



EEE uLoop status

Review and latest results with ECO-gas mixture on CERN-01 telescope

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- ◆ Gas recirculation system
 - P&ID
 - Last measurements and issue
 - Current setup
- ◆ Efficiency
 - Comparison with different fresh gas flows
 - Comparison with no recirculation
- ◆ Conclusions

Gas Recirculation System (GRS) uLoop: P&ID

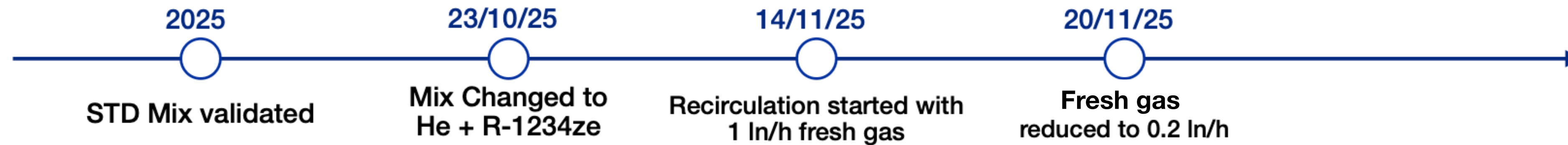


¹NC valve is optional: in 100% recirculation, it would need to be opened periodically (pulsed or a few times every N days) until now it was never tested

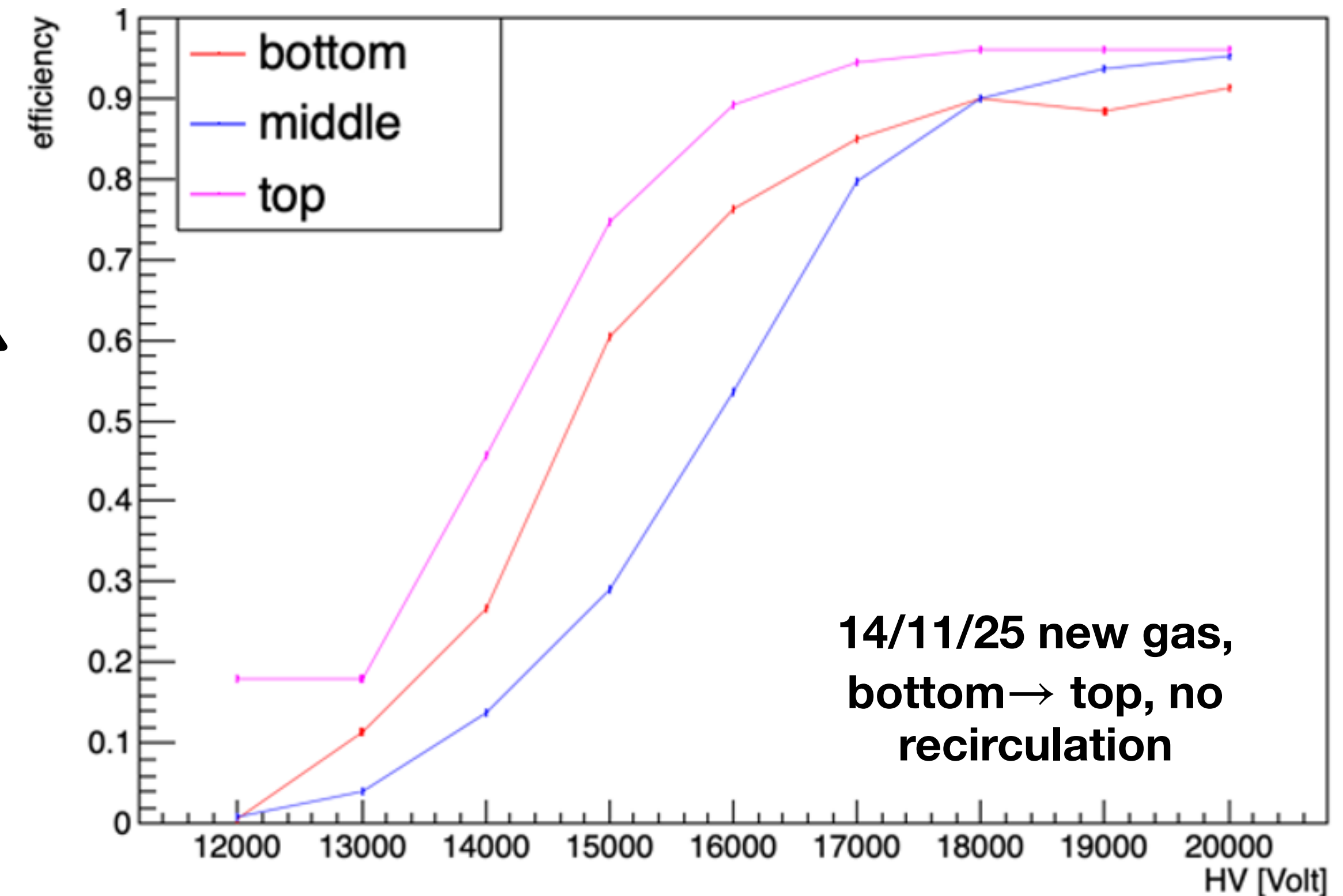
²Normal rotameters (no monitoring)

³To avoid damages due to pressure changes

Gas Recirculation System (GRS) uLoop: last measurements



- Good results obtained with standard mixture R-1234a+ SF₆
- Mixture changed to He+R-1234ze initially in open loop
- Recirculation started with 1 ln/h fresh gas then mixed flow was reduced to 0.2 ln/h (95% recirc.)
- 4 chambers in the loop: **bottom**→ **top**



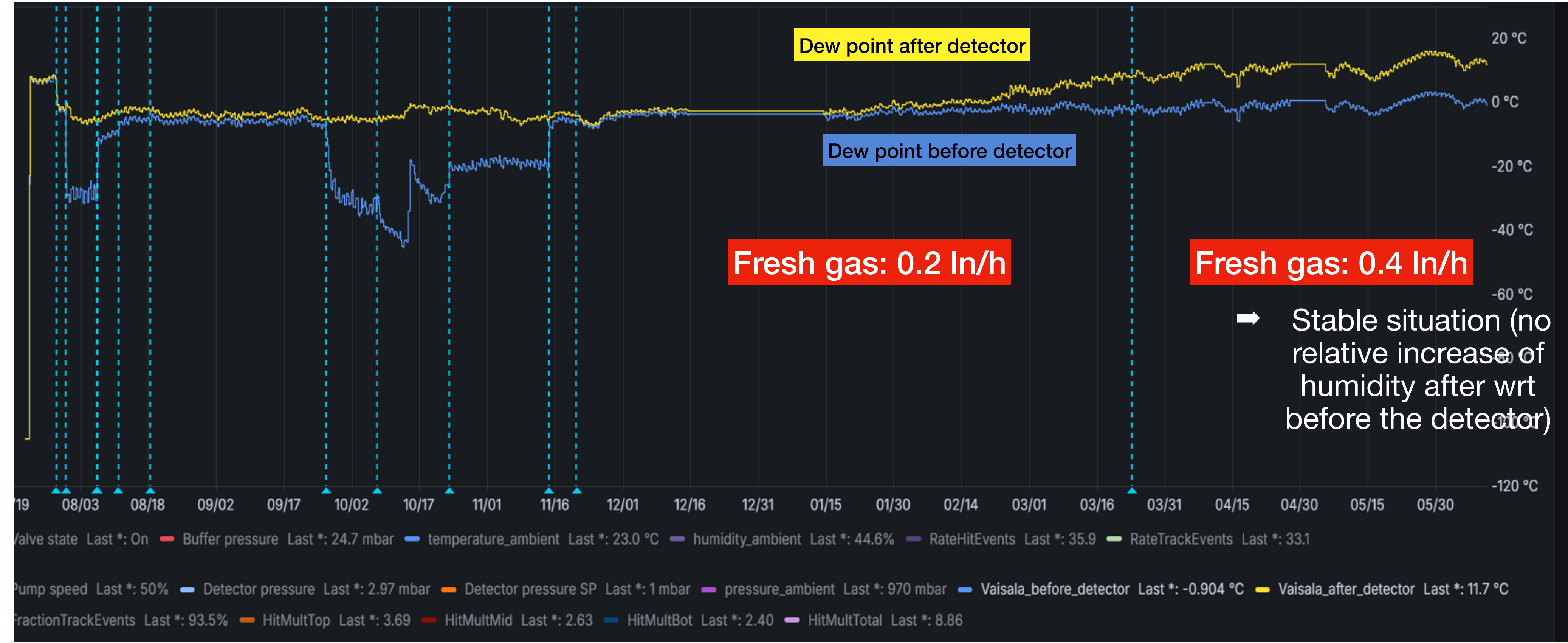
Gas Recirculation System (GRS) uLoop: humidity issue



- Good results obtained with standard mixture R-1234a+ SF₆
- Mixture changed to He+R-1234ze initially in open loop
- Recirculation started with 1 In/h fresh gas then mixed flow was reduced to 0.2 In/h (95% recirc.)
- 4 chambers in the loop: bottom → top
- In February there was a **increase in humidity after detector with the hits decreasing on all the 3 chambers**



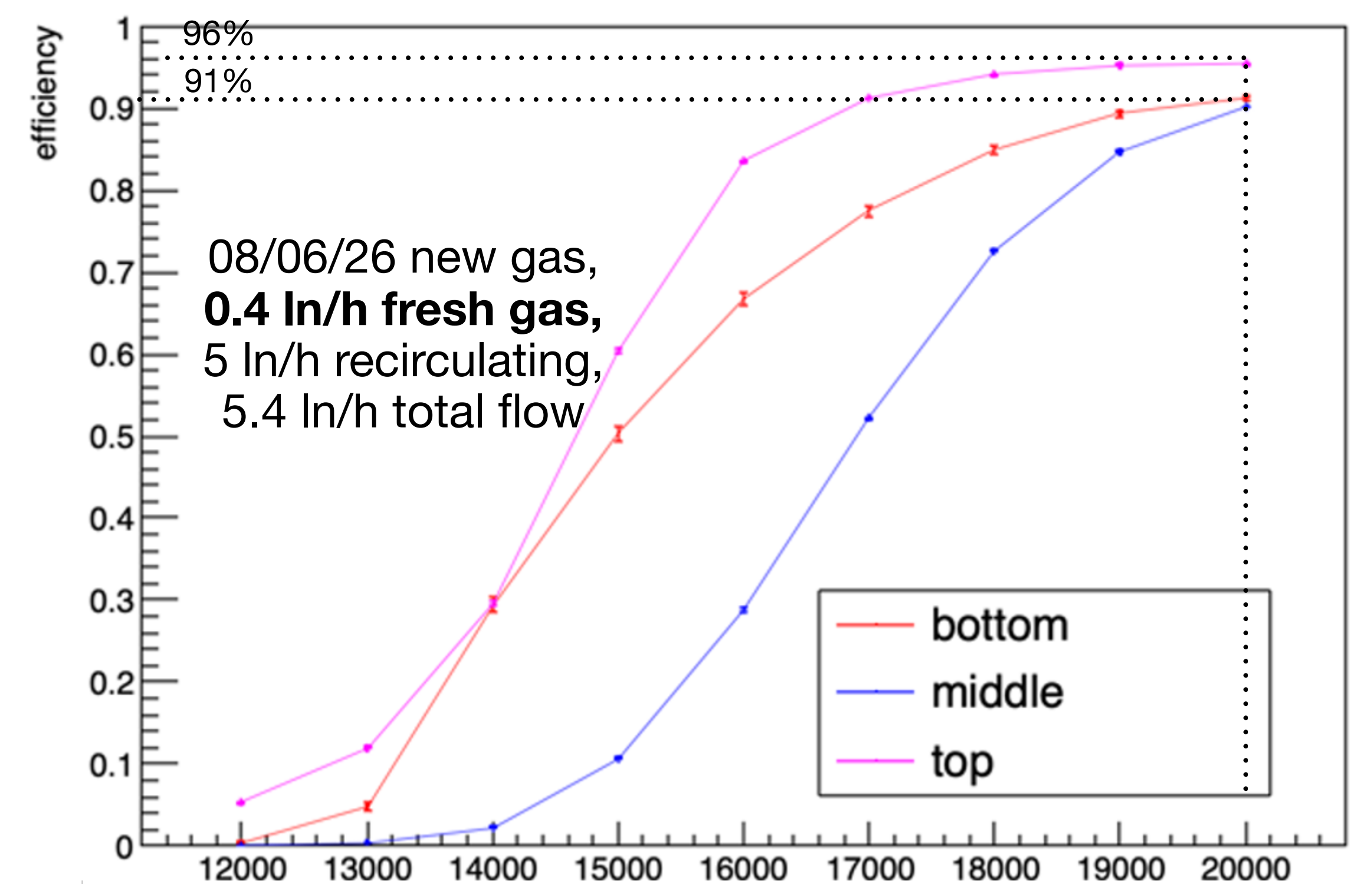
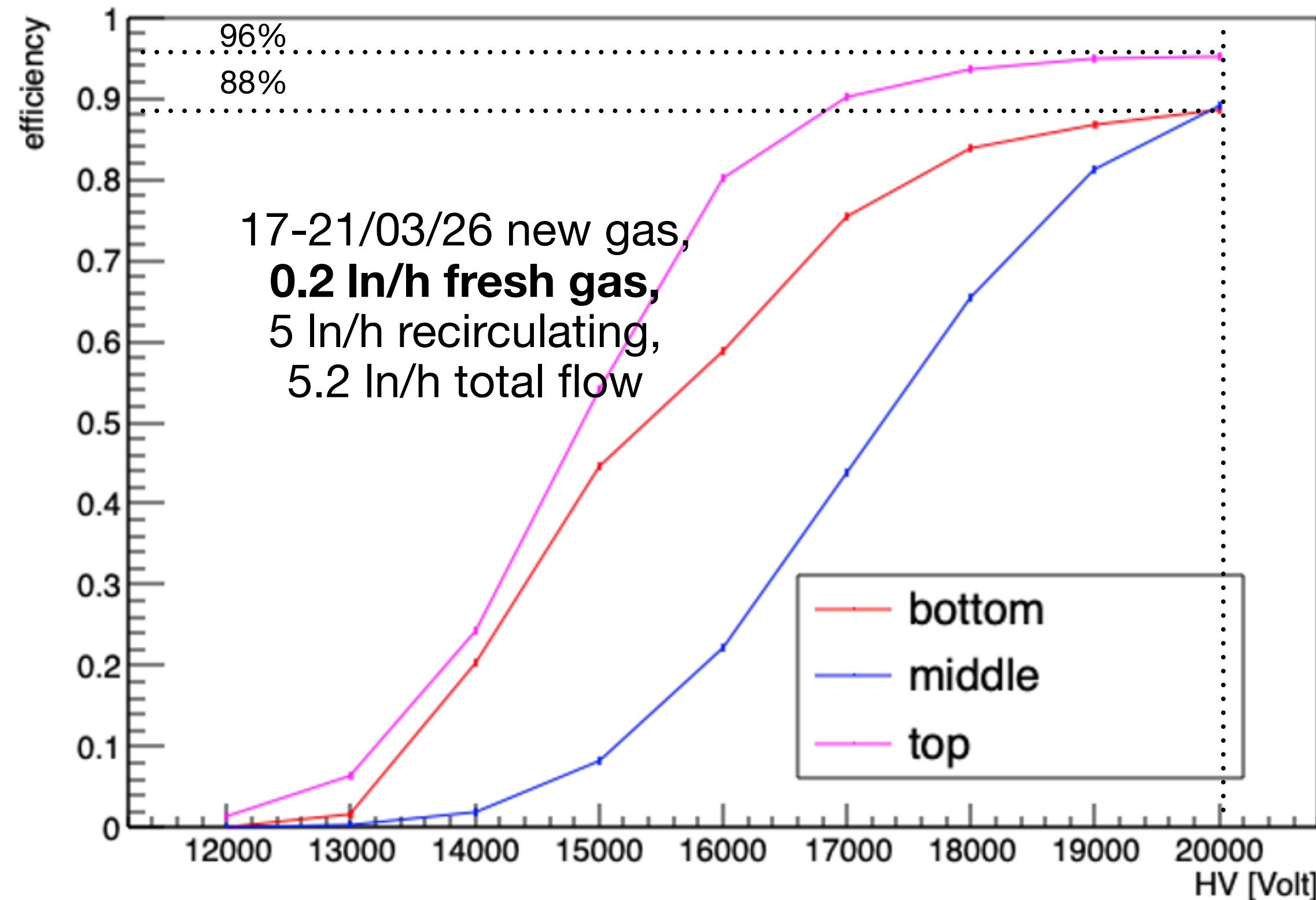
Gas Recirculation System (GRS) uLoop: current setup



Efficiency of the chambers at 0.2 and 0.4 ln/h



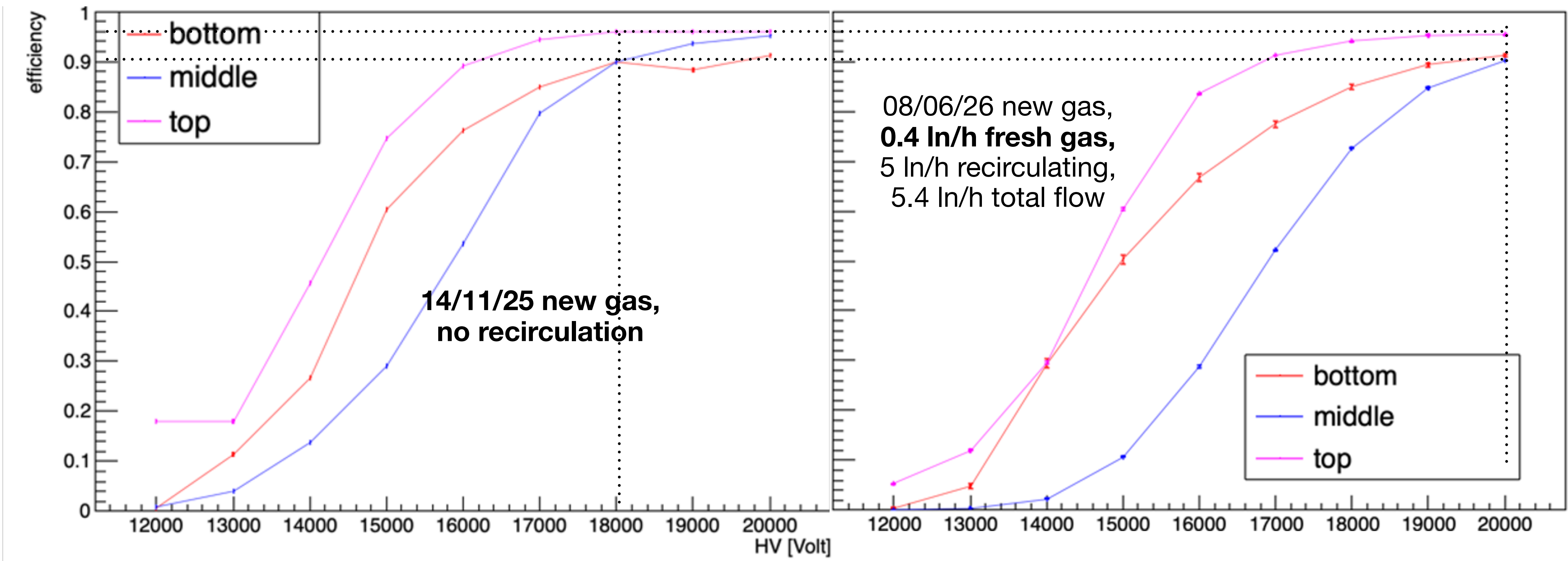
50%-50% Eco-freon and He mixture



➡ Reason of this increase in humidity (and the need for increasing the fresh gas) might be due to a *leak* on the plastic pipes from the loop to the chambers and from the mixer to the system (all the GRS is made with copper pipes)

*another similar setup but with all stainless steel: 0.2 L/h with ~ 2 L detectors (<<< volume of telescope chambers!)

Comparison between no recirculation and present status with 0.4 In/h of fresh gas out of 5.4 Ln/h of total flux (93% recirc.)



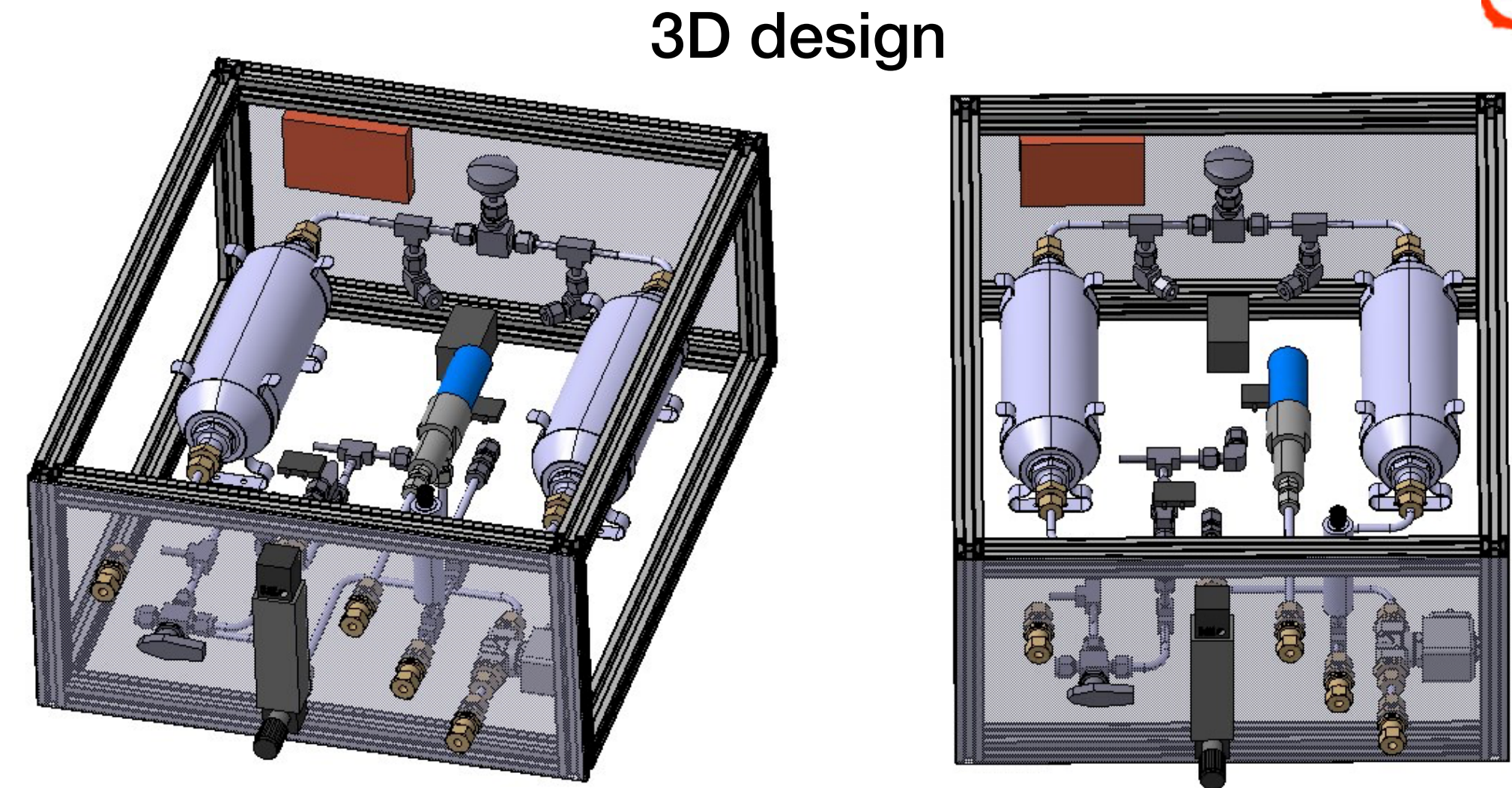
- ➡ Similar performance at the highest Voltage
- ➡ Slightly less efficient at lower voltages
- ➡ Comparable to standard mixture performance with no recirculation

Conclusions



Gas group: next steps and ideas

- ◆ Some fresh gas always needed: now managed to go from 1 Ln/h to 0.2/0.4 Ln/h
- ◆ To reduce this number more: on detector side need of **copper** everywhere (to remove leaks)
- ◆ Possible idea on the setup: similar to other small systems used in test beams



CERN-01 setup

- ◆ soon to be moved to another space a few meters away from the previous spot → this or next week
- ◆ First step: **flush** for ~a few days with dry nitrogen to remove contaminants
- ◆ Then trying to go back to **0.2 Ln/h with new gas mixture**



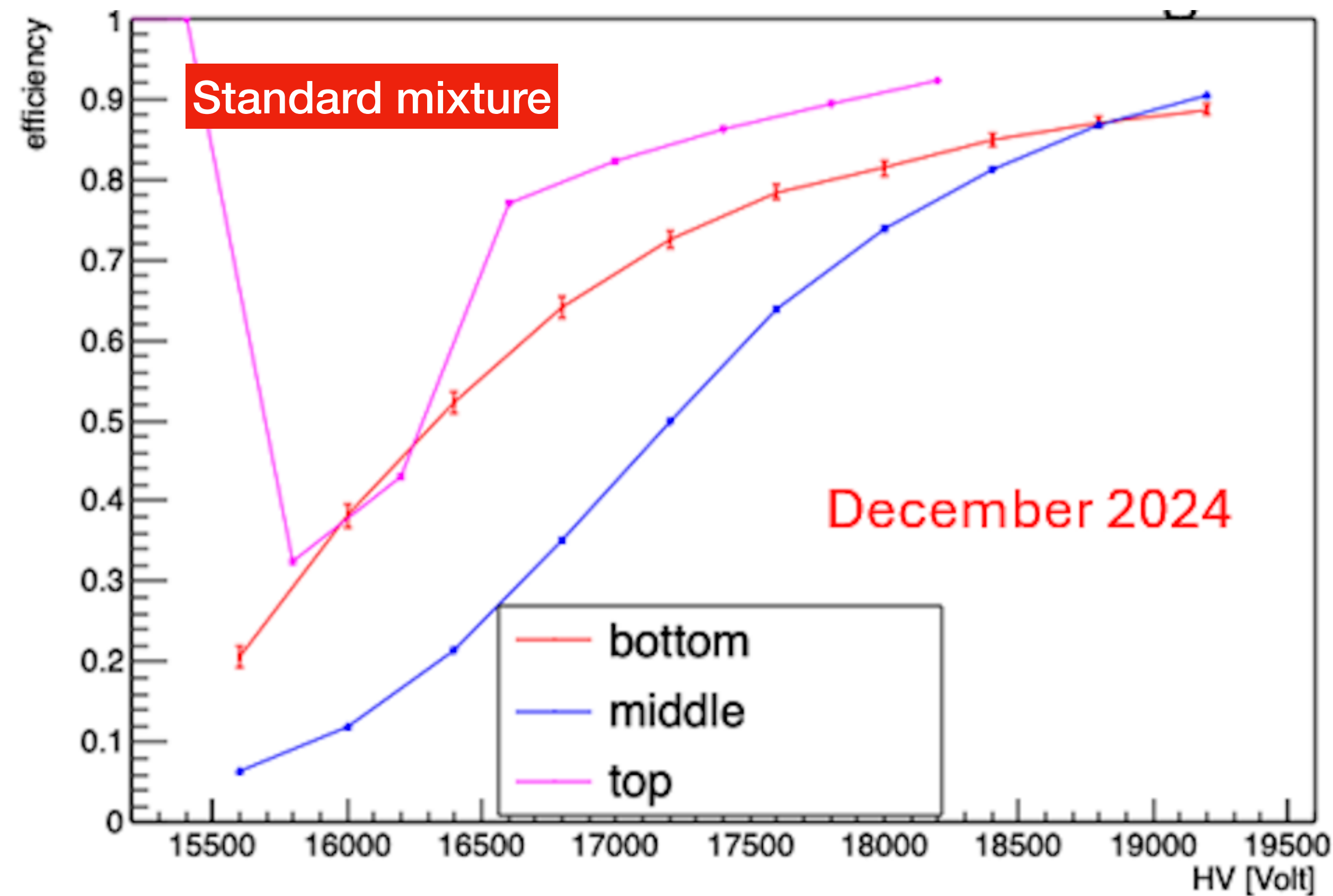


**Thank
you !**

Backup

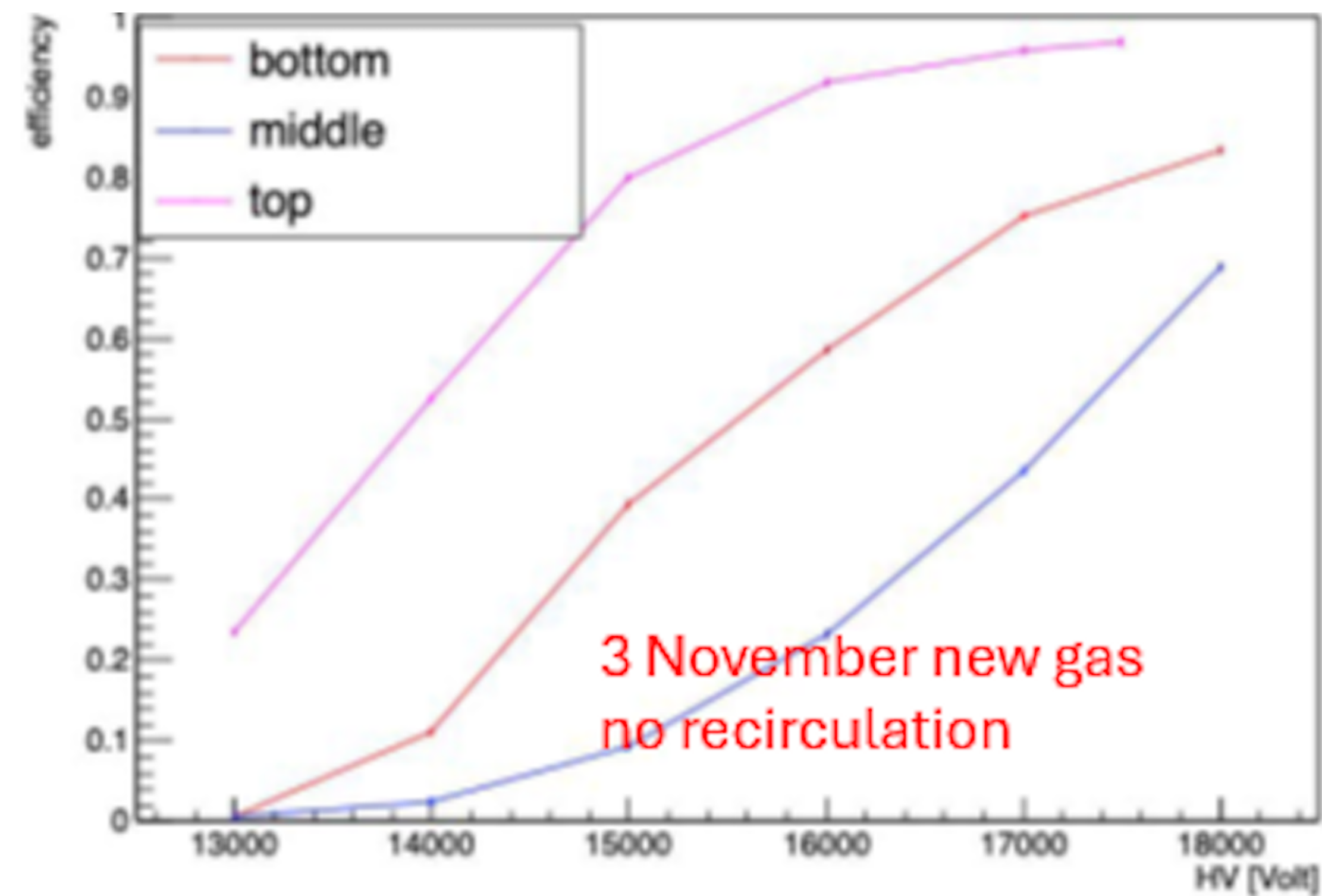


Standard mixture: efficiency plot

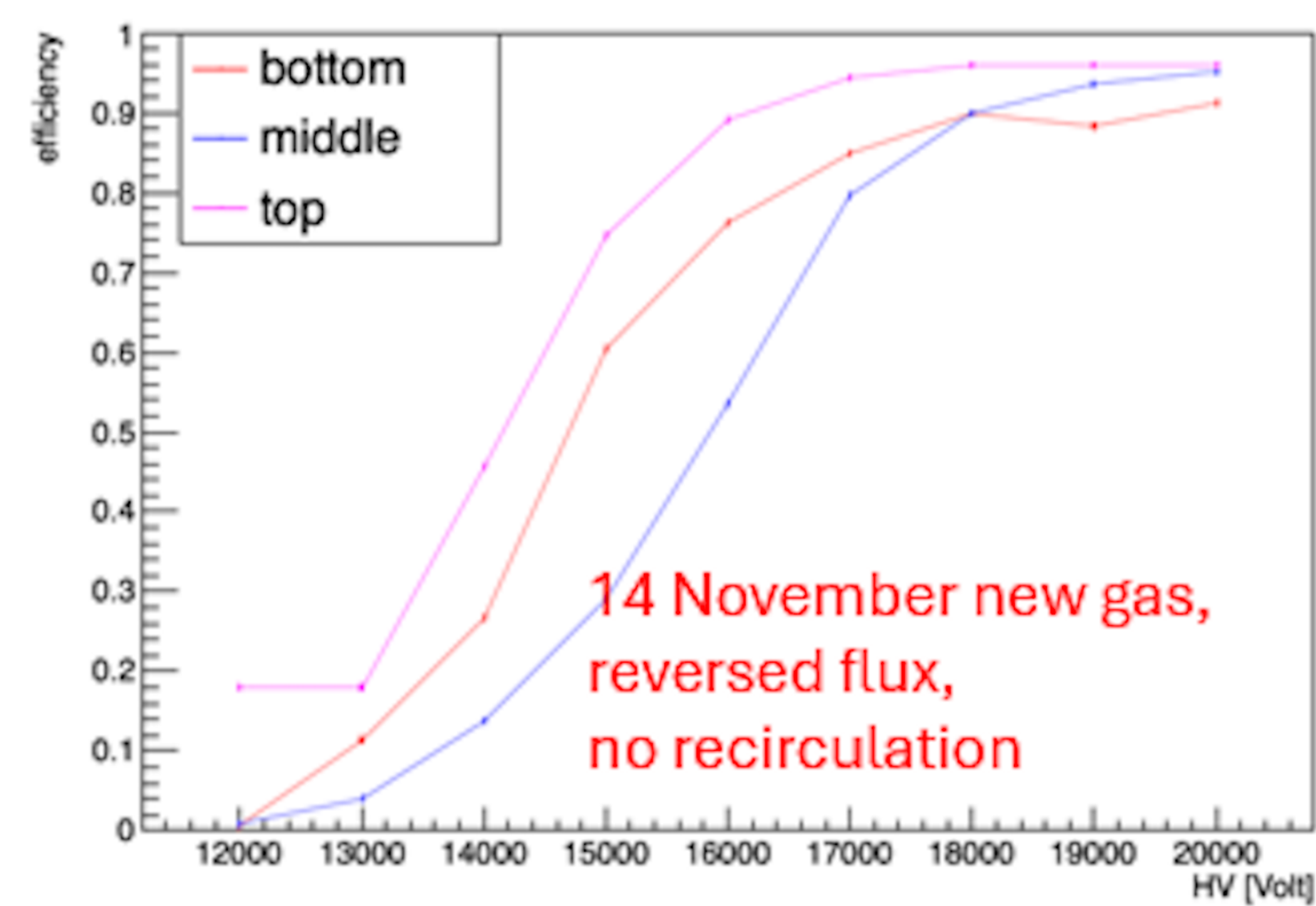


Comparison between flux direction and no recirculation

Top->bottom



Bottom->top



Chambers setup

Eco-freon C3F4H2 R1234ze + He mixture 50%-50%
Flush of chambers from BOTTOM to TOP

Gas flows : MAIN mixer -> μ GRS -> BOTTOM -> MIDDLE -> TOP-2 -> TOP -> μ GRS -> μ GRS bubbler

TOP: 2019.07.26.051 (250 mkm)
TOP-2: 2019.02.14 (250 mkm)
MID: 2022.03.03.0053 (300 mkm)
BOT: old BOTTOM (300 mkm)

DIST: TOP - 0.10 m - TOP-2 m - 0.09 m - MID - 1.07 m - BOT

DIST: TOP - 0.19 m - MID - 1.07 m - BOT
TRG: Triple TOP-MID-BOT

HV TOP: 16.8 kV (CAEN HV)
HV MID: 18.2 kV (DC-DC Box)
HV BOT: 18.2 kV (DC-DC Box)

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Trigger: Tripple TOP-MIDDLE-BOTTOM

HV TOP: 16.8 kV (CAEN HV)
HV MID: 18.2 kV (DC-DC Box)
HV BOT: 18.2 kV (DC-DC Box)