Eff vs HVgas
2022 and 2024 TB
SHiP/LHCb

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27/05/2025

Summary formulas

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

- R = Resistance
- ρ = resistivity
- s = thickness = 0,16 cm
- A = area = 7000 cm^2

I_{dark} = fit of the first 2 points of $I_{out\ of\ spill}$ vs HV_{app} evaluated at HV_{app}

$$I = I_{in\ of\ spill} - I_{dark}$$

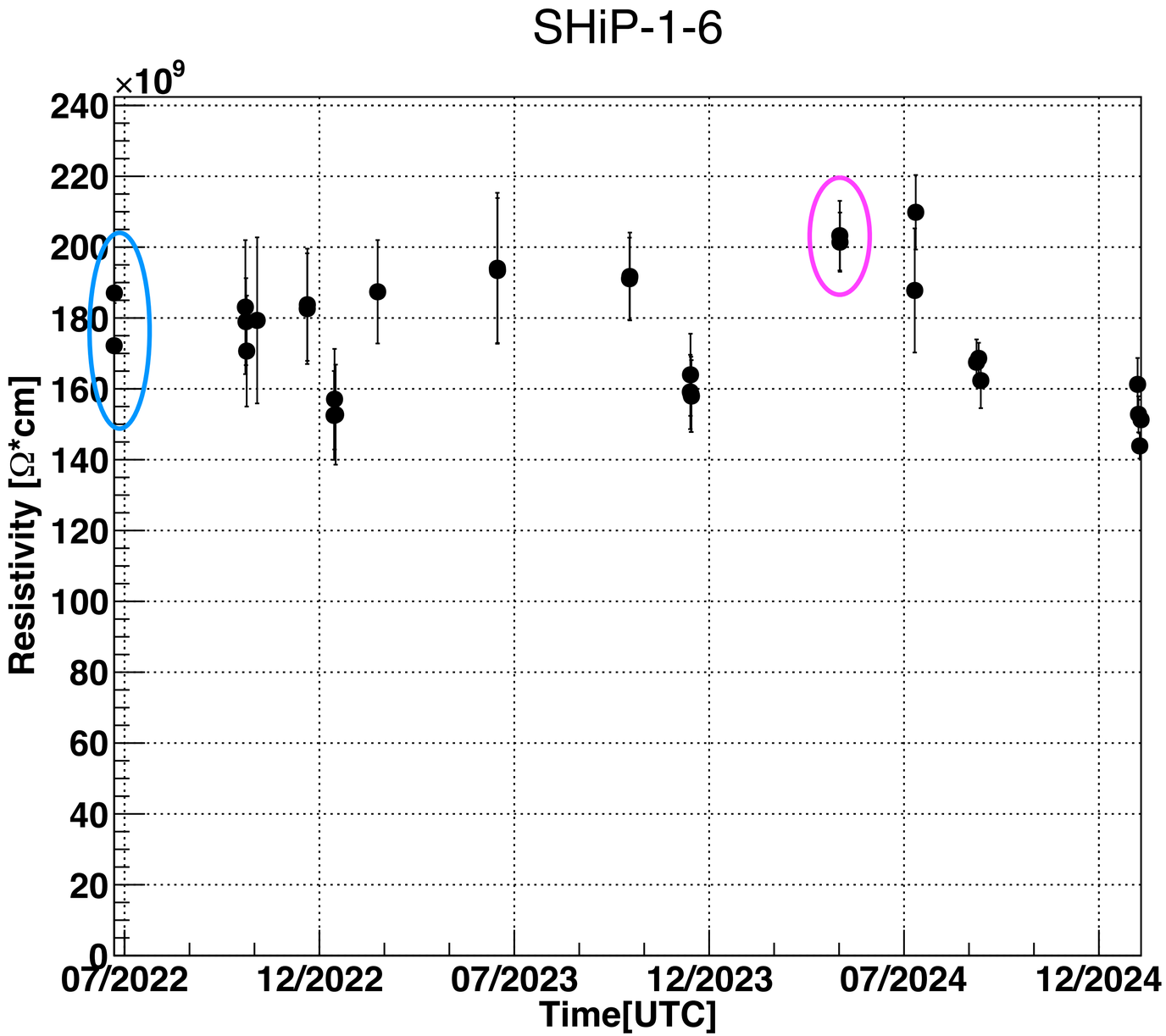
$$HV_{gas} = HV_{app} - R \cdot I$$

$$HV'_{gas} = HV_{gas} \cdot \frac{T}{T_0}\frac{P_0}{P}$$

(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

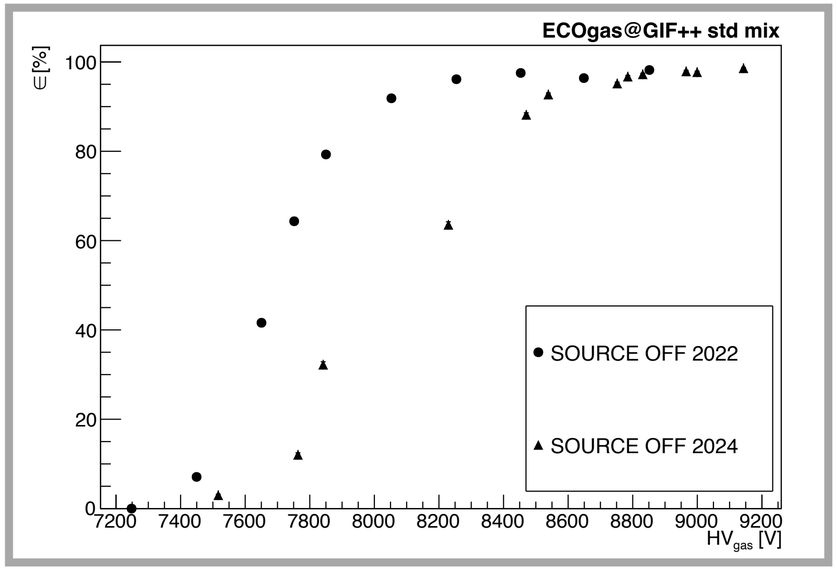
$$\rho(T_{scan}) = \rho(T) \cdot 4.4^{\frac{T - T_{scan}}{12°C}}$$

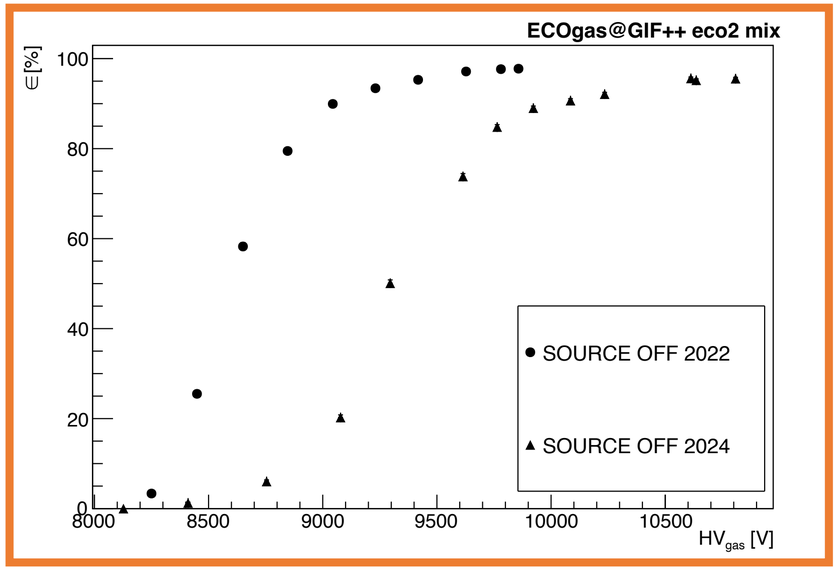
Resistivity

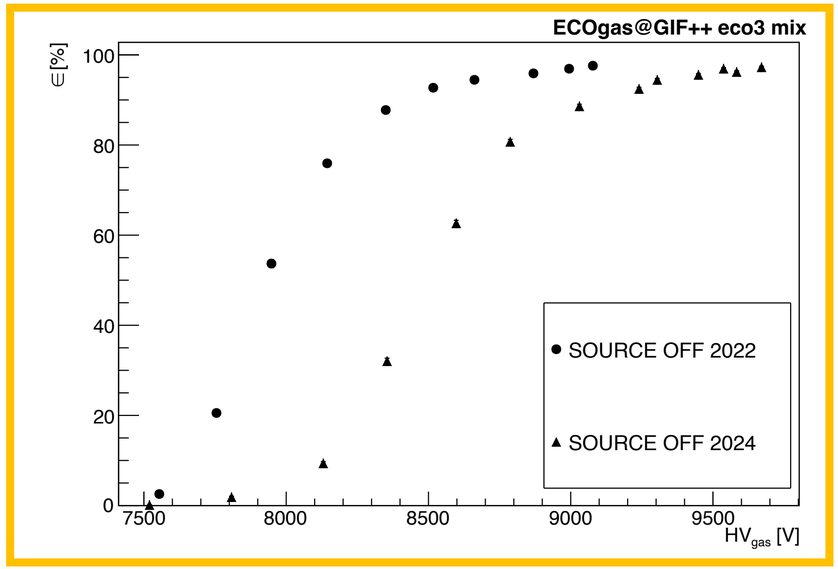
ARGON Scan	Date	T (°C)	rho @T 20° (Ohm*cm)	Errore rho (Ohm*cm)	Weighted mean
254	22/06/2022	21,9	1,721847E+11	2,191975E+10	1,868033E+11
255	22/06/2022	22,3	1,870466E+11	2,827875E+09	
849	02/05/2024	20,87	2,032476E+11	9,823277E+09	2,021822E+11
850	02/05/2024	20,86	2,014129E+11	8,346910E+09	

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







Std

202207 - Std - Run 294

HVapp	HVeff	HVgas	I_out(uA)	I_in(uA)	darkI(uA)	eff2D
7011	7249	7248	0,3	0,4	0,3	0
7205	7450	7450	0,3	0,4	0,3	7
7399	7652	7650	0,4	0,5	0,3	42
7496	7753	7752	0,4	0,5	0,3	64
7594	7853	7850	0,4	0,8	0,4	79
7788	8055	8053	0,4	0,7	0,4	92
7982	8256	8254	0,5	0,7	0,4	96
8177	8458	8453	0,6	1,0	0,4	98
8370	8660	8649	0,7	1,9	0,4	96
8563	8861	8852	0,7	1,8	0,5	98

202407 - Std - Run 878

HVapp	HVeff	HVgas	I_out(uA)	I_in(uA)	darkI(uA)	eff2D
7262	7562	7517	104	110	104	3
7456	7764	7764	128	128	128	12
7601	7915	7841	151	155	146	32
7747	8066	8229	135	142	163	64
7941	8267	8470	143	161	187	88
8040	8368	8539	174	178	199	93
8137	8468	8752	171	175	211	95
8235	8569	8785	193	196	224	97
8332	8670	8831	211	215	235	97
8431	8770	8999	213	218	248	98
8529	8870	8966	243	248	260	98
8821	9173	9143	274	299	296	99

Eco2

202207 - Eco2 - Run 322

HVapp	HVeff	HVgas	I_out(uA)	I_in(uA)	darkI(uA)	eff2D
8006	8250	8250	1	1	1	3
8201	8451	8449	1	1	1	26
8396	8653	8651	1	1	1	58
8592	8854	8846	1	2	1	79
8786	9055	9044	2	3	2	90
8981	9256	9231	2	5	2	93
9176	9458	9418	2	7	2	95
9371	9659	9628	3	6	2	97
9566	9860	9780	4	13	2	98
9762	10061	9857	6	30	3	98

202407 - Eco2 - Run 901

HVapp	HVeff	HVgas	I_out(uA)	I_in(uA)	darkI(uA)	eff2D
7849	8165	8127	159	163	159	0
8140	8468	8410	194	202	194	1
8333	8669	8754	207	207	218	6
8527	8871	9078	208	216	242	20
8722	9072	9296	230	238	266	50
8916	9274	9614	238	247	290	74
9110	9475	9764	268	277	314	85
9207	9576	9922	271	282	326	89
9304	9677	10085	275	286	338	91
9401	9778	10235	281	292	350	92
9595	9979	10612	282	293	374	96
9692	10080	10636	303	315	386	95
9789	10181	10808	304	318	398	96

Eco3

202207 - Eco3 - Run 347

HVapp	HVeff	HVgas	I_out(uA)	I_in(uA)	darkI(uA)	eff2D
7287	7555	7554	8	8	8	3
7482	7757	7755	9	9	9	21
7676	7958	7948	11	11	10	54
7870	8160	8144	12	13	11	76
8064	8361	8350	12	13	11	88
8260	8562	8517	15	19	12	93
8456	8763	8662	17	29	13	94
8650	8965	8869	19	28	14	96
8843	9167	8994	23	41	15	97
9038	9368	9078	28	60	15	98

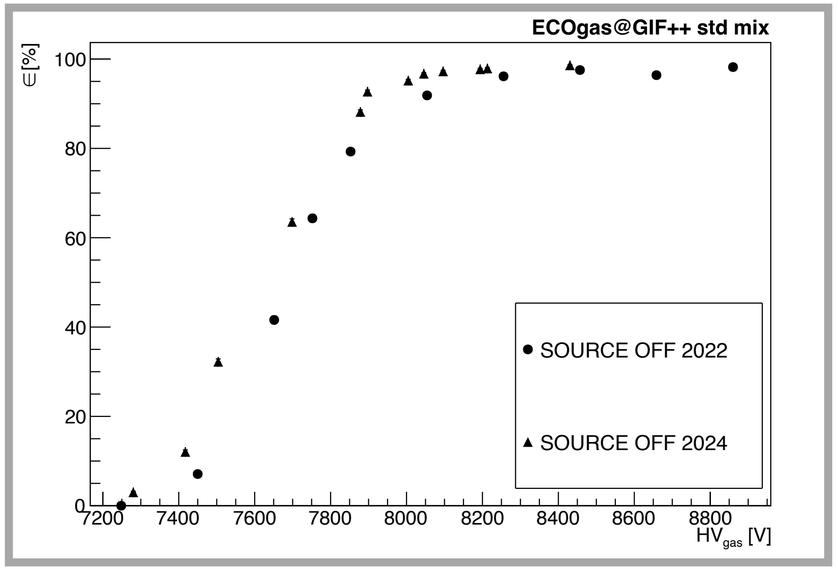
202407 - Eco3 - Run 945

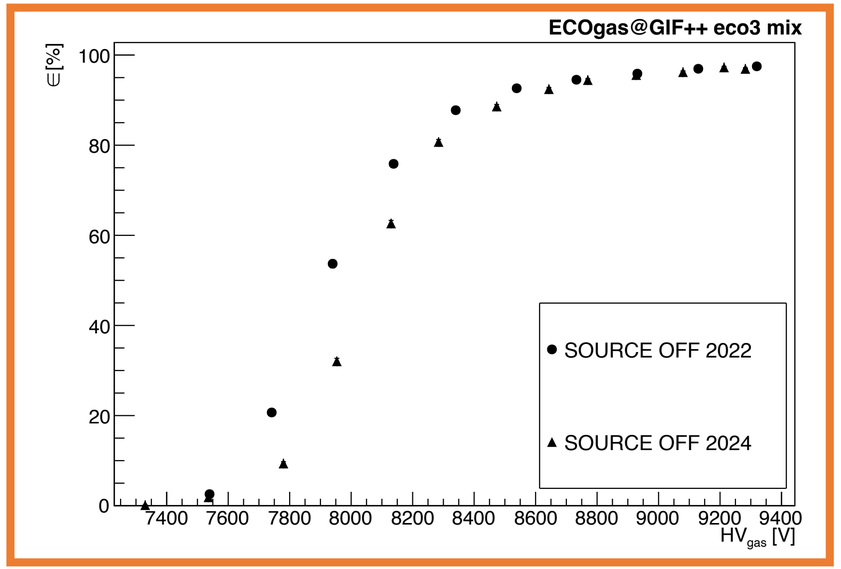
HVapp	HVeff	HVgas	I_out(uA)	I_in(uA)	darkI(uA)	eff2D
7284	7556	7520	84	88	84	0
7527	7808	7808	101	101	101	2
7769	8060	8130	104	109	117	9
7964	8261	8355	114	120	131	32
8156	8463	8598	123	128	145	63
8350	8665	8787	141	143	158	81
8544	8866	9031	145	152	172	89
8739	9068	9240	157	164	185	92
8933	9269	9304	185	195	199	94
9127	9471	9449	201	215	212	96
9321	9672	9583	219	237	226	96
9515	9874	9671	244	264	240	97
9708	10076	9537	293	319	253	97

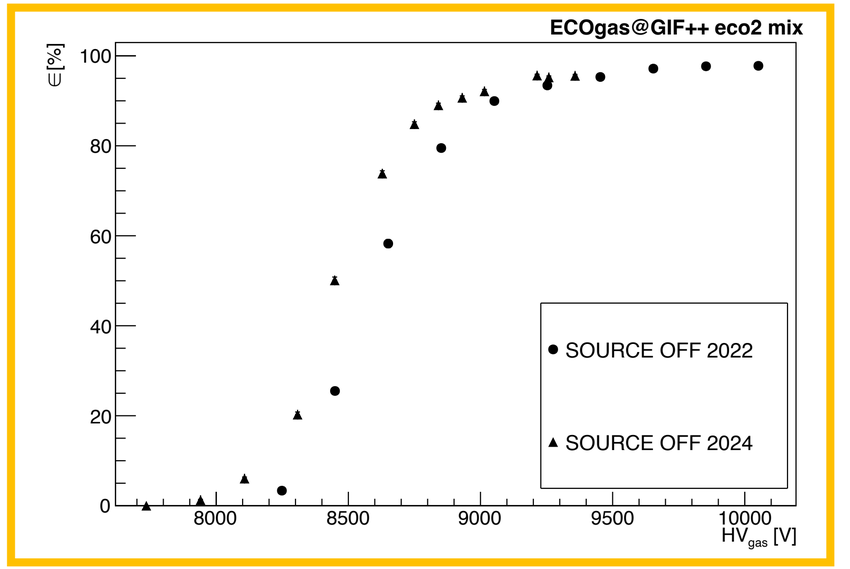
back up

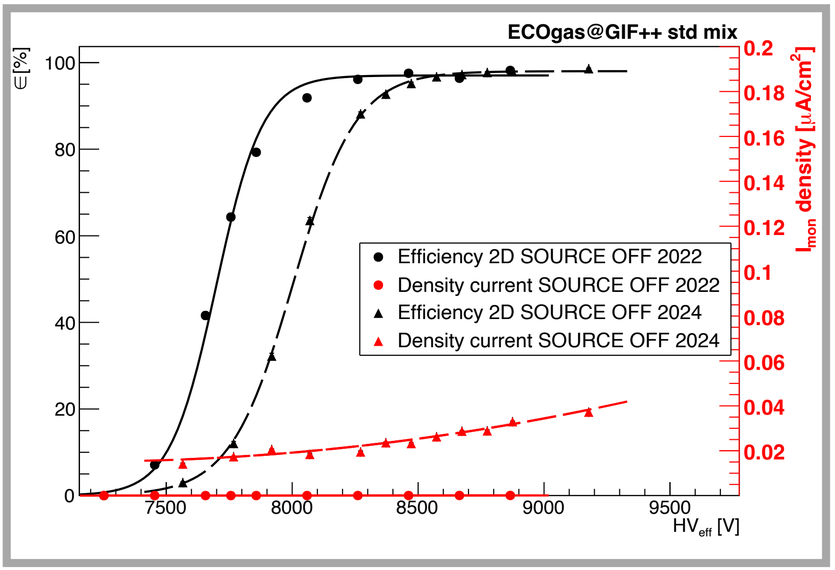
Rho “self” evaluated

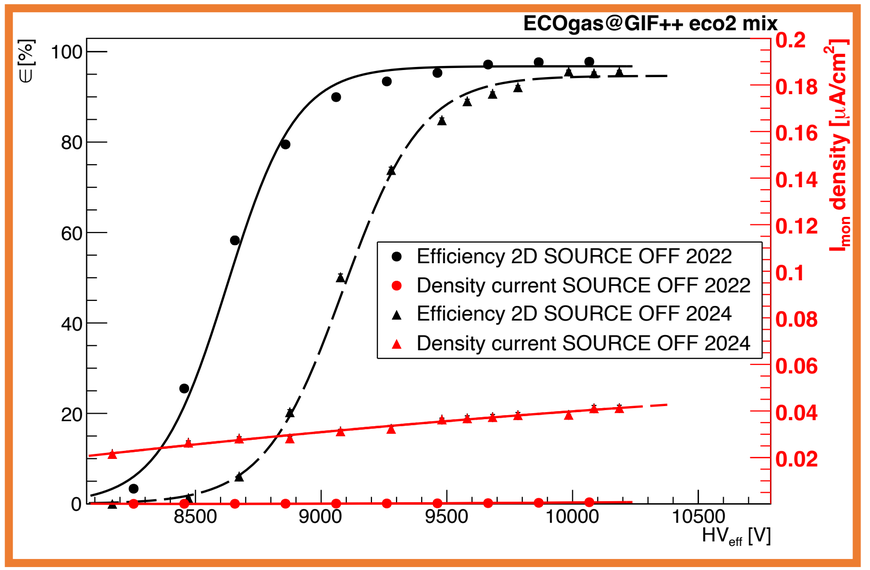
	rho (10^11 Ohm*cm)				
	std mix	eco2	eco3	Mean	Error
07/2022	0,35	0,38	0,36	0,36	0,02
07/2023	0,51	0,50	0,49	0,50	0,01
07/2024				0,57 (estimate)	

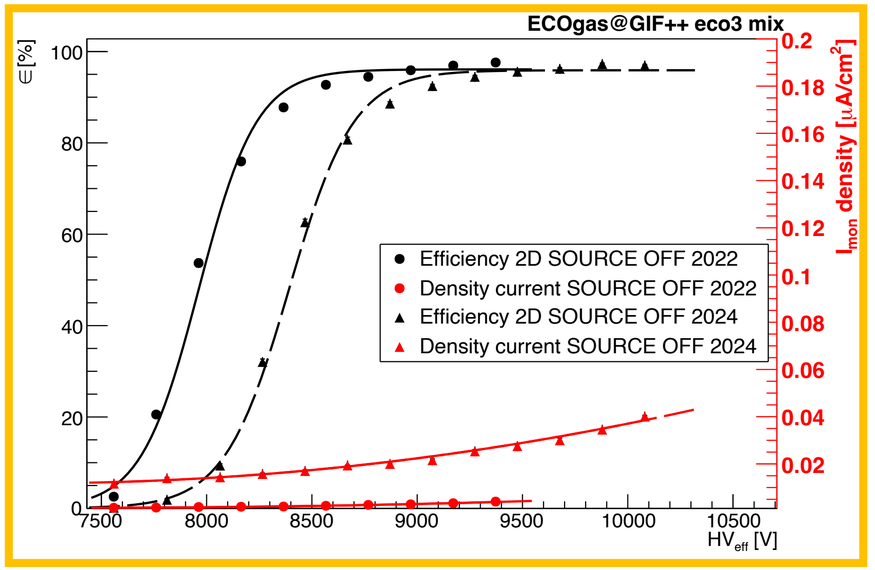







ECOgas@GIF++ std mix
∈ [%]
I_mon density [μA/cm²]
HV_eff [V]
Efficiency 2D SOURCE OFF 2022
Density current SOURCE OFF 2022
Efficiency 2D SOURCE OFF 2024
Density current SOURCE OFF 2024


ECOgas@GIF++ eco2 mix
∈ [%]
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
∈ [%]
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