

evolution of measured TB GIF++ released dose vs nominal ABS - update-

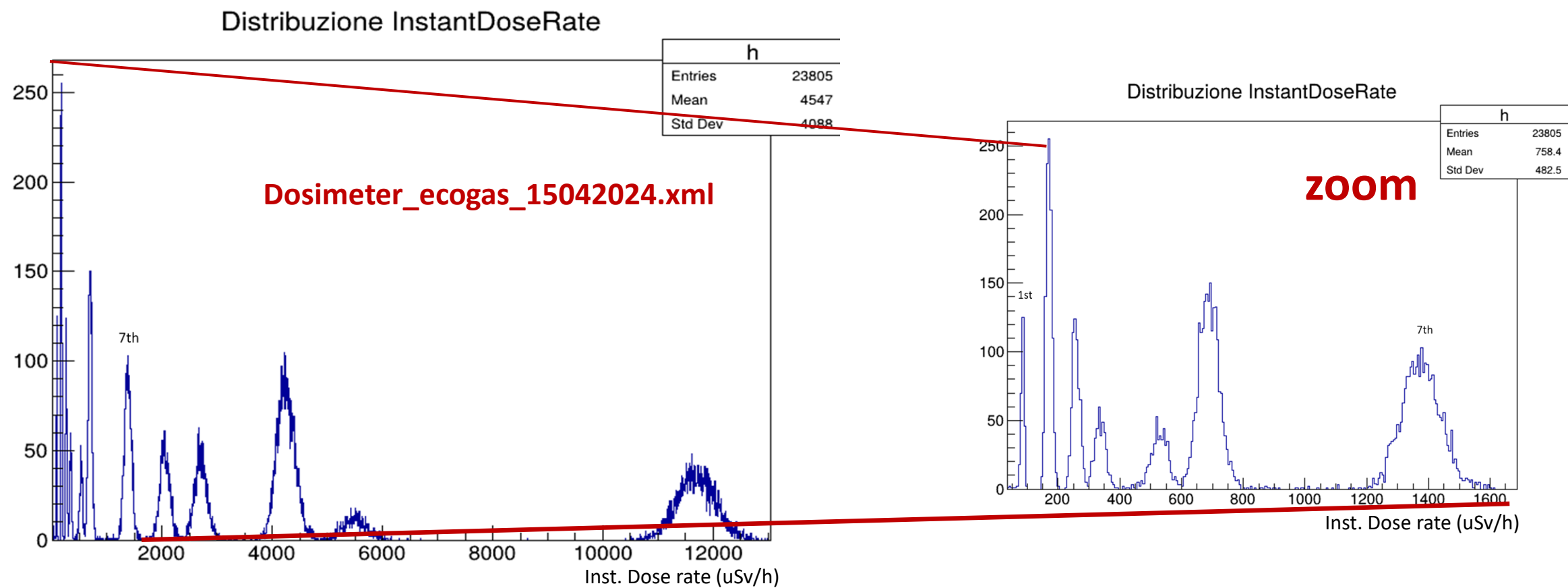
V. Zippo on behalf of the LHCb Bari group

Measured dose in 2024: new data set (the right one)

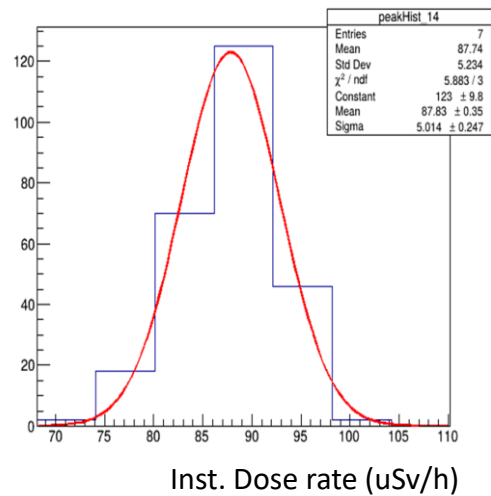
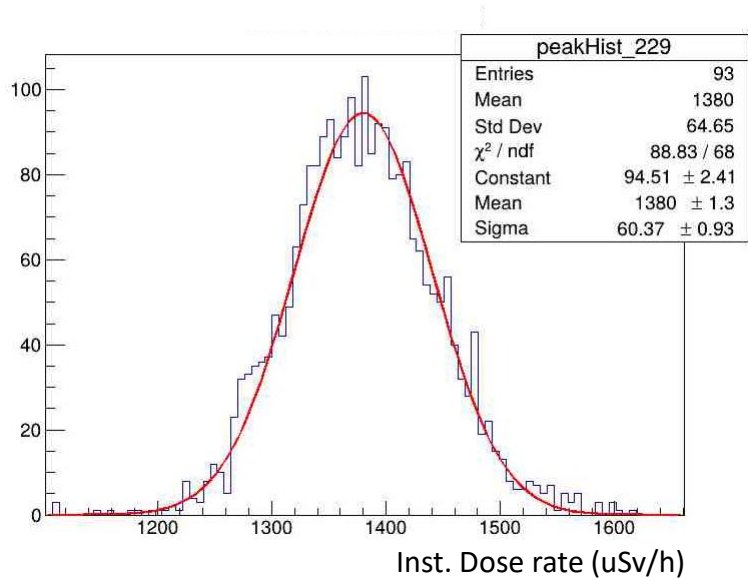
Shared directory current content for 2024 measurements (thanks to Mattia):

April test beam 2024 → usual dosimeter (*MIRION RDS-31iTx S/R*)

June-July test beam 2024 → different dosimeter, DO NOT use for comparison



Measured dose vs ABS in 2024



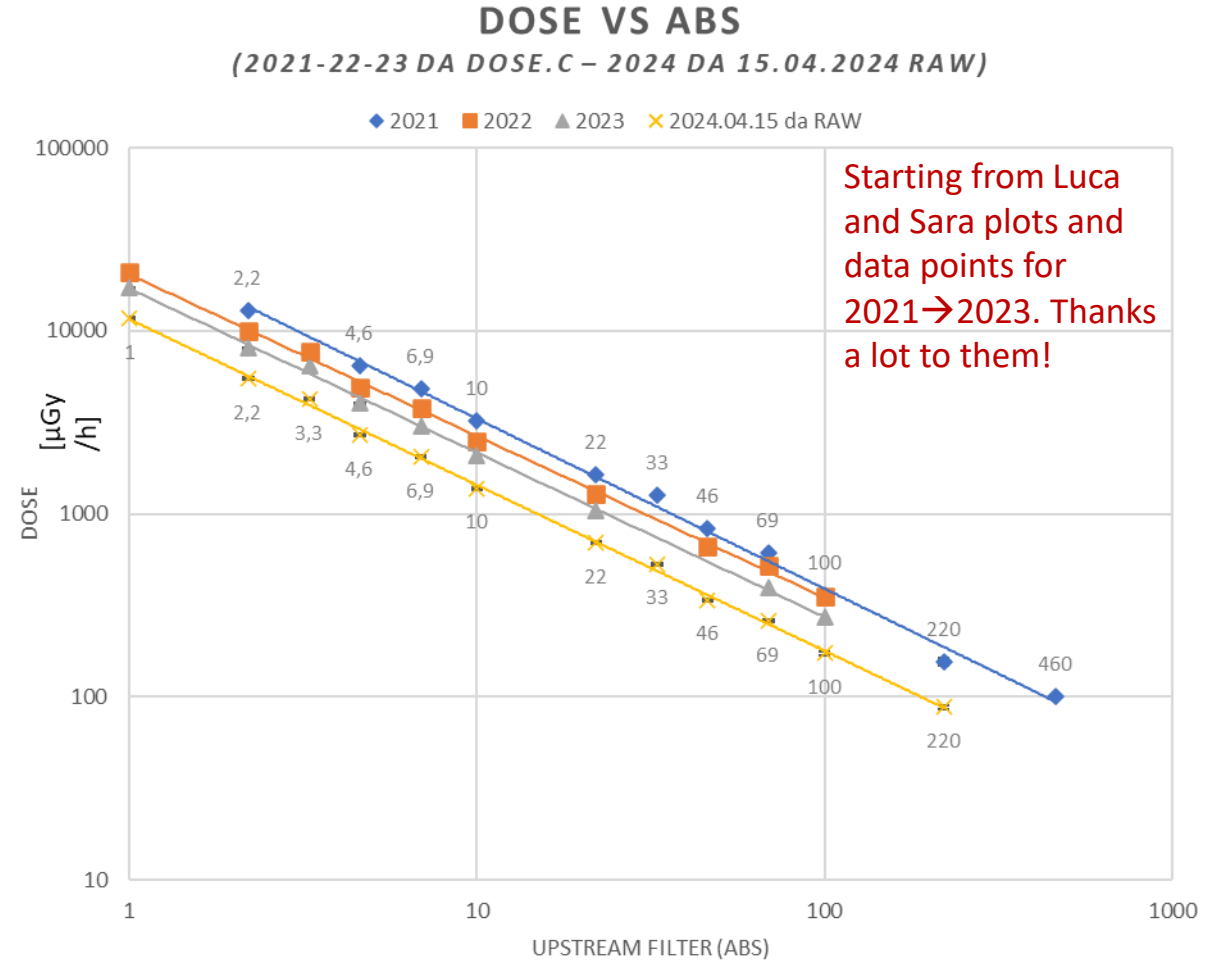
ABS	Dose (uGy/h) as gaussian fit mean	Max semi- dispersion (uGy/h)
1	11683,2	338
2,2	5497	183
3,3	4248,59	149
4,6	2703,99	94
6,9	2047,18	70
10	1380,08	46
22	692,211	23
33	532,093	17
46	339,094	11
69	260,799	8
100	172,874	6
220	87,8342	3

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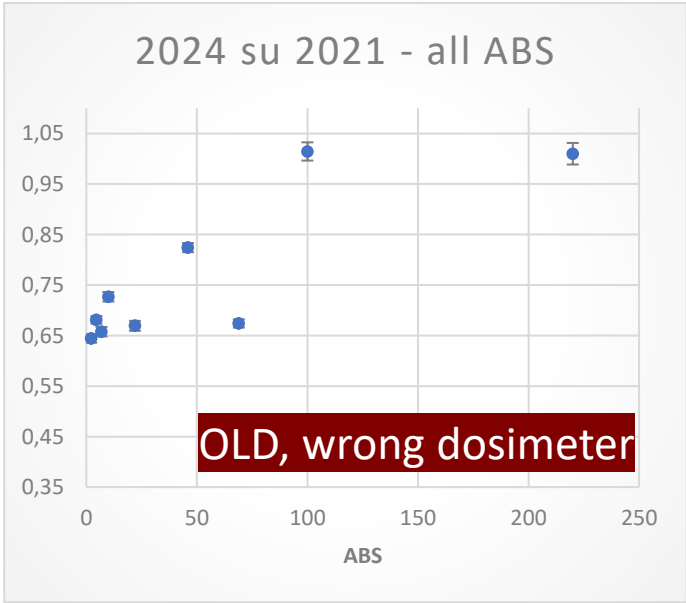
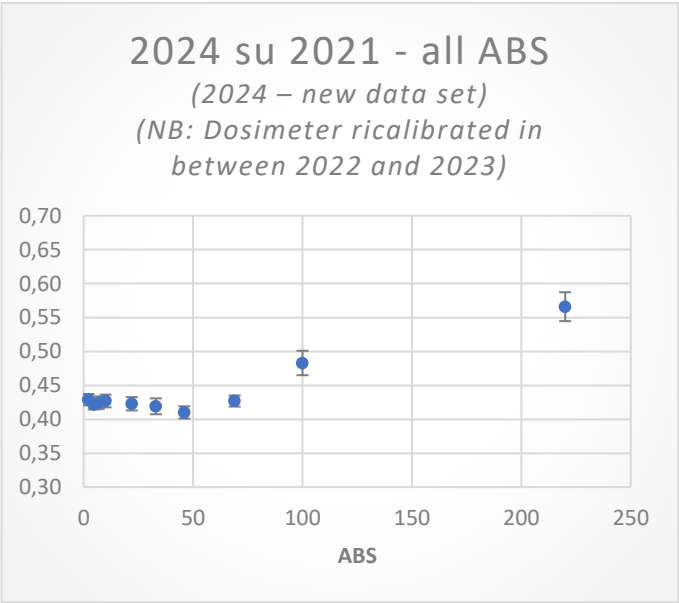
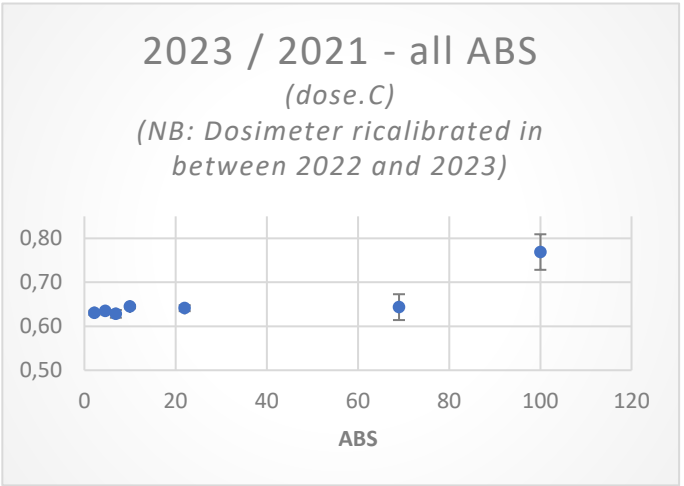
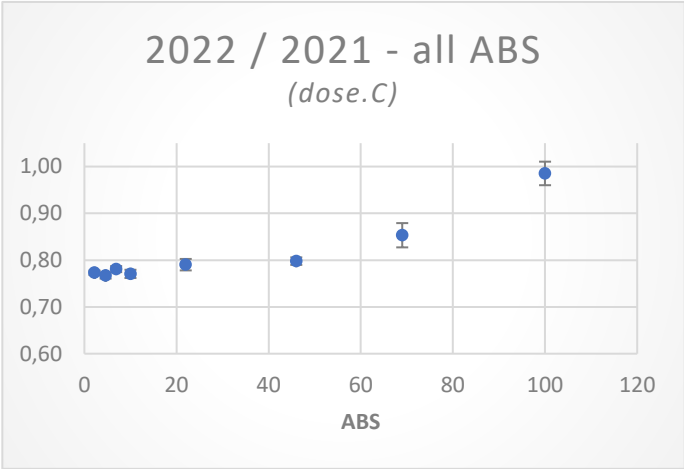
The graph shows the (mean) dosimetric measurement of the gamma source at GIF++ vs the nominal ABS

The measurements were taken with the **MIRION RDS-31iTx S/R dosimeter**, during RPC EcoGas@GIF++ Coll. beam tests, **from 2021 to 2024**.

As expected, a reduction in the measured dose can be observed over the years.

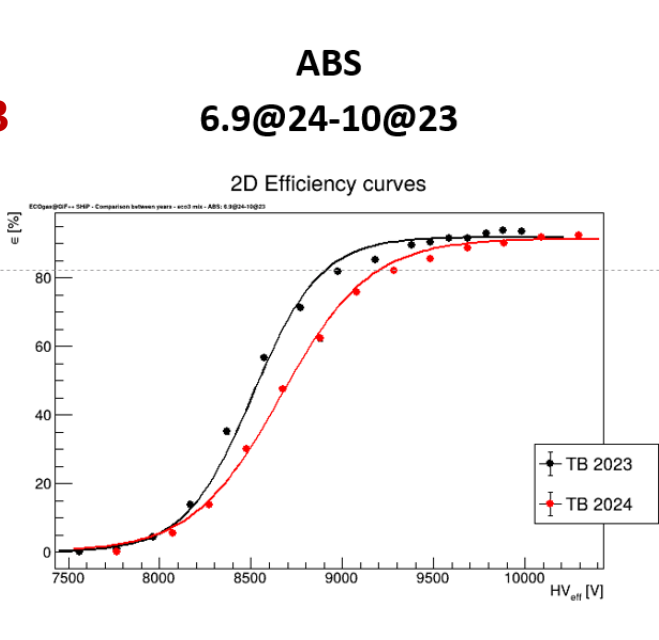
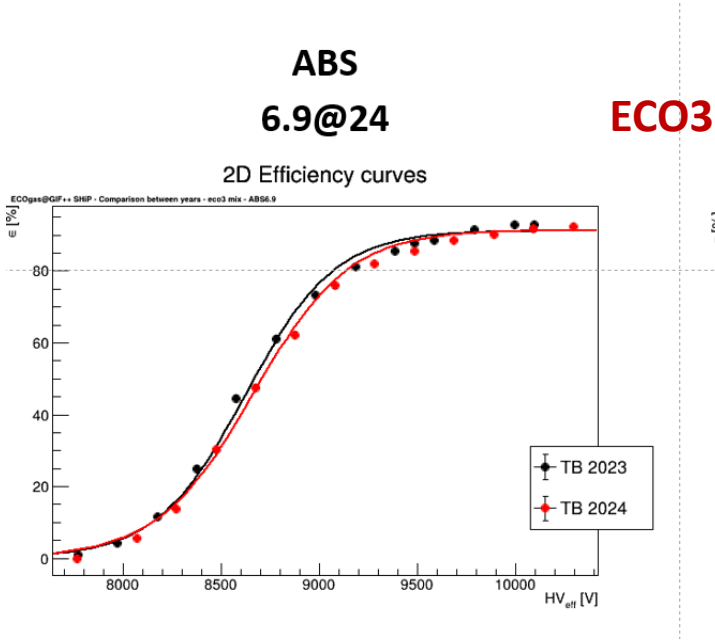


Dose ratio vs ABS



dose reduction compensation: “Equivalent” ABS

ABS	2024	2023	2022	2021
	1	1÷2.2	2.2	3.3
	2.2	3.3	4.6	6.9
	3.3	4.6	6.9	6.9÷10
	4.6	6.9	10	10÷22
	6.9	10	10÷22	22
	10	10÷22	22	22÷33
	22	33	46	46÷69
	33	46	69	69÷100
	46	69	100	100
	69	100		100÷220
	100			220
	220			460



Dose at Source Off

	Dose (uSv/h)
01/11/2021 11:33	0,12
17/07/2022 21:45	0,12
T3 -12/07/2023 00:34	0,12
T1-13/07/2023 00:42	0,12
04/11/2024 09:53	0,12

Measurements all **constants** during the observation time.

Error estimated to be:

$$\delta_x = \sqrt{\frac{0.01^2}{3} + \frac{0.028^2}{3} + \frac{0.006^2}{3}} = 0.018 \frac{\mu\text{Sv}}{h}$$

On the basis of:

Sensib. 0.01 $\mu\text{Sv/h}$

linearity $0.15 \cdot 0.12 \mu\text{Sv/h} = 0.018 \mu\text{Sv/h} + 0.01 \mu\text{Sv/h} = 0.028 \mu\text{Sv/h}$

Calib.Acc. $0.05 \cdot 0.12 = 0.006 \mu\text{Sv/h}$

dose@source off: $(0.12 \pm 0.02) \frac{\mu\text{Sv}}{h}$

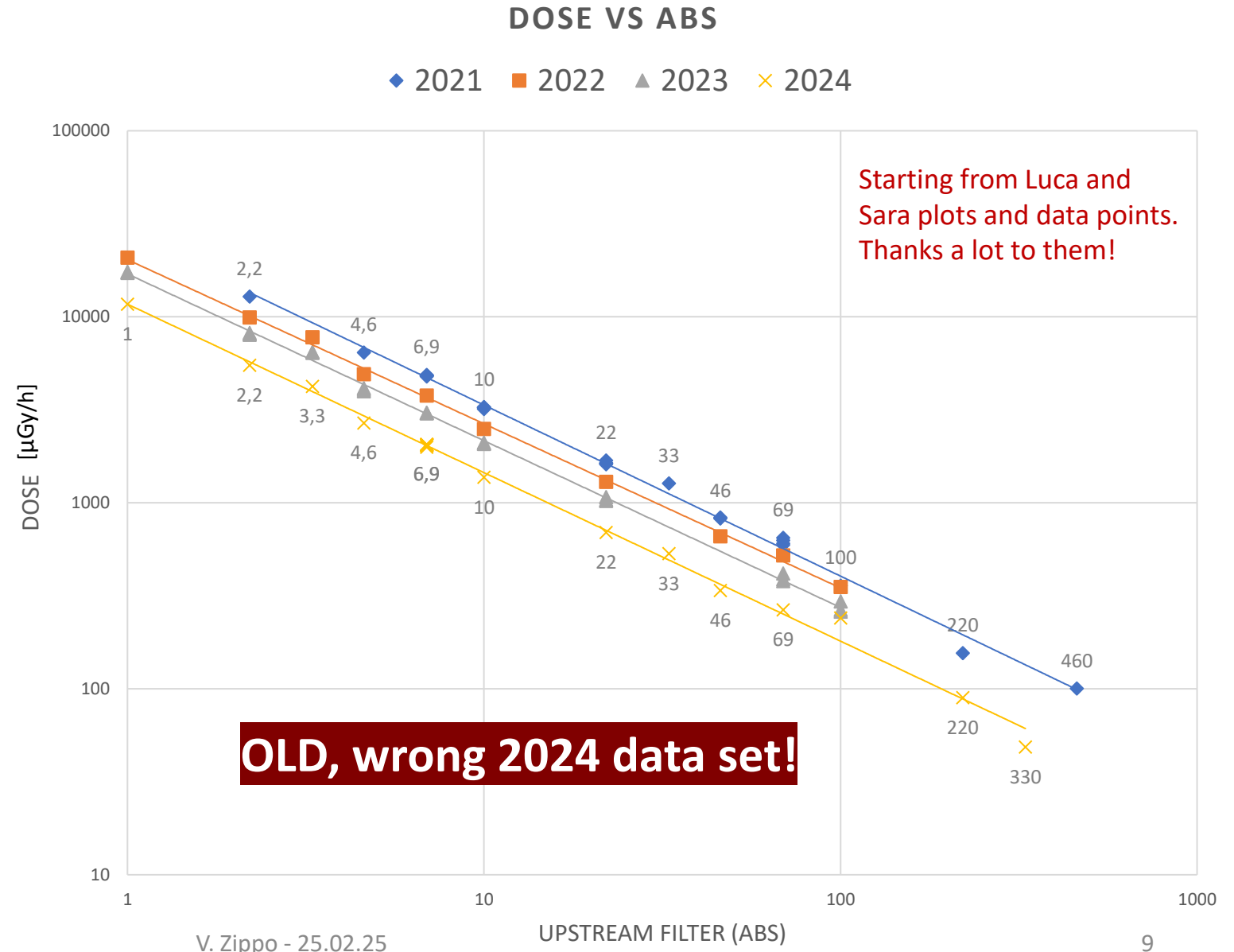
backup

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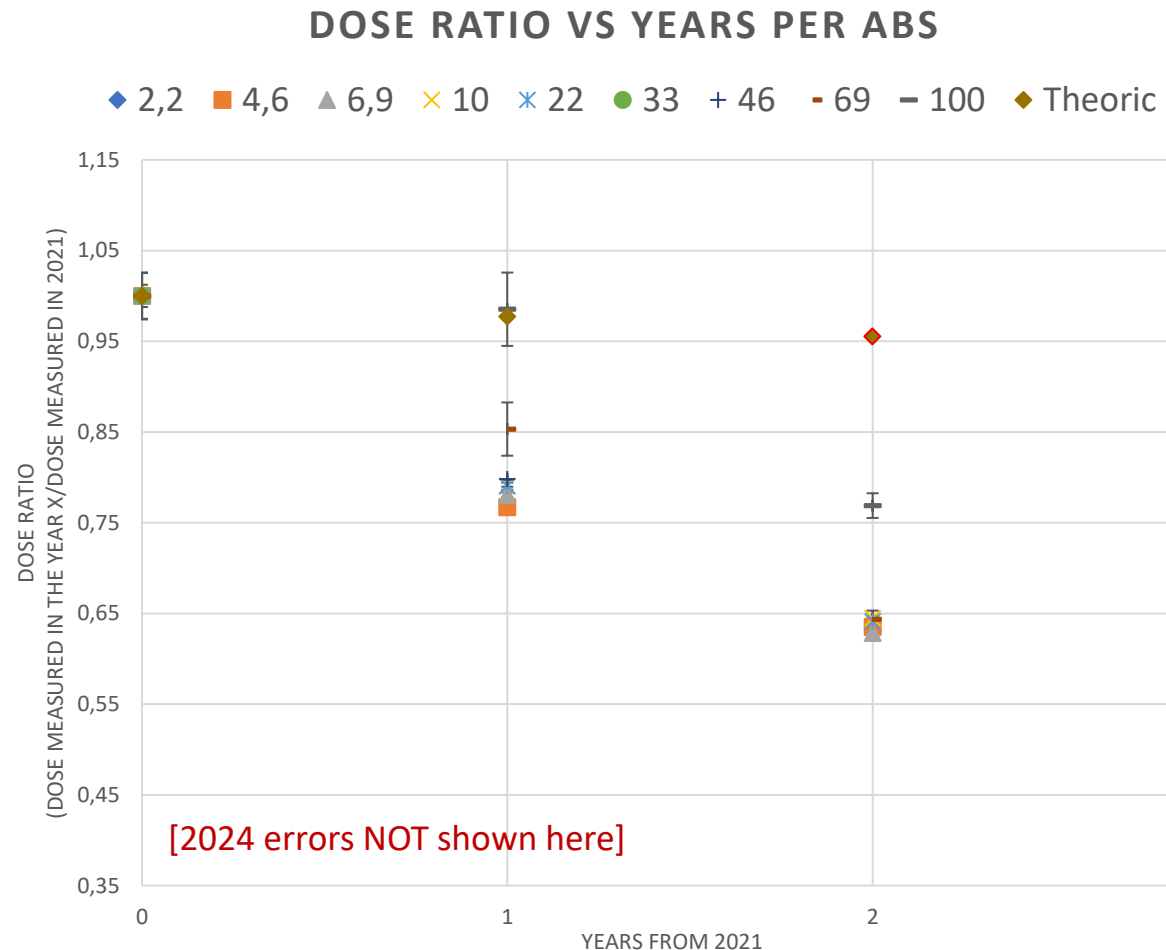
As expected, a reduction in the measured dose can be observed over the years.



Measured vs expected dose

OLD, wrong 2024 data set!

This graph shows the ratio between the doses measured in the years 2022-2023-2024 compared to the 2021 measurement for each ABS, as well as the theoretical trend that this ratio should have based on the exponential decrease in activity.



Not ONLY exponential decrease in activity. Maybe Set-ups effect + other effect related to the specific dosimeter? [see later]

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8.1 Radiological Characteristics

- Radiation detected: gamma and X-rays, 48 keV...3 MeV; Alpha and Beta radiation with external probes.
- Ambient dose equivalent $H^*(10)$.
- Dose rate measurement range: 0.01 $\mu\text{Sv/h}$...0.1 Sv/h (1 $\mu\text{rem/h}$...10 rem/h).
- Dose measurement range: 0.01 μSv ...10 Sv (1 μrem ...1000 rem).
- Resolution: three significant digits or 0.01 $\mu\text{Sv/h}$ on dose rate and 0.01 μSv on dose (1 $\mu\text{rem/h}$ on dose rate and 1 μrem on dose).
- Calibration accuracy*: $\pm 5\%$, ^{137}Cs , calibration direction and in the calibration field, temperature $+20\text{ }^\circ\text{C}$ (68°F).
- Dose rate linearity: $\pm 15\%$ $\pm$ least significant number 0.05 $\mu\text{Sv/h}$...0.1 Sv/h (5 $\mu\text{rem/h}$ to 10 rem/h).

- Variation of the response due to photon radiation energy and angle of incidence: $(R_{E,A})\ 71\% < R_{E,A} < 160\%$ (48 keV...3 MeV), $\pm 60^\circ$

**Compared to Finnish National Laboratory STUK.*

https://assets-mirion.mirion.com/prod-20220822/cms4_mirion/files/pdf/user-manuals-guides/2096_6082_rds_31_user-manual_eng_v3_21.pdf