Eff vs HVgas
2022 and 2024 TB
SHiP/LHCb

Giuliana Galati on behalf of the SHiP/LHCb Bari Group

07/05/2025

Summary formulas

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

- R = Resistance
- ρ = resistivity
- s = thickness = 0.16 cm
- A = area = 7000 cm^2

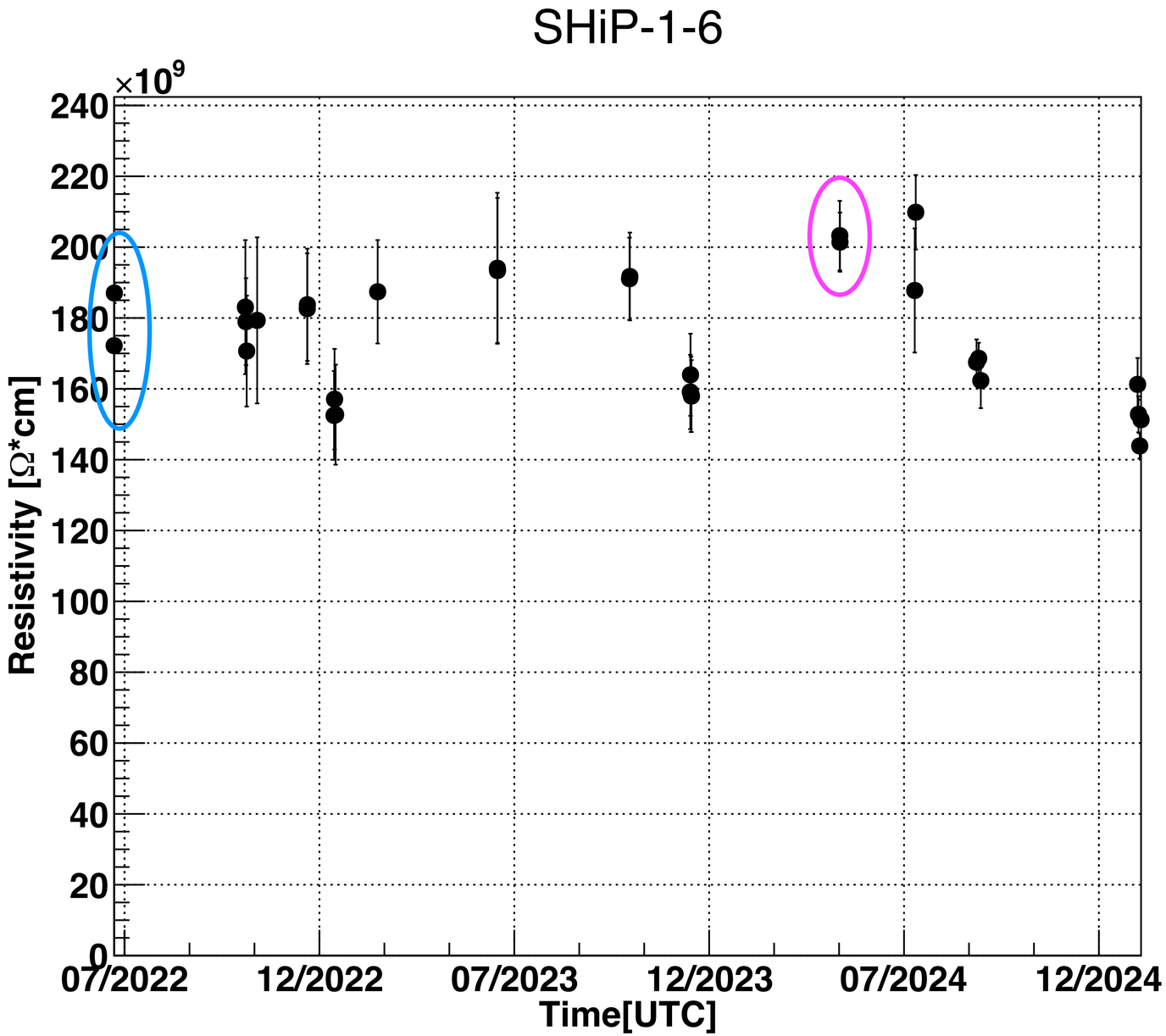
$$HV_{gas} = HV_{app} - R \cdot I$$

- I = current out of spill

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

- $T_0 = 273.15K = 20°C$
- P_0 = 990 mbar

Resistivity measured in Argon (by Luca)



$$\rho(T_0) = \rho(T) \cdot 4.4^{\frac{T - T_0}{12°C}}$$

$$T_0 = 20°C$$

Values 2022: 22/06/2022

Values 2024: 02/05/2024

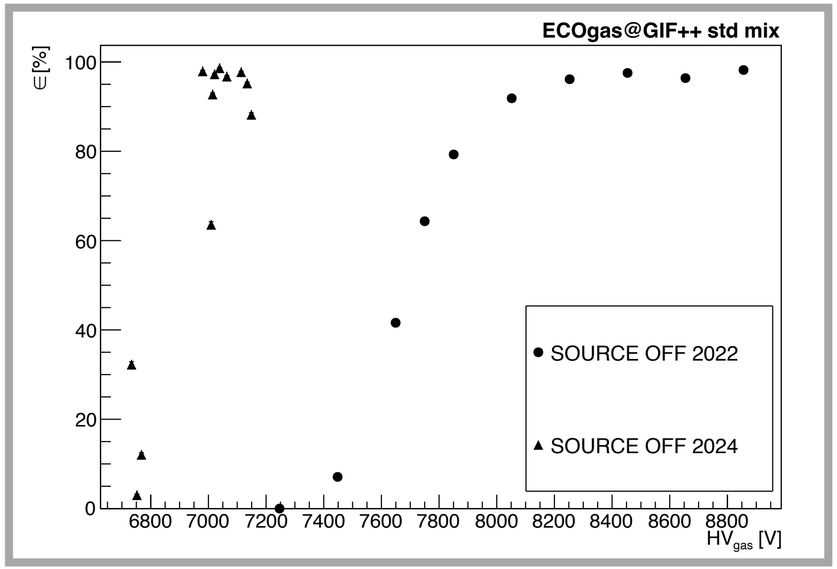
$$\rho(T_{scan}) = \rho(T) \cdot 4.4^{\frac{T - T_{scan}}{12°C}}$$

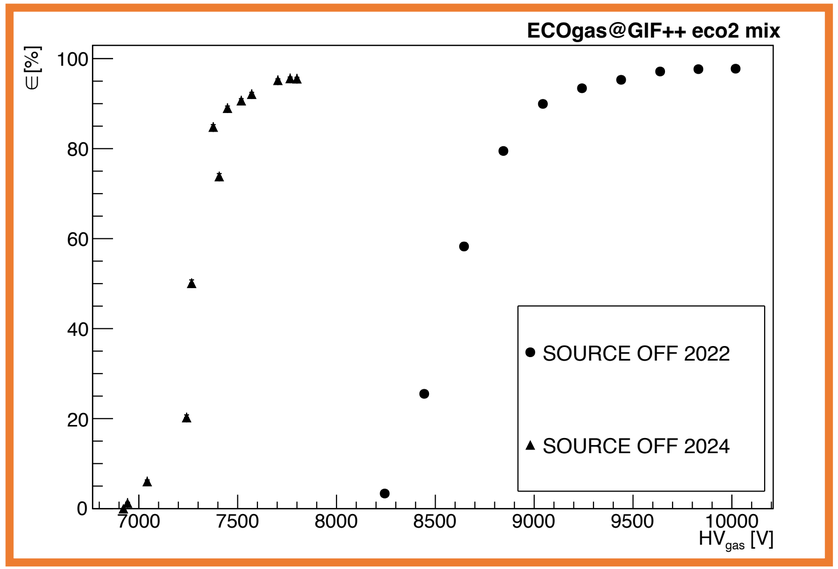
Resistivity

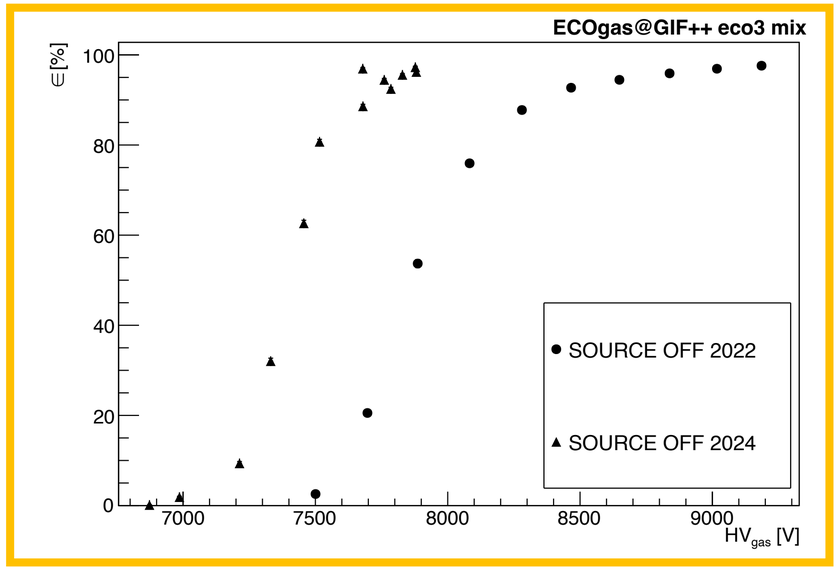
ARGON Scan	Date	T (°C)	rho @T 20° (Ohm*cm)	Errore rho (Ohm*cm)	Weighted mean
254	22/06/2022	21,9	1,721847E+11	2,191975E+10	1,868033E+11
255	22/06/2022	22,3	1,870466E+11	2,827875E+09	
849	02/05/2024	20,87	2,032476E+11	9,823277E+09	2,021822E+11
850	02/05/2024	20,86	2,014129E+11	8,346910E+09	

Efficiency Scan	Date	T_scan (°C)	rho @ T_scan (Ohm*cm)
294	14/07/2022	21,5	1,552219E+11
322	17/07/2022	21,5	1,552219E+11
347	21/07/2022	22,4	1,388974E+11
878	27/06/2024	21,7	1,639031E+11
901	30/06/2024	21,65	1,649180E+11
945	05/07/2024	21,3	1,722010E+11

Rho evaluated in argon

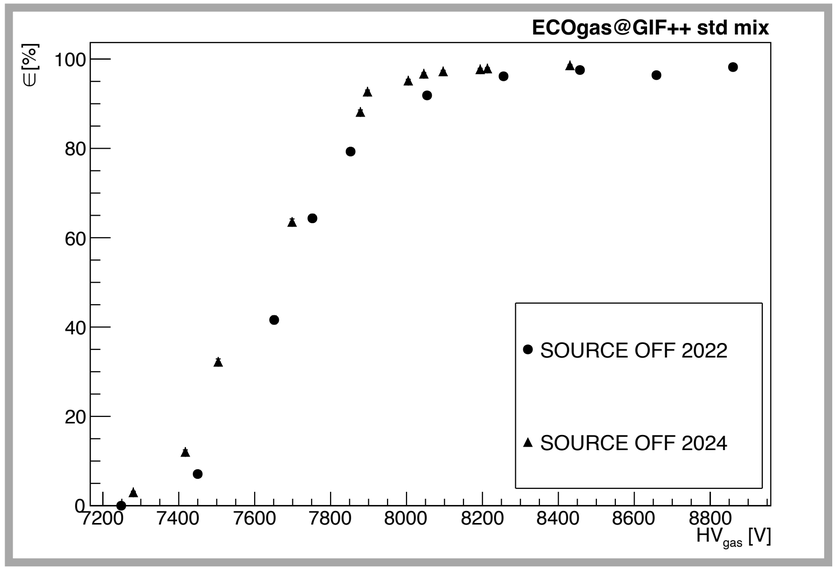


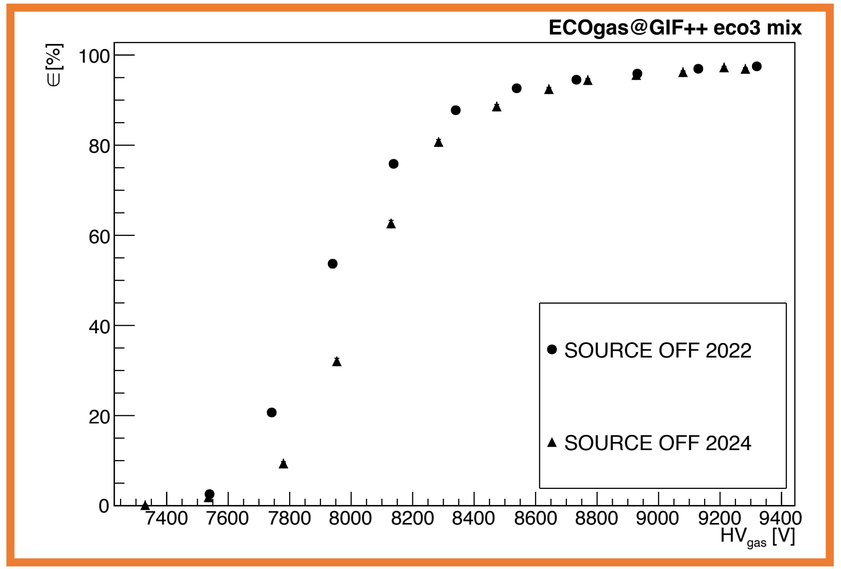


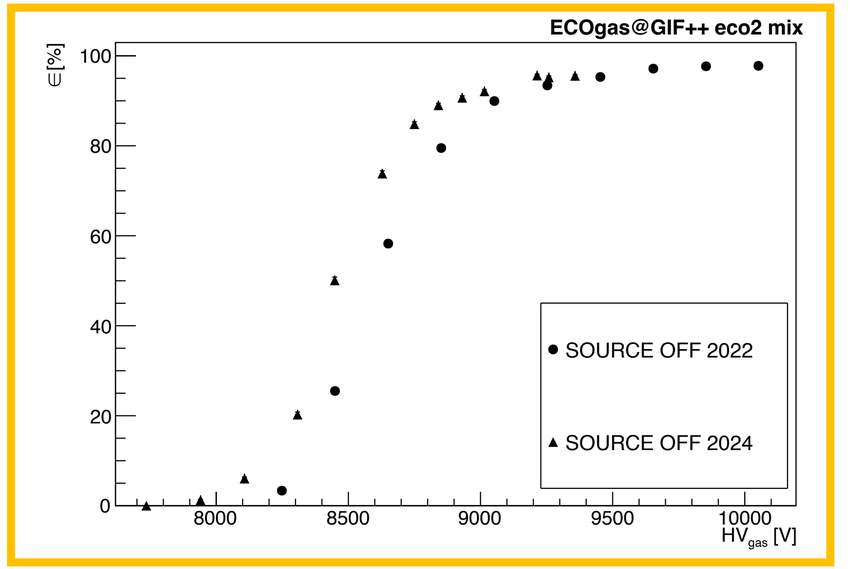


Rho “self” evaluated

	rho (10^11 Ohm*cm)				
	std mix	eco2	eco3	Mean	Error
07/2022	0,35	0,38	0,36	0,36	0,02
07/2023	0,51	0,50	0,49	0,50	0,01
07/2024				0,57 (estimate)	







202207 - Std - Run 294

HVeff (V)	HVapp (V)	I(uA)
7249 ± 1	7247	0.3 ± 0.1
7450 ± 1	7448	0.3 ± 0.1
7652 ± 1	7649	0.4 ± 0.1
7753 ± 1	7750	0.4 ± 0.1
7853 ± 1	7851	0.4 ± 0.1
8055 ± 1	8052	0.4 ± 0.1
8257 ± 1	8253	0.5 ± 0.1
8458 ± 1	8454	0.6 ± 0.1
8660 ± 1	8654	0.7 ± 0.1
8861 ± 1	8856	0.7 ± 0.1

202207 - Eco2 - Run 322

HVeff (V)	HVapp (V)	I(uA)
8250 ± 1	8244	0.8 ± 0.1
8451 ± 1	8444	1.0 ± 0.1
8653 ± 1	8645	1.0 ± 0.1
8854 ± 1	8844	1.3 ± 0.1
9055 ± 1	9044	1.5 ± 0.1
9256 ± 1	9242	2.0 ± 0.1
9458 ± 1	9440	2.4 ± 0.1
9659 ± 1	9637	3.0 ± 0.1
9860 ± 1	9831	4.0 ± 0.1
10061 ± 1	10019	5.8 ± 0.1

202207 - Eco3 - Run 347

HVeff (V)	HVapp (V)	I(uA)
7555 ± 1	7501	8.3 ± 0.1
7757 ± 1	7697	9.1 ± 0.1
7958 ± 1	7887	10.8 ± 0.3
8160 ± 1	8083	11.7 ± 0.2
8361 ± 1	8280	12.3 ± 0.2
8562 ± 1	8466	14.6 ± 0.1
8763 ± 1	8649	17.4 ± 0.2
8965 ± 1	8838	19.2 ± 0.2
9167 ± 1	9017	22.7 ± 0.2
9368 ± 1	9185	27.7 ± 0.3

202407 - Std - Run 878

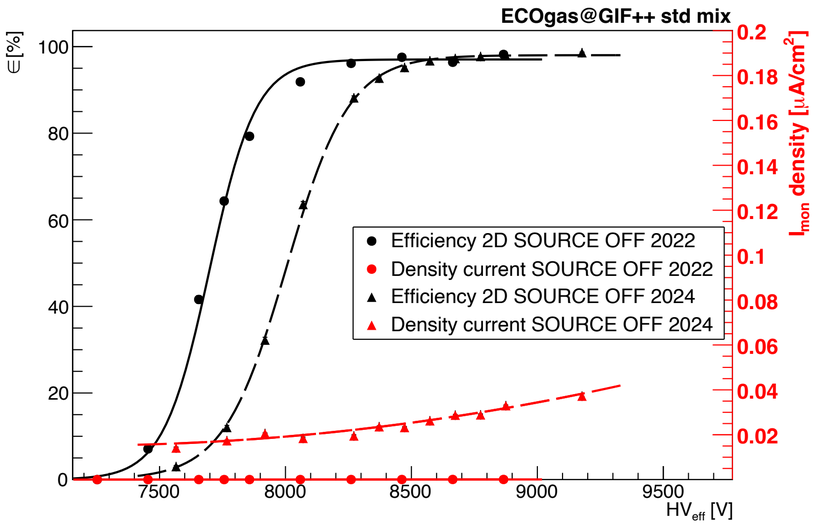
HVeff (V)	HVapp (V)	I(uA)
7562 ± 1	6752	104 ± 3
7764 ± 1	6768	128 ± 2
7915 ± 1	6734	151 ± 2
8066 ± 1	7010	135 ± 4
8267 ± 1	7149	143 ± 4
8368 ± 1	7015	174 ± 3
8468 ± 1	7135	171 ± 3
8569 ± 1	7064	193 ± 2
8670 ± 1	7021	211 ± 2
8770 ± 1	7114	213 ± 3
8870 ± 1	6980	243 ± 2
9173 ± 1	7038	274 ± 8

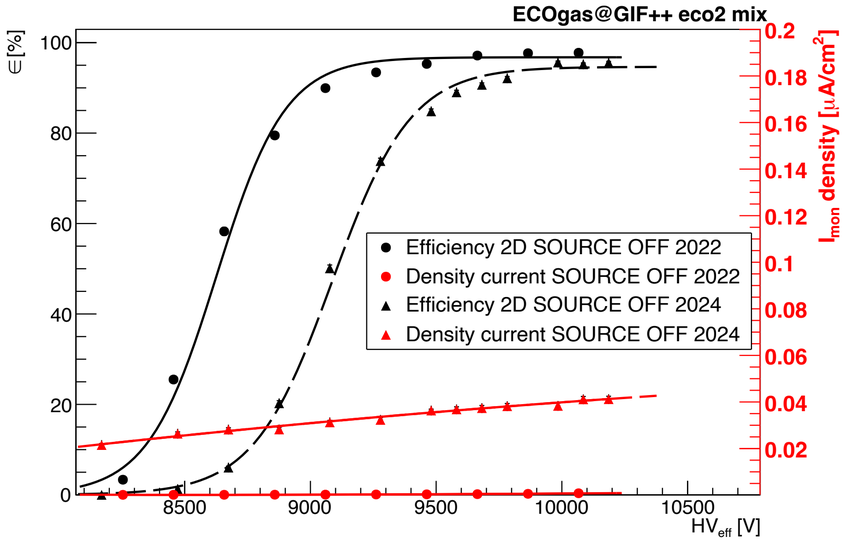
202407 - Eco2 - Run

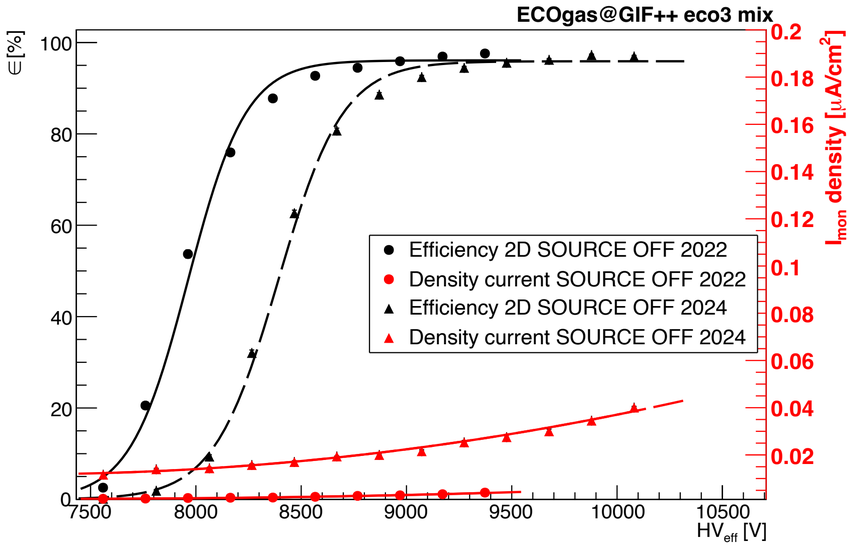
HVeff (V)	HVapp (V)	I(uA)
8165 ± 1	6922	159 ± 5
8468 ± 1	6943	194 ± 6
8669 ± 1	7042	207 ± 6
8871 ± 1	7242	208 ± 6
9072 ± 1	7267	230 ± 6
9274 ± 1	7407	238 ± 7
9475 ± 1	7376	268 ± 5
9576 ± 1	7448	271 ± 8
9677 ± 1	7518	275 ± 8
9778 ± 1	7571	281 ± 8
9979 ± 1	7766	282 ± 8
10080 ± 1	7703	303 ± 9
10181 ± 1	7800	304 ± 9

202407 - Eco3 - Run

HVeff (V)	HVapp (V)	I(uA)
7556 ± 1	6873	84 ± 3
7808 ± 1	6986	101 ± 3
8060 ± 1	7213	104 ± 3
8261 ± 1	7331	114 ± 4
8463 ± 1	7456	123 ± 4
8665 ± 1	7516	141 ± 2
8866 ± 1	7680	145 ± 4
9068 ± 1	7785	157 ± 4
9269 ± 1	7760	185 ± 6
9471 ± 1	7829	201 ± 6
9672 ± 1	7881	219 ± 7
9874 ± 1	7878	244 ± 8
10076 ± 1	7679	293 ± 4


ECOgas@GIF++ std mix
ε [%]
I_mon density [μA/cm²]
HV_eff [V]
Efficiency 2D SOURCE OFF 2022
Density current SOURCE OFF 2022
Efficiency 2D SOURCE OFF 2024
Density current SOURCE OFF 2024


ECOgas@GIF++ eco2 mix
ε [%]
I_mon density [μA/cm²]
HV_eff [V]
Efficiency 2D SOURCE OFF 2022
Density current SOURCE OFF 2022
Efficiency 2D SOURCE OFF 2024
Density current SOURCE OFF 2024


ECOgas@GIF++ eco3 mix
ε [%]
I_mon density [μA/cm²]
HV_eff [V]
Efficiency 2D SOURCE OFF 2022
Density current SOURCE OFF 2022
Efficiency 2D SOURCE OFF 2024
Density current SOURCE OFF 2024