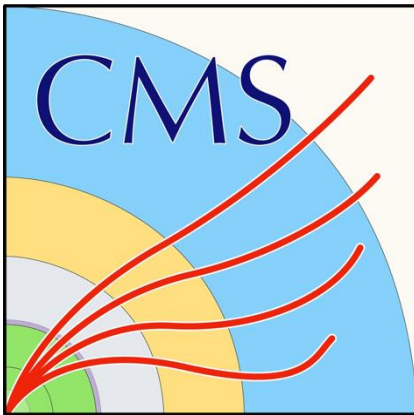




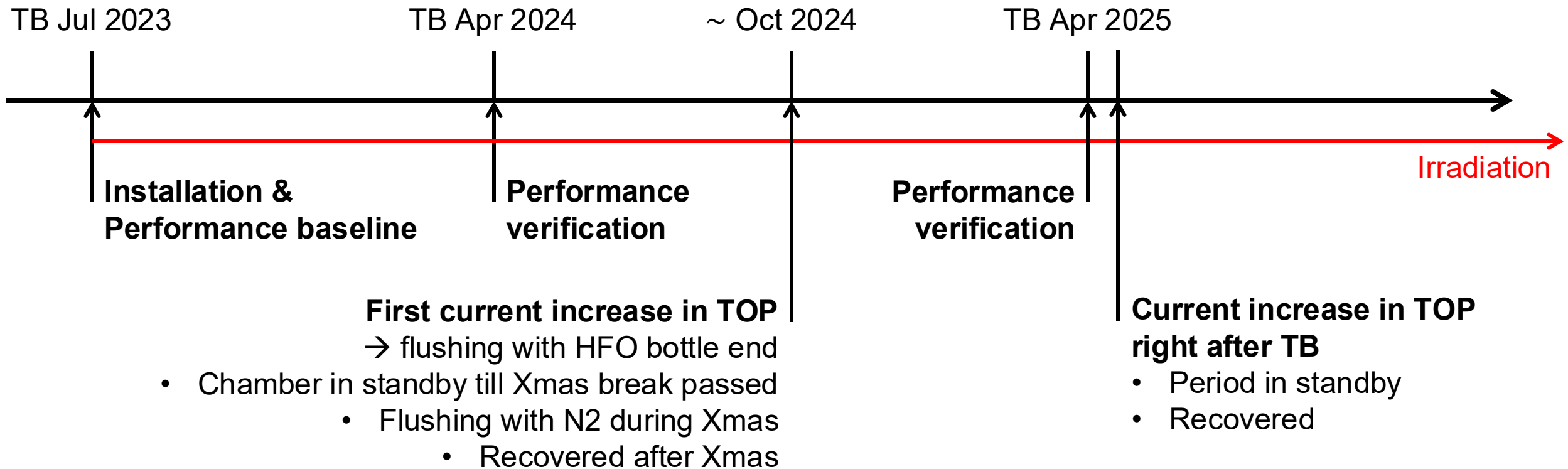
Status KODEL-H

Dayron Ramos (University and INFN Bari)

- TB April 2025 summary
- Hvgas correction (2023-2024)

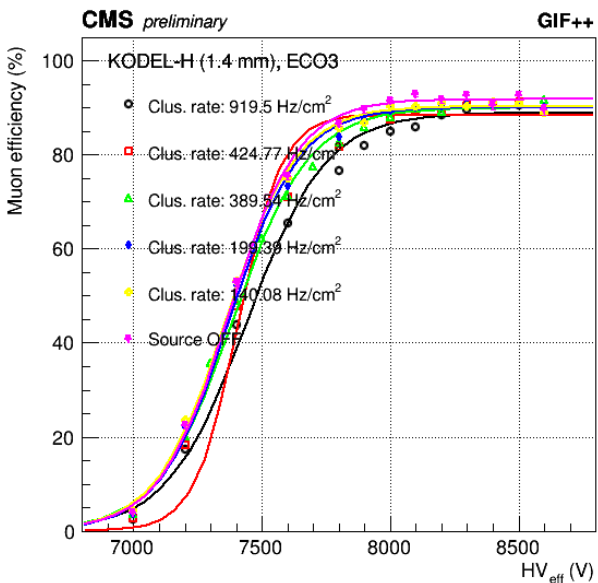
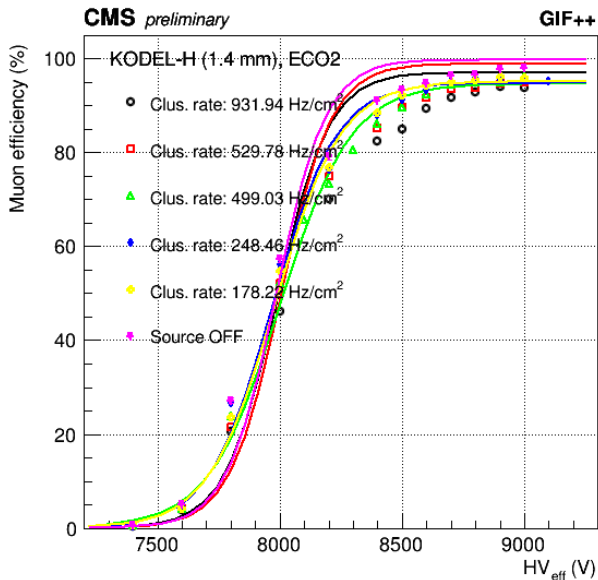
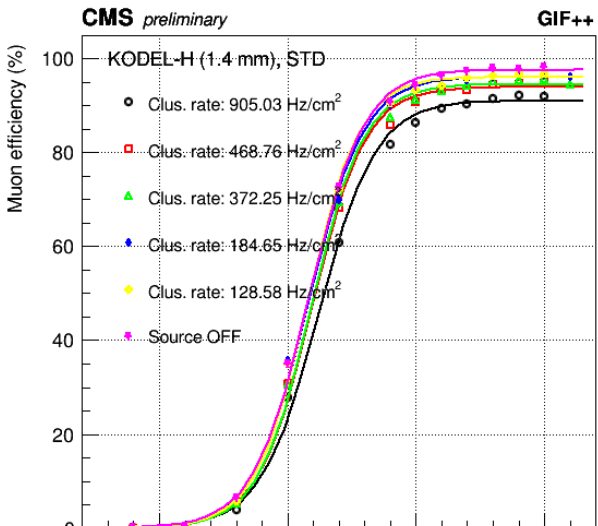


KODEL-H: short history





Results TB Apr 2025



STD

run	abs	eff_max	hv50	WP	eff(WP)	mCLS	itop	ibot
1050	1.0	91.0	7120.7	7567.8	89.4	1.6	14.2	71.6
1051	2.2	94.0	7095.6	7522.3	92.4	1.6	14.2	44.6
1048	3.3	94.6	7094.0	7517.2	93.1	1.7	13.9	37.7
1053	6.9	96.1	7082.4	7517.3	94.5	1.7	13.9	25.5
1047	10.0	96.1	7079.1	7498.8	94.6	1.7	14.2	21.3
1045	OFF	97.6	7083.0	7521.3	96.0	1.8	14.7	12.5

ECO2

run	abs	eff_max	hv50	WP	eff(WP)	mCLS	itop	ibot
1065	1	97.1	7987.3	8418.7	95.4	1.5	31.5	88.8
1061	2.2	98.9	8003.3	8429.1	97.3	1.6	25.8	60.4
1062	3.3	94.7	7999.1	8546.9	92.6	1.8	28.5	61.9
1059	6.9	94.9	7970.4	8474.5	92.9	1.9	22.4	38.3
1060	10	95.2	7979.1	8493.8	93.2	1.9	21.3	31.8
1056	OFF	99.7	7985.4	8404.1	98.2	1.9	17.2	14.5

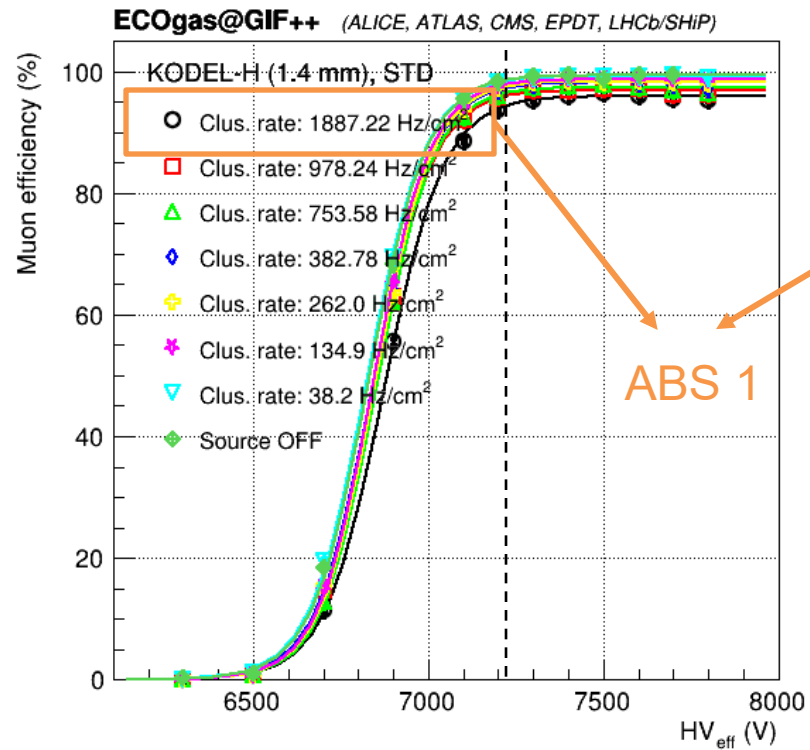
ECO3

run	abs	eff_max	hv50	WP	eff(WP)	mCLS	itop	ibot
1070	1	88.9	7442.0	8015.6	86.8	1.6	19.2	109.2
1069	2.2	88.5	7409.2	7777.1	87.4	1.6	16.3	54.2
1073	3.3	90.0	7389.3	7942.6	88.0	1.8	17.9	61.3
1072	6.9	90.1	7374.7	7895.0	88.2	1.9	17.3	39.5
1071	10	90.4	7362.9	7885.3	88.4	1.9	17.3	31.9
1066	OFF	91.8	7371.3	7887.5	89.9	2.0	16.5	13.8

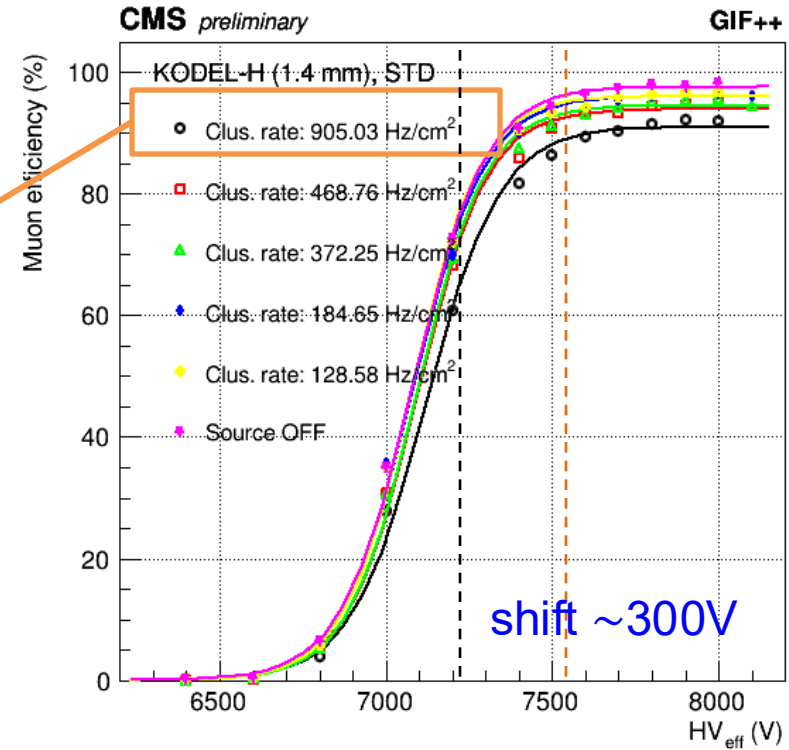


Verification: STD

2024



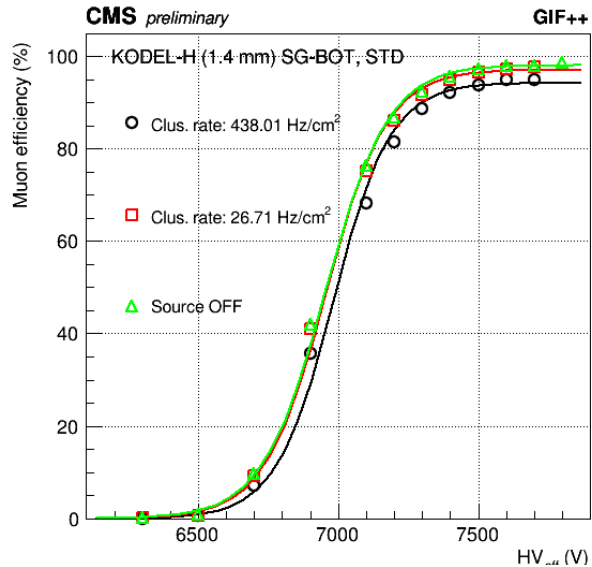
2025



- Rate capability losses
- Shift in overall WP around 300V w.r.t values reported during TB 2024

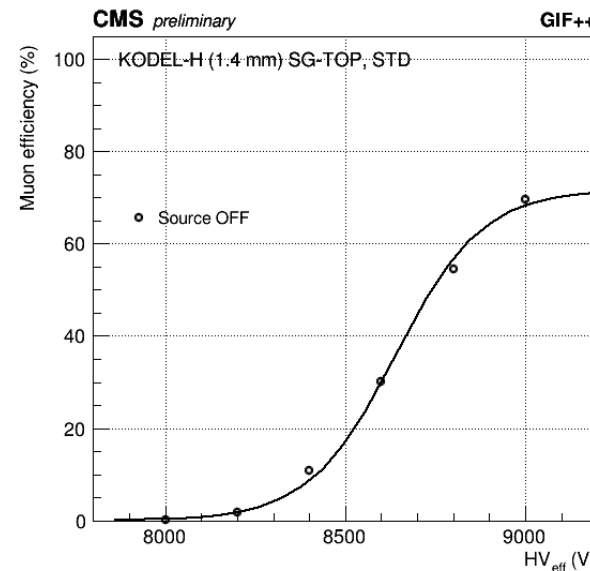
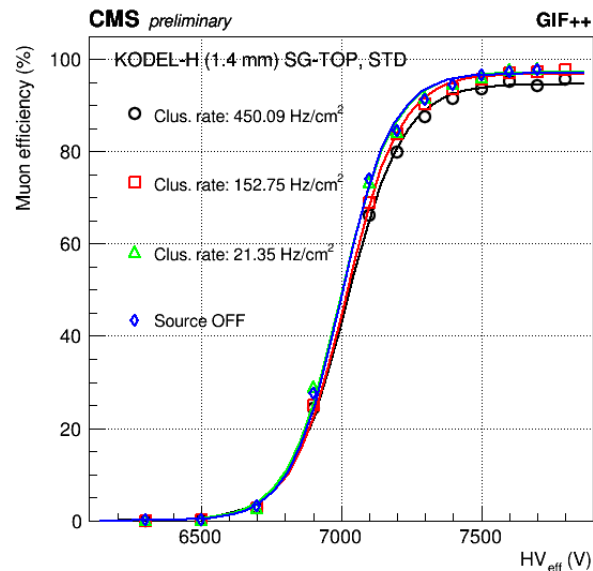
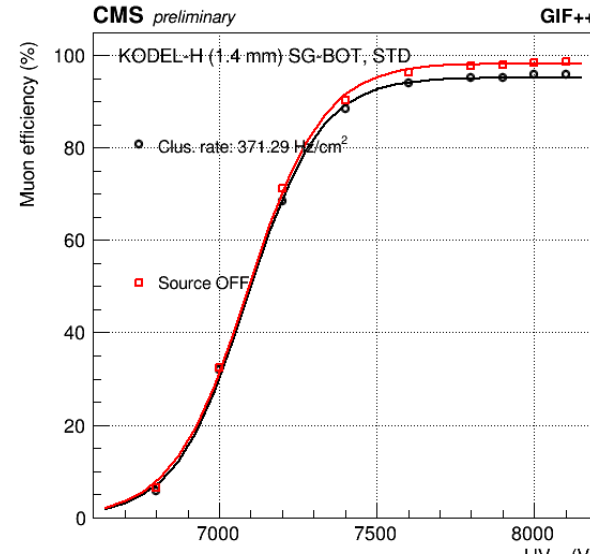


Verification in single gap: STD



2024

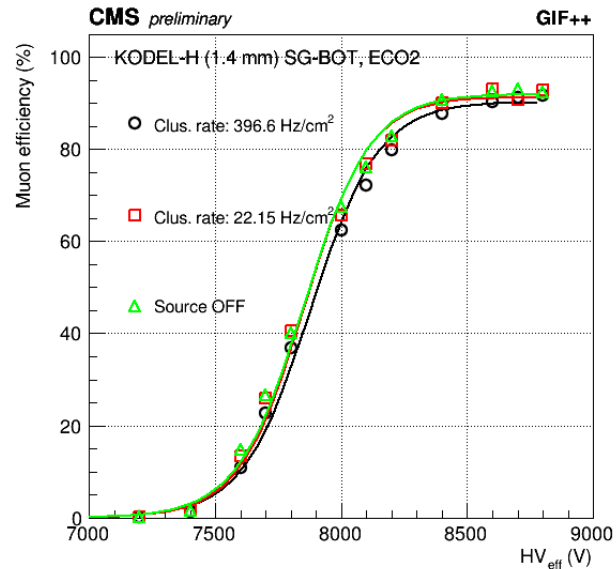
2025



- Remarkable increase of voltage drop in TOP
- Plateau at ~1.5 kV higher for TOP w.r.t BOT gap

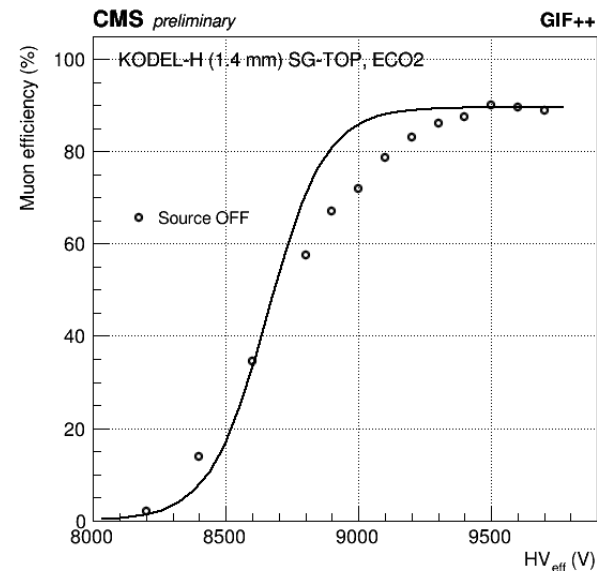
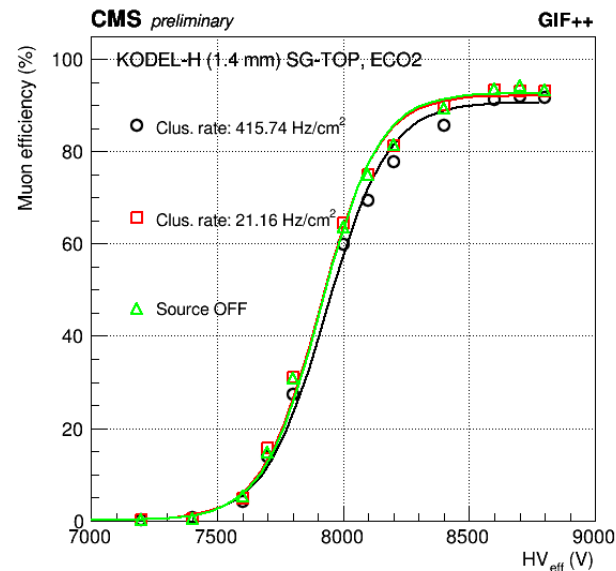
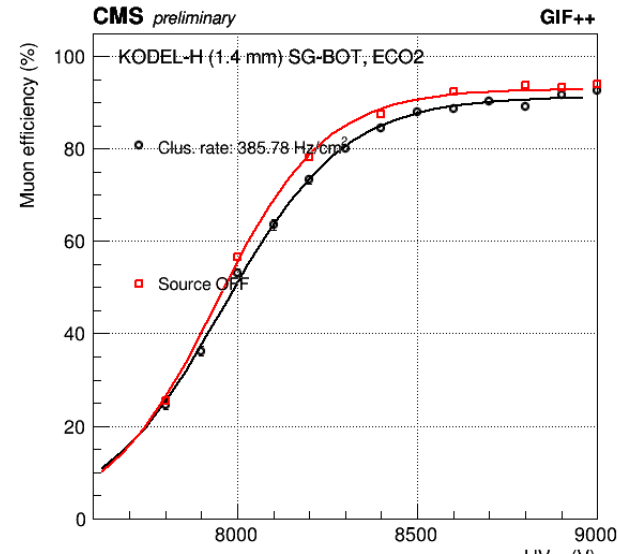


Verification in single gap: ECO2



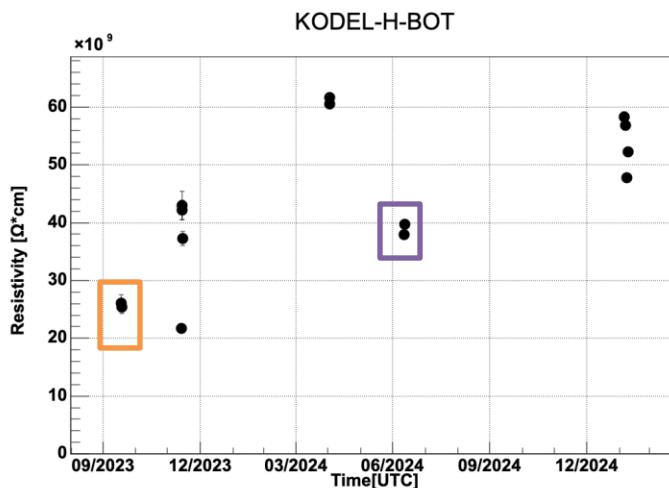
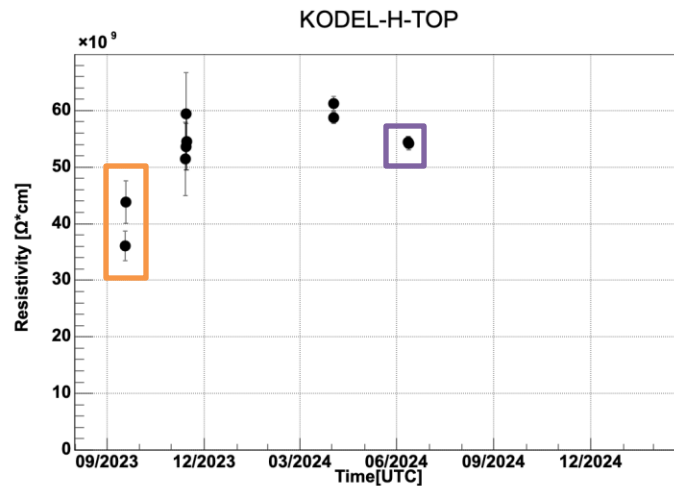
2024

2025





Hv gas: resistivity



Rho0 ($T_0 = 20^\circ\text{C}$)

scan 687, 688

rho0_top_2023 = [36032684471.29438, 43867029763.30897]

rho0_bot_2023 = [26130540400.25485, 25419685016.28018]

scan 849, 850

rho0_top_2024 = [61259680571.86028, 58721867213.798836]

rho0_bot_2024 = [60584759179.84912, 61695423157.415]

Rho PT treatment

1. Rho in Ar scan temperature:

$\rho(T_{\text{Ar}}) = \rho(T_0)/4.4^{**}[(T_{\text{Ar}} - T_0)/12^\circ\text{C}]$ where $T_0 = 20^\circ\text{C}$ and T_{Ar} is estimated for the scan from DIP

2. Rho in HVscan temperature: $\rho(T_{\text{scan}}) = \rho(T_{\text{Ar}})*4.4^{**}[(T_{\text{Ar}} - T_{\text{scan}})/12^\circ\text{C}]$

RhoAr (T_{Ar})

rhoAr_top_2023 = [34535623719.92875]

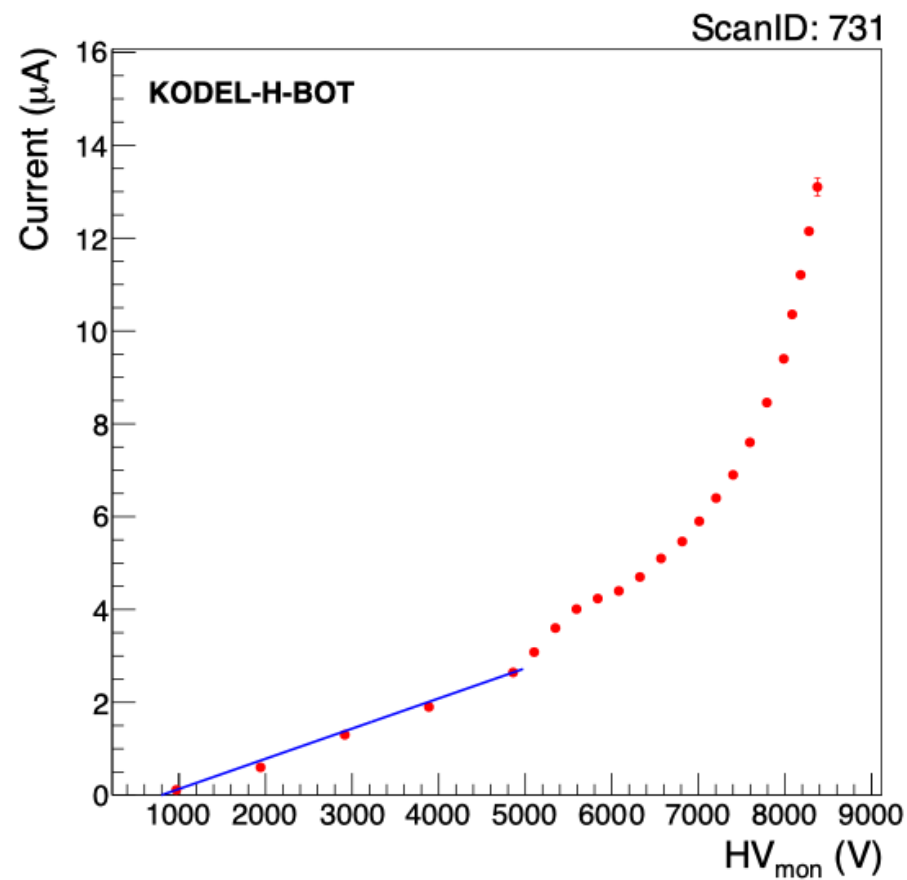
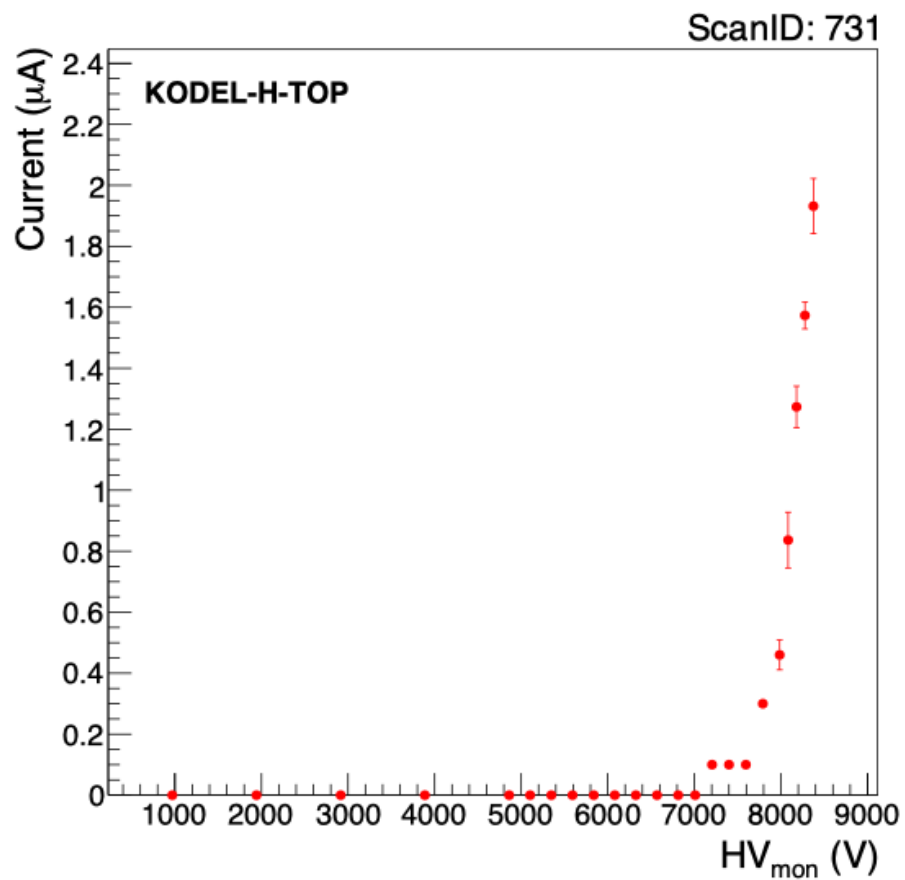
rhoAr_bot_2023 = [22285023693.238224]

rhoAr_top_2024 = [53925060115.338104]

rhoAr_bot_2024 = [54957690454.66639]



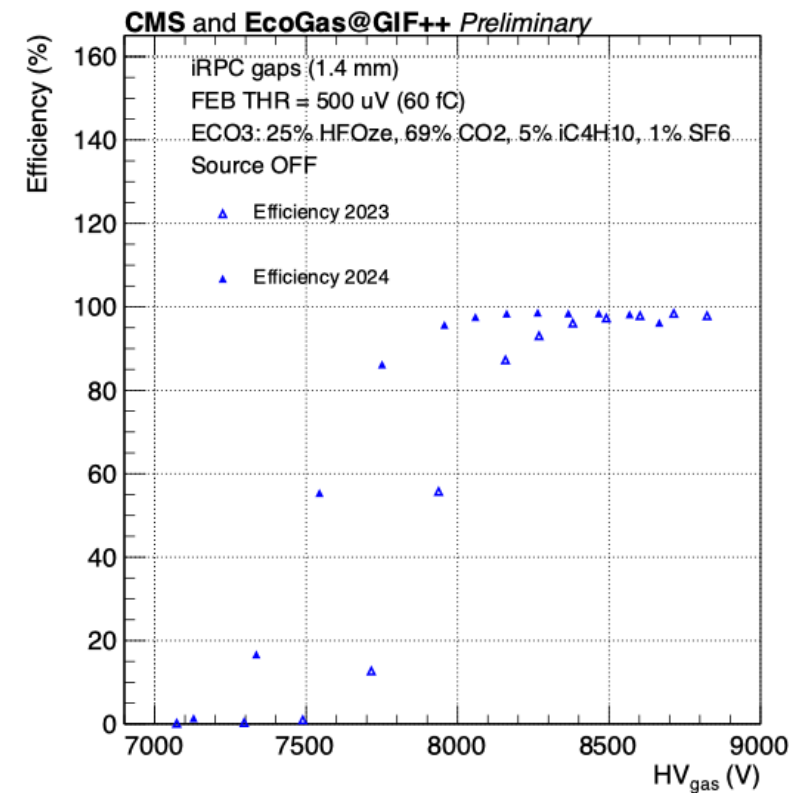
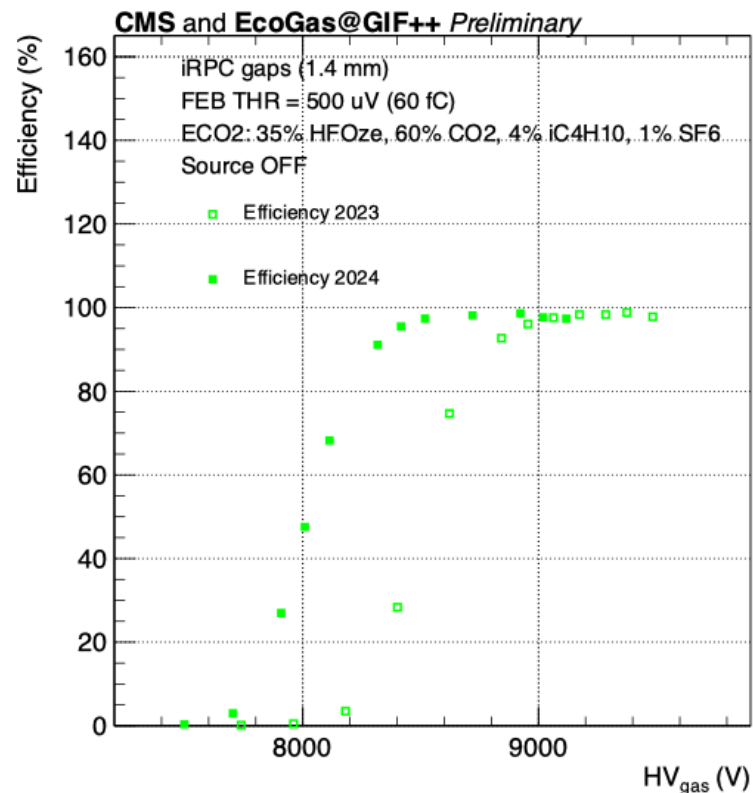
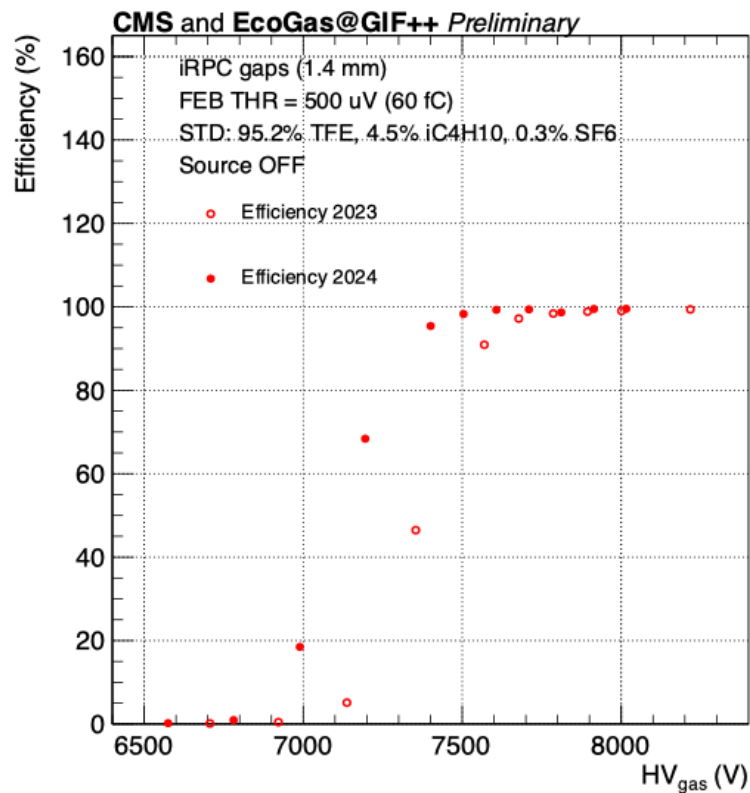
Hvgas: ohmic 2024





Hvgas

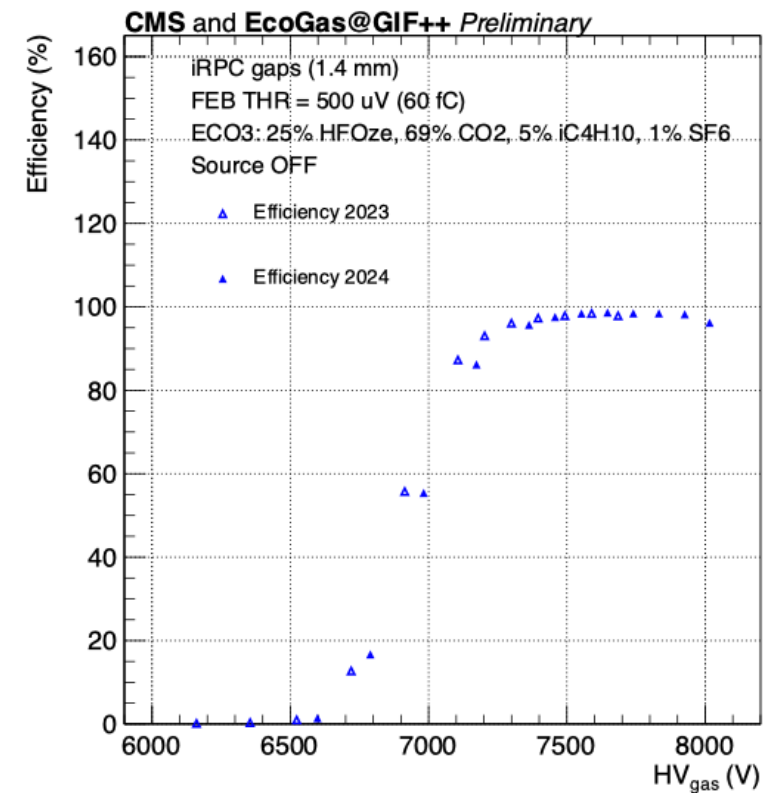
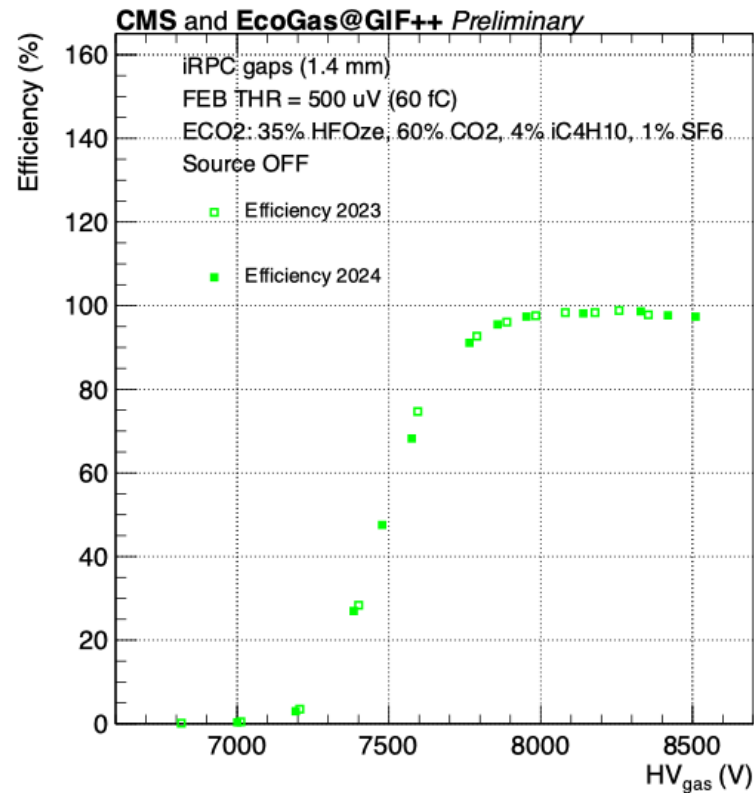
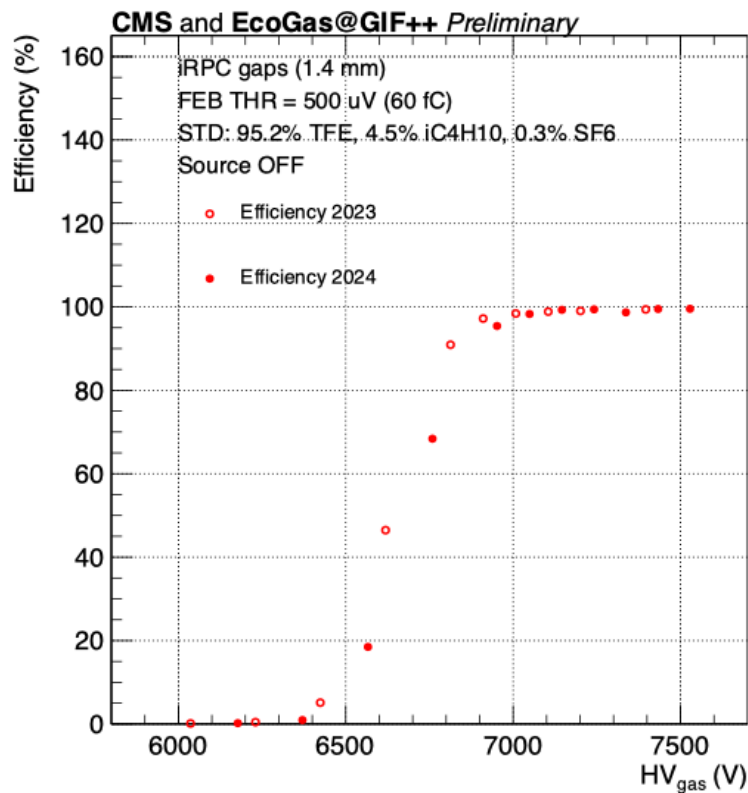
- **PT treatment, ohmic contribution estimated with closest Source OFF weekly scan ECO2 and HVgas normalized to T0=20°C**





HVgas

- **NO PT treatment, ohmic contribution estimated with closest Source OFF weekly scan ECO2 and HVgas NO normalized**





Remarks

- High increase of ohmic drop was verified in TOP gap during Apr 2025 TB
→ No gas related effect (single gap - gas independently)
- TB July plans: run Kodel-H in double mode with different HVs for each gap
- HVgas correction match 2023-2024 without any PT treatment → ongoing for 2025 data



Thanks



Backup slides

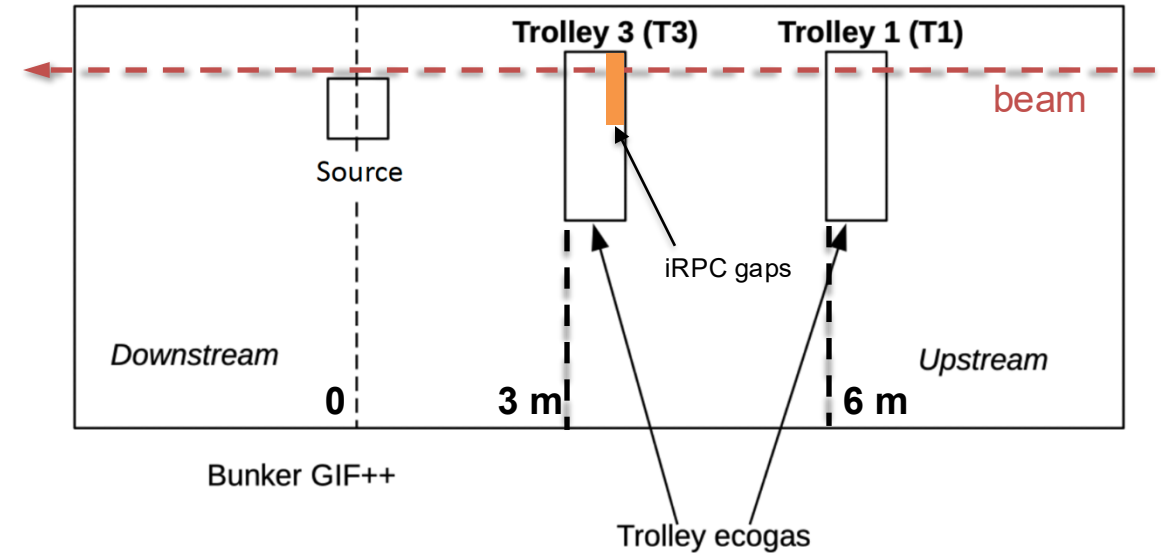
State of art

Setup at GIF++ [2, 3]

- 12.2 TBq ^{137}Cs + H4 SPS beam line available at GIF++
- Radiation intensity attenuated by combination of filters
- Gas mixer unit to provide up to 4 component gas mixture (humidified): TFE, iC_4H_{10} , SF_6 , CO_2 , Ar, HFO
- Trigger made off 4 scintillator coincidence (two of them internal and two external to the bunker)

Layout of iRPC gaps prototype

Gaps	Strips	Readout system
Double gap layout	Strips: 32	KODEL Front-end electronic
Total area: $51 \times 51 \text{ cm}^2$	Strip width: 1.27 cm	+ CAEN multi-hit TDC (Time-to-Digital Converter) model
Active area: $45.5 \times 45.5 \text{ cm}^2$	Strip pitch: $\sim 1.4 \text{ cm}$	V1190
Electrode material: Bakelite	Termination: 50 ohms	
Electrode thickness: 1.43 mm		
Electrode bulk resistivity: $1.17\text{--}1.39\text{E}10 \text{ }\Omega\text{cm}$		
Gas thickness: 1.4 mm		



Some definitions

- Logistic function for efficiency fit:

$$\varepsilon(HV) = \frac{\varepsilon_{max}}{1 + e^{-\beta(HV - HV_{50})}}$$

where the free parameters are: ε_{max} , representing the asymptotic maximum efficiency (plateau efficiency); β , which is related to the steepness of the efficiency curve, and HV_{50} , which represents the voltage where the efficiency reaches 50% of its maximum.

- Working point:

$$\text{WP} = \frac{\log 19}{\beta} + HV_{50} + 150 \text{ V}$$

Summary formulas

$$R = \frac{\rho \cdot 2 \cdot s}{A}$$

- R = Resistance
- ρ = resistivity
- s = thickness = 0.16 cm
- A = area = 7000 cm²

$$HV_{gas} = HV_{app} - R \cdot I$$

- I = current out of spill

$$HV'_{gas} = HV_{gas} \cdot \frac{T}{T_0} \frac{P_0}{P} \quad (\text{hereafter called simply HV}_{gas})$$

- $T_0 = 273.15K = 20^\circ C$
- $P_0 = 990 \text{ mbar}$

$$HV_{\text{eff}} = HV_{\text{app}} \frac{P_0 T}{P T_0}$$

$$| \quad HV_{\text{app}} = HV_{\text{eff}} \frac{P T_0}{P_0 T}$$

$$HV_{\text{gas}} = HV_{\text{app}} - IR$$

$$HV_{\text{gas}}^* = HV_{\text{gas}} * \frac{P_0 T}{P T_0}$$

$$HV_{\text{gas}}^* = (HV_{\text{app}} - IR) * \frac{P_0 T}{P T_0}$$

$$HV_{\text{gas}}^* = HV_{\text{eff}} - IR * \frac{P_0 T}{P T_0}$$