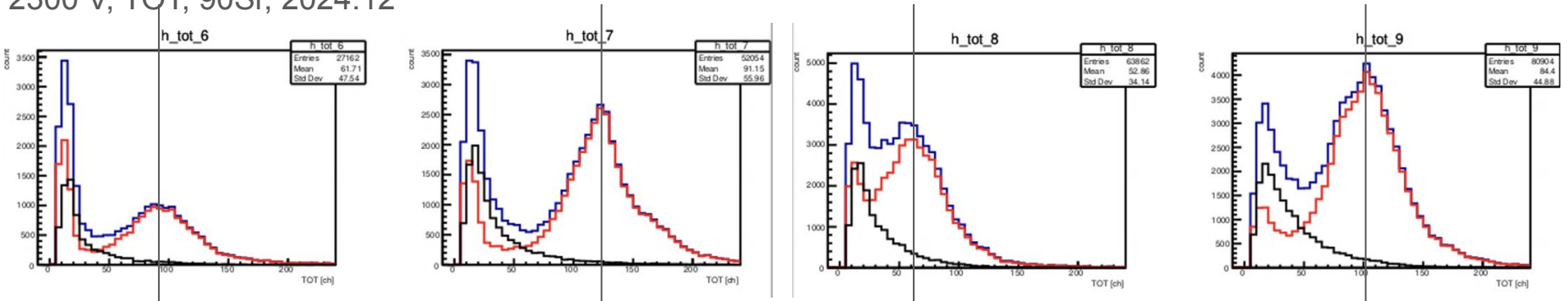
Little smaller and more noise than last year, it's consistent with eff curve in p.4.



Gas study w/ test chamber : status update

Ar-CO2, 90Sr, TDC : **Check of reproducibility** by rough efficiency

2300 V, TOT, 90Sr, 2024.12



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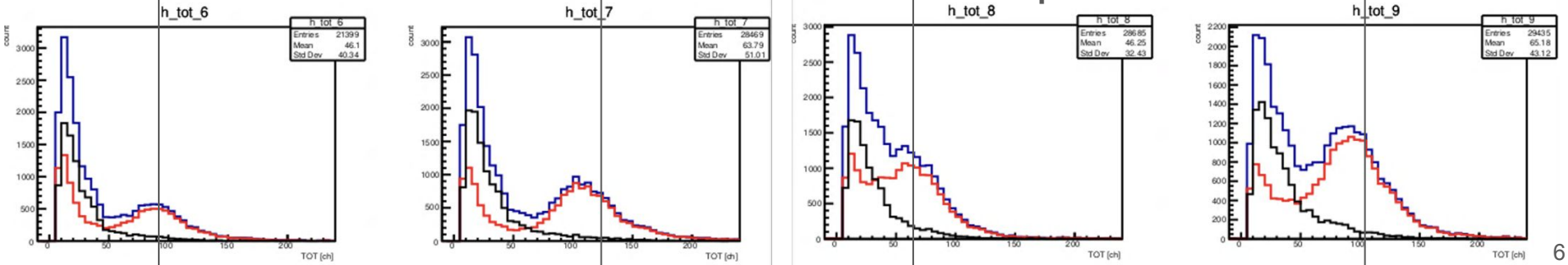
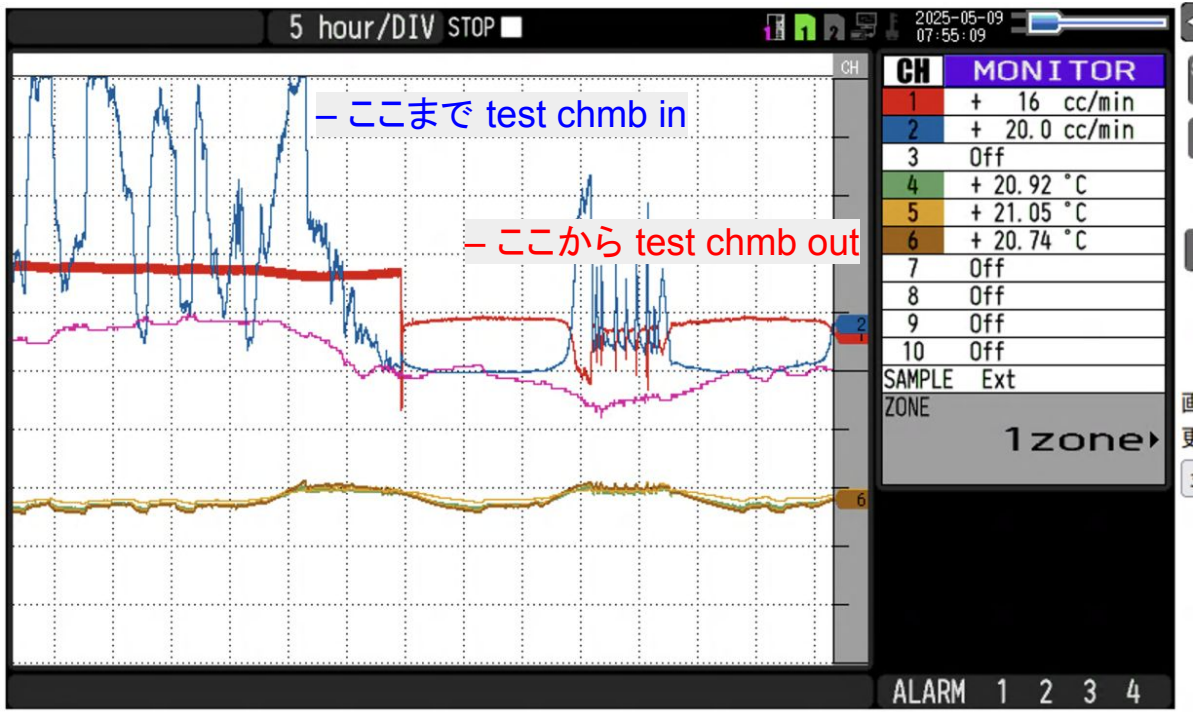


Gas study w/ test chamber : status update

Ar-CO2, 90Sr, TDC : **Check of reproducibility** by rough efficiency

- Is gas condition not good? low purity?
  - But gas replacement should be okey, I think…



Next plan:
After taking cosmic @2200V,
check by 90Sr again.
(it's difficult by 55Fe)

E80- CDC: status

- No progress
- At first, I will commit the new test chamber.

ToDo list

- J-PARC Sympo proceedings : waiting for the referee replying

Referee's Report	
	This paper reports on a study of the chamber gas for the Cylindrical Detector System (CDS), a key detector to be used in the J-PARC E80 experiment scheduled to begin in 2027, which aims to search for the KNNN bound state. In the previous experiment, E15, Ar-C_2H_6 (50:50) gas was used. However, since this is a flammable gas and the size of the CDC will be three times larger in E80, a non-flammable gas was sought as an alternative. Using the gas simulation tool Garfield++, the drift velocity and gain were evaluated, and Ar-CO_2 (90:10) was determined to be the optimal choice. Cosmic-ray tests and data analysis confirmed that sufficient resolution and detection efficiency could be achieved with this gas mixture. This paper clearly and systematically describes the gas study in detail and can be considered to have reached a publishable level. Minor comments: There is an inconsistency between the dimensions shown in Figure 2 and those described in the text. The figure lists an inner diameter of 330 mm, while the text mentions an inner radius of 150 mm. Also, the figure shows a length of 2680 mm, whereas the text states 2580 mm. Even if they are referring to different lengths, it would be clearer to standardize or clarify this discrepancy. It is stated that the results in Figure 5 agree well with the Garfield++ simulations, but it would be helpful to include a quantitative comparison—either in the figure or in the text—showing how closely the two results match. In the upper part of Figure 6, "Cosimc-ray" should be corrected to "Cosmic-ray." Regarding the references: if there is a publication detailing the CDC used in the E15 experiment, which was also used in the cosmic-ray test, it should be cited. Additionally, it would be helpful to include at least a web link or pointer to the Garfield++ resource. There are no major issues with the English, but if necessary, the manuscript could be submitted for professional proofreading.

ToDo list

- J-PARC Sympo proceedings : waiting for the referee replying

Reply Review Report	
Revised Manuscript	[Revised Manuscript (PDF)]
Reply / Message to the Editor	
Reply to the referee's Report	We sincerely thank the referee for their careful reading and valuable comments. We have revised the manuscript accordingly, and our responses to each point are as follows: 1. -- Inconsistency in dimensions between Figure 2 and the text -- We have corrected the inconsistency: the inner diameter in the figure has been updated to 300 mm, corresponding to the inner radius of 150 mm described in the text. Regarding the length, we have clarified in the revised text and the caption that 2580 mm refers to the active length of the CDC, while 2680 mm in the figure indicates the total mechanical length. 2. -- Quantitative comparison between Figure 5 and Garfield++ simulations -- We have added a quantitative comparison between the experimental data and the Garfield++ simulation results in the revised text. Specifically, we included examples of the gas gain values obtained from the simulations, and showed that the relative behavior of the gas gain between Ar–CO2 and Ar–C2H6 is consistent with the experimental results. 3. -- Typo in Figure 6 (“Cosimc-ray”) -- The typo has been corrected to “Cosmic-ray” in Figure 6. 4. -- Reference to the E15 CDC and Garfield++ -- We have added a reference to the publication describing the CDC used in the E15 experiment [Ref. 3], which is used in the beam test run in J-PARC. Furthermore, we have included a footnote with the official Garfield++ website link.
	[1st Report]

ToDo list

- DC2 : ver.0 → rewriting now/, first deadline is 2025/5/13(Tue).
- Tokusui MT slide : almost the same as JPS MT ? ok ?

Schedule

- 2025.05.07 ~ 2025.5.9 : Tokai
- 2025.5.12 : RIKEN
- 2025.5.13 ~ 2025.5.16 : Tokai
- 2025.5.17 ~ : Saitama
- 2025.5.21 ~ :Tokai

とりあえず準備棟2Fに移動した。ふぅ。。。来週開発棟へ

Back Up

What we need for test chamber @RIKEN

- ASAGI, 変換基板,ASAGA sys用cable? → 白鳥さん??
- HUL & DTL
- Normal test chamber → RIKEN（後回しか？）
- SONY ASD, 変換基板
- Repeater : ×1 アナログ信号見るだけなら要らない。
- Power Supply
  - CAENクレート (Pot Wire用)
  - for repeater (SONY ASD用)
    - 5.29V : ×1
    - 5.49V, 1.02A : ×1
  - for ASAGI
    - +5.0V, 0.5A : ×1
  - for SONY ASD
    - +3.0V, 0.38A : ×1
    - -3.0V, 0.13A : ×1
    - Vth 1~10V, 0~0. A : ×1
- Gas system
  - Ar-C2H6 : ×1
  - レギュレータ(可燃) : ×1
  - Flow meter (needle式) : ×1
  - 1/4ガスチューブ
  - バブラー, 油 : ×1
- Cable
  - SONY ASD用
    - 6m flat cable : ×1
    - 16ch×2 <-> 32ch flat cable : ×1
- NIMビン、モジュール一式
  - 赤HV, clock, discri, divider, coin, fan-in-fan-out, gate-generator, scaler, ECL->NIM (NIM->ECLも欲しい...) etc…

Ar-CO2 vs Ar-C2H6のまとめ
Long vs Original (Ar-C2H6)のまとめを作れ。

木村は何を見たいのか、リストアップせよ。