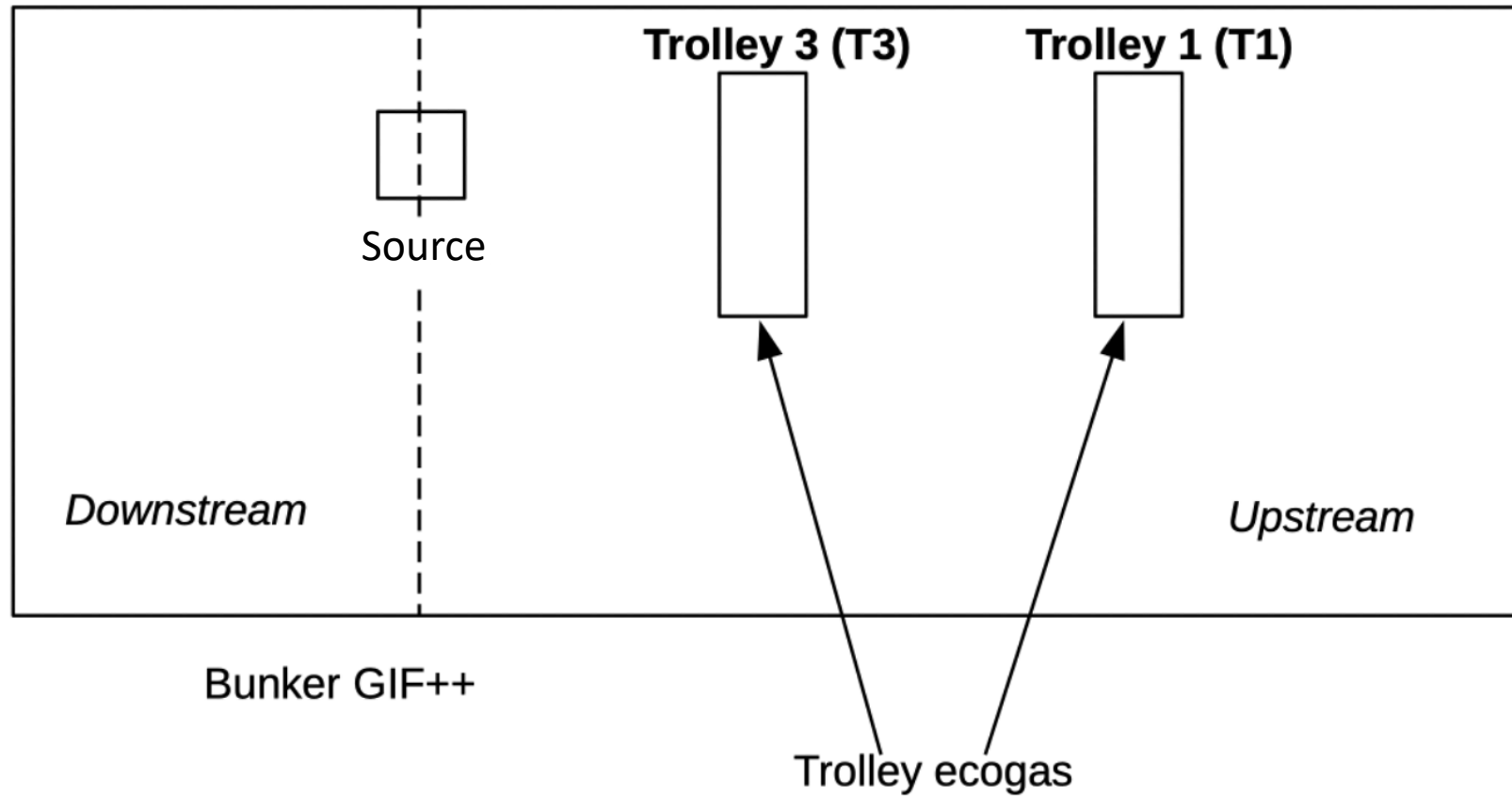# ECOgas@GIF++ weekly meeting
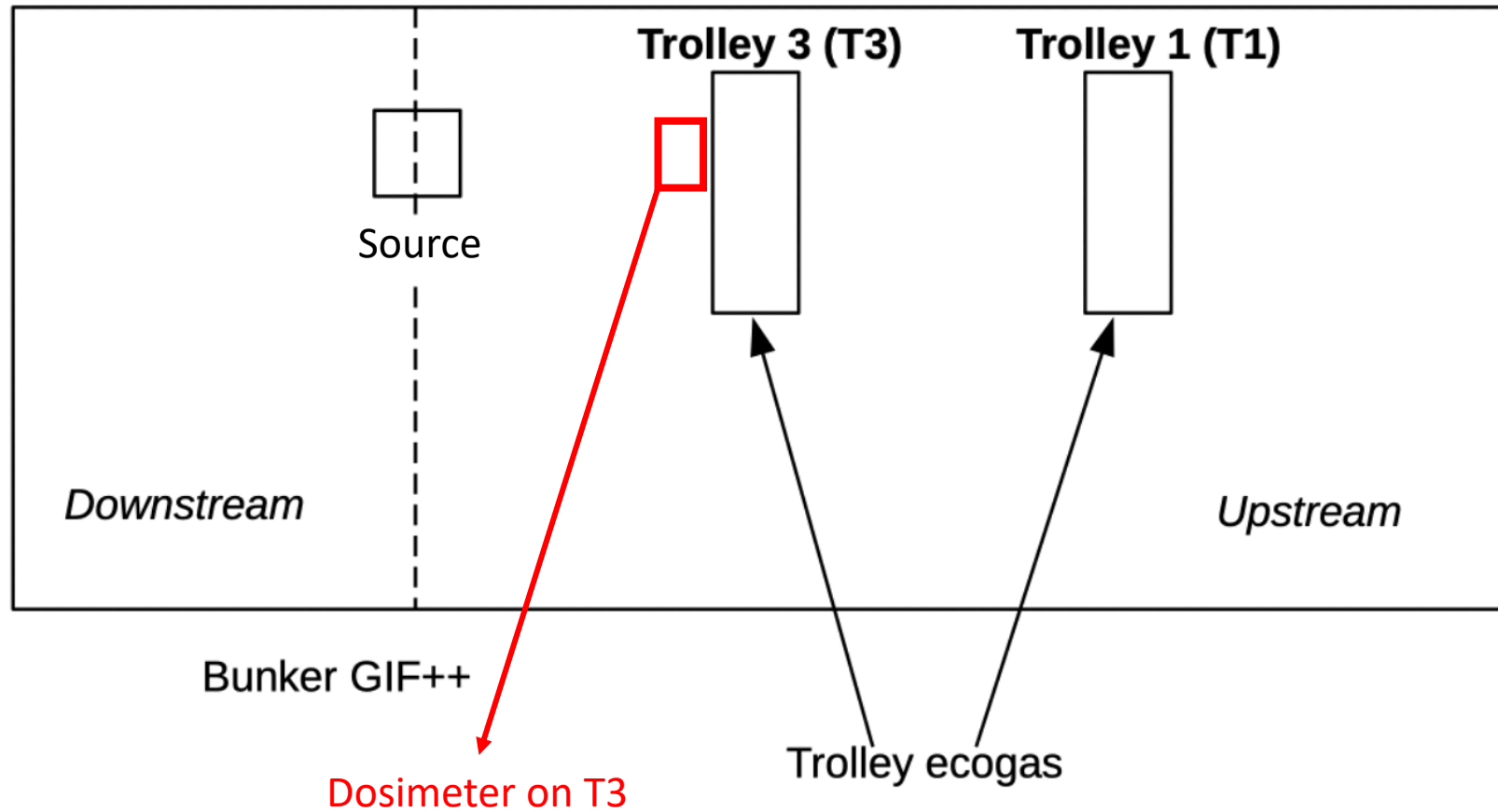
Dose rate studies

Sara Garetti, Luca Quaglia
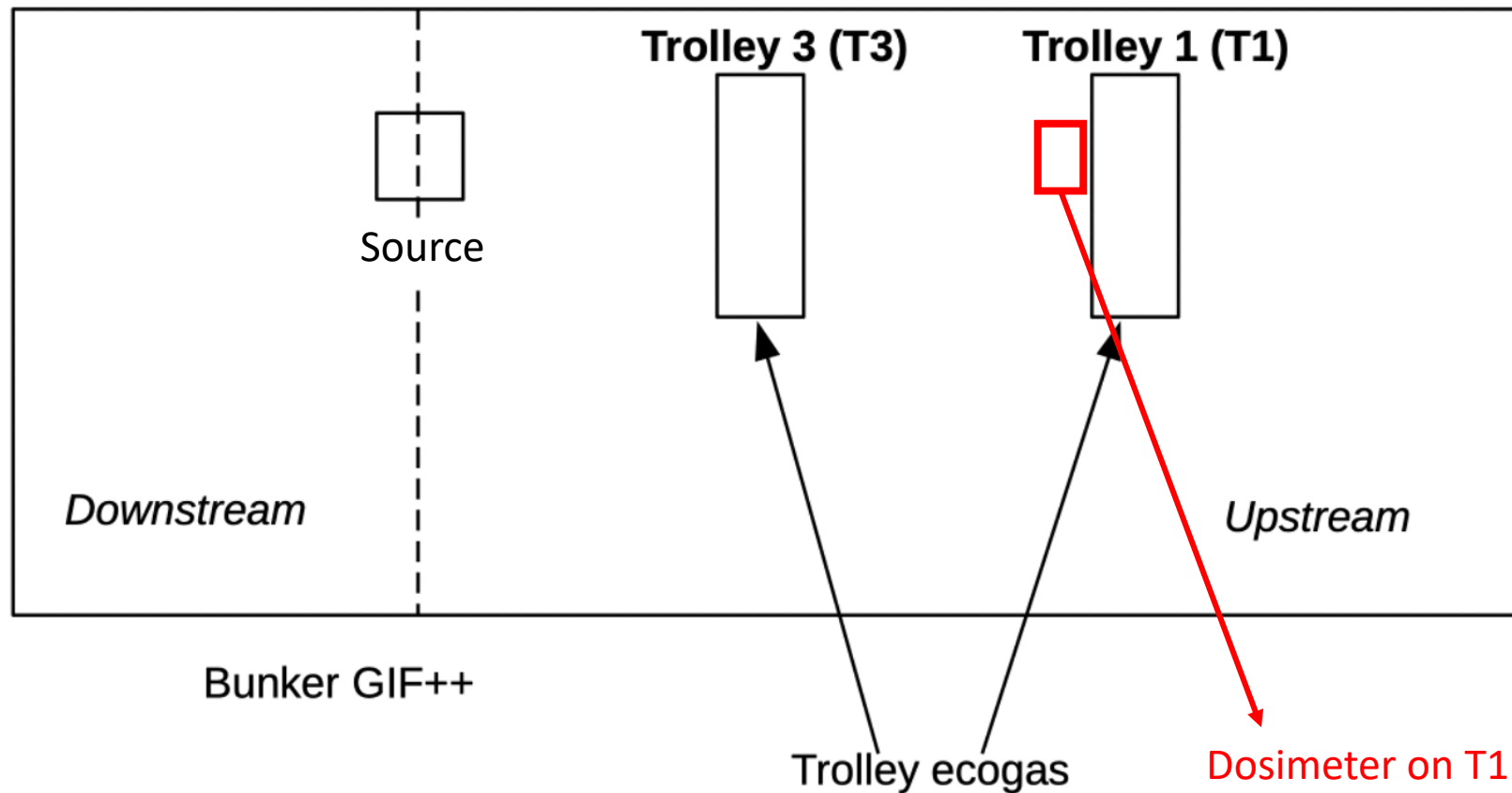
SETUP

SETUP

SETUP

Measurements

- Dosimeter does an instant measure of the dose rate (μGy/h) every 10 seconds
- Upstream and downstream filters were changed and every combination was kept for 2/3 minutes
- In order to study the photons backscattering on the bunker wall, measurements with the same upstream filter and different downstream filter were performed

Measurements

During 2021:

T1 and T3:
- Upstream filter changed at: 10 000, 460, 220, 100, 69, 46, 33, 22, 10, 6.9, 4.6, 3.3, 2.2, 1
- Downstream filter changed at: 460, 100, 69, 46, 33, 22, 15, 10, 6.9, 4.6, 3.3, 2.2, 1.5, 1

During 2022:

T1 and T3:
- Upstream filter changed at: 100, 69, 46, 22, 10, 6.9, 4.6, 3.3, 2.2, 1
- **Downstream filter kept at: 1**

During 2023:

T1:
- Upstream filter changed at: 460, 100, 69, 22, 10, 6.9, 4.6, 3.3, 2.2, 1
- Downstream filter changed at: 460, 22, 1

T3:
- Upstream filter changed at: 100, 69, 22, 10, 6.9, 4.6, 3.3, 2.2, 1
- Downstream filter changed at: 460, 22, 1

Analysis

Times	Up	Down	Status
2021-11-01 11:55:00	100	0	1
2021-11-01 11:55:10	100	0	1
2021-11-01 11:55:20	100	0	1
2021-11-01 11:55:30	100	10	1
2021-11-01 11:55:40	100	10	1
2021-11-01 11:55:50	100	10	1
2021-11-01 11:56:00	100	10	1
2021-11-01 11:56:10	100	10	1
2021-11-01 11:56:20	100	10	1
2021-11-01 11:56:30	100	10	1
2021-11-01 11:56:40	100	10	1
2021-11-01 11:56:50	100	10	1
2021-11-01 11:57:00	100	10	1
2021-11-01 11:57:10	100	10	1
2021-11-01 11:57:20	100	10	1
2021-11-01 11:57:30	100	10	1
2021-11-01 11:57:40	0	0	1
2021-11-01 11:57:50	0	0	1
2021-11-01 11:58:00	220	22	1
2021-11-01 11:58:10	220	22	1
2021-11-01 11:58:20	220	22	1
2021-11-01 11:58:30	220	22	1
2021-11-01 11:58:40	220	22	1
2021-11-01 11:58:50	220	22	1

For each year the csv file with the filters combinations, the date and the source status is read and then the data with:
- source ON (Status = 1) ✔
- upstream filter value > 0 ✔
- downstream filter > 0 ✔

were selected and start/end time for each filter pair was selected

For each year the data in the xml file were converted into a txt file with dose and data-time.
In the time-interval obtained from the csv file average dose was computed.

Dose [µGy/h]	Times
93.98	01/11/2021 11:54:57
92.64	01/11/2021 11:55:07
92.45	01/11/2021 11:55:17
91.21	01/11/2021 11:55:27
89.89	01/11/2021 11:55:37
89.67	01/11/2021 11:55:47
85.74	01/11/2021 11:55:57
86.55	01/11/2021 11:56:07
85.27	01/11/2021 11:56:17
82.86	01/11/2021 11:56:27
79.17	01/11/2021 11:56:37
79.66	01/11/2021 11:56:47
78.02	01/11/2021 11:56:57
77.94	01/11/2021 11:57:07
74.32	01/11/2021 11:57:17
72.92	01/11/2021 11:57:27
72.64	01/11/2021 11:57:37
70.58	01/11/2021 11:57:47
66.93	01/11/2021 11:57:57
59.03	01/11/2021 11:58:07
59.03	01/11/2021 11:58:17
58.73	01/11/2021 11:58:27
55.08	01/11/2021 11:58:37
54.09	01/11/2021 11:58:47
53.66	01/11/2021 11:58:57

Analysis

For each filter pair the average dose with error was calculated.
The error was computed as:

$$\sigma_{dose} = \frac{\sigma}{\sqrt{N}}$$

Where σ is the standard deviation and N the number of dose values in the specific time range

\<dose\> [µGy/h]	$\sigma_{\text{<dose>}}$ [µGy/h]	Up	Down
780.7592976190481	38.531660774149614	460.0	460.0
28.0071052631579	0.8557380484538246	460.0	1.0
37.050000000000004	0.9805100713404222	460.0	6.9
27.688333333333333	0.6635440125309373	460.0	4.6
22.426666666666666	0.2516772022679331	460.0	46.0
20.8348	0.43140666043382625	460.0	10.0
62.658181818181816	7.644363082830954	100.0	1.0
81.83416666666666	1.6378822516292253	100.0	10.0
48.66583333333333	2.658640418759676	220.0	22.0
34.020833333333336	0.507503483094979	220.0	4.6
28.649166666666662	1.2317236373013503	10000.0	3.3
4411.625	58.21731496181902	1.0	1.0
4331.673846153846	40.10316233036322	1.0	4.6
4340.634166666667	52.27105773228646	1.0	460.0
2052.340833333333	23.13028974580188	2.2	22.0
2101.838333333333	23.536456790101663	2.2	33.0
1626.680833333333	22.07992092989018	3.3	15.0
2083.4791666666665	28.151038235289793	2.2	1.5
1616.2575	15.849808101553178	3.3	6.9
1653.8425	21.222233343081065	3.3	3.3
1051.0225	18.060899090216132	4.6	6.9
998.0924999999999	7.7251538304777805	4.6	3.3
202.795	2.018081709911366	33.0	6.9
806.8630769230768	10.591429432148123	6.9	3.3
812.9966666666666	16.86672671866181	6.9	2.2
788.1633333333333	5.2601828135838815	6.9	46.0
795.0338461538462	9.153563236308823	6.9	4.6
138.205	4.811621584531277	46.0	1.0
146.505	2.1099718151212485	46.0	3.3

Analysis and discussion
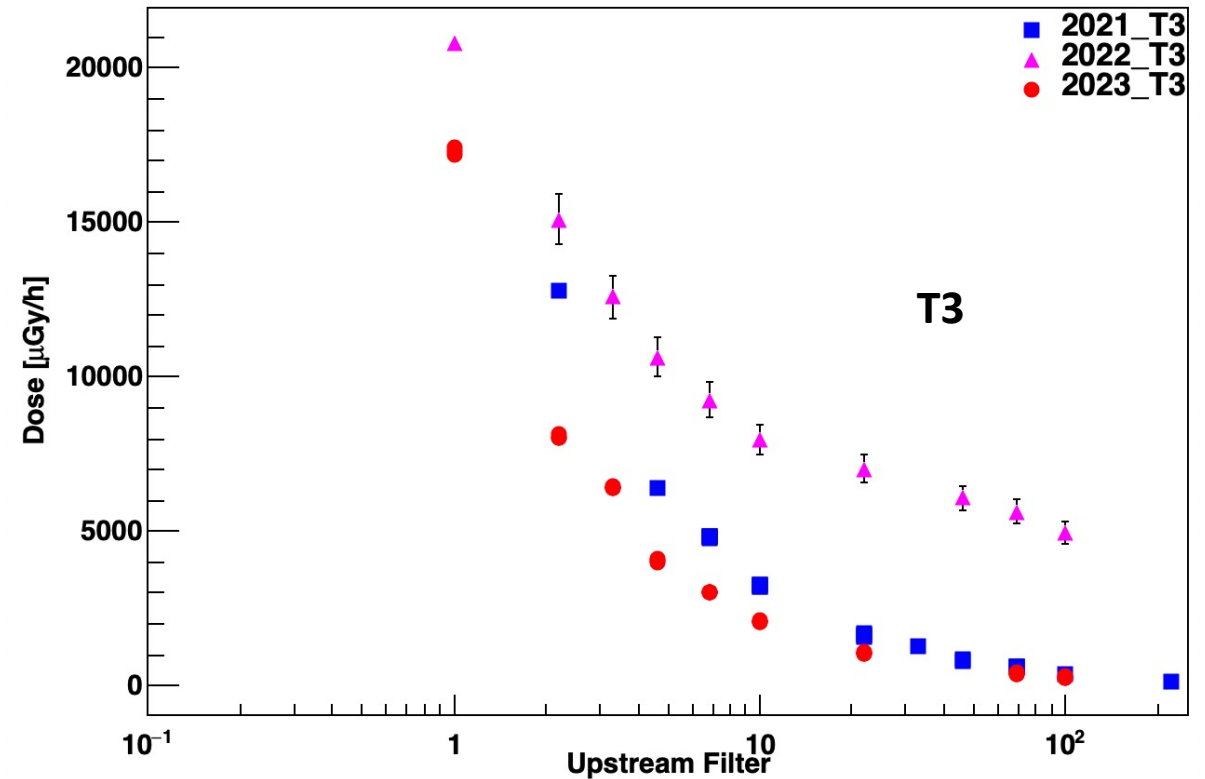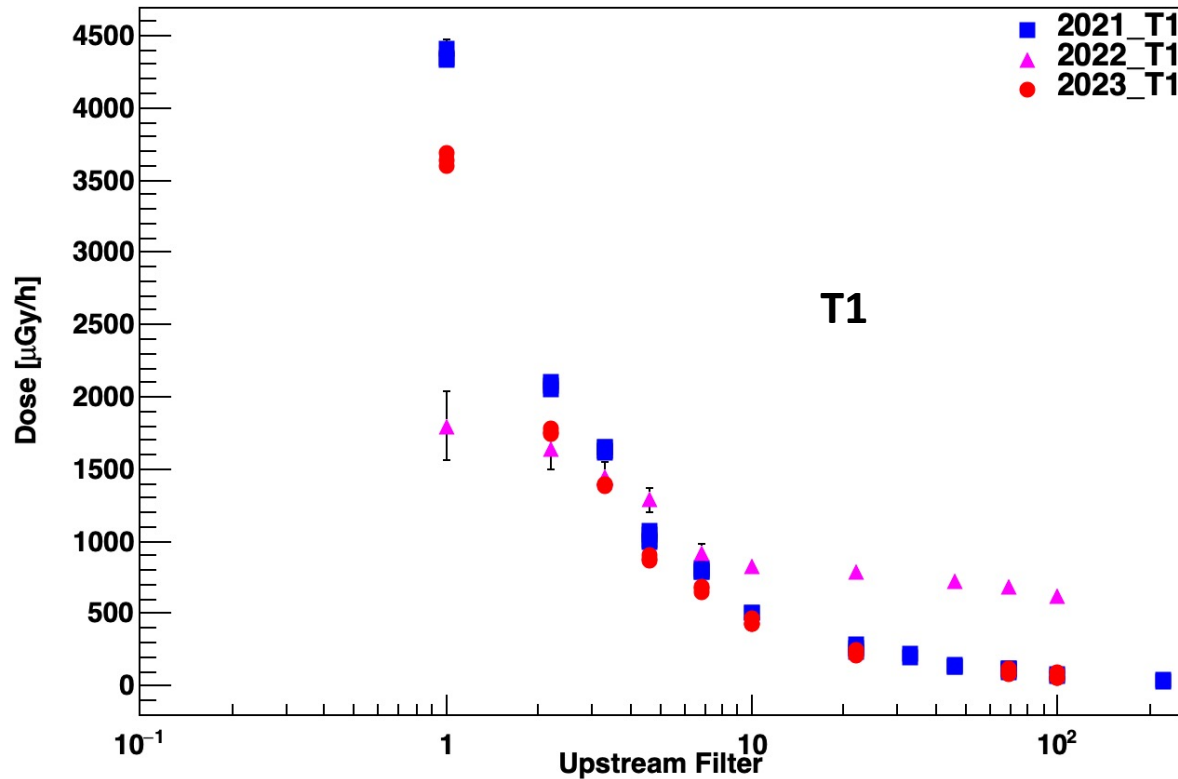
Data from 2021 and 2023 seems reasonable: lower instant dose rate due to source degradation.

➢ Data from 2022 looks suspicious (?)

➢ Does anyone remember where we installed the dosimeter in 2022?

Further studies on 2022

Here a graph of the instant dose rate measured by RP dosimeter installed in the GIF++

The position of this dosimeter is always fixed (we don't know the exact position but we can ask to Giuseppe)

For sure not behind any setup ➡ measurement independent from the presence of other setups

We checked 2021 vs 2022 vs 2023 to see if any obvious strangeness in the data is visible to justify the differences in 2022 data
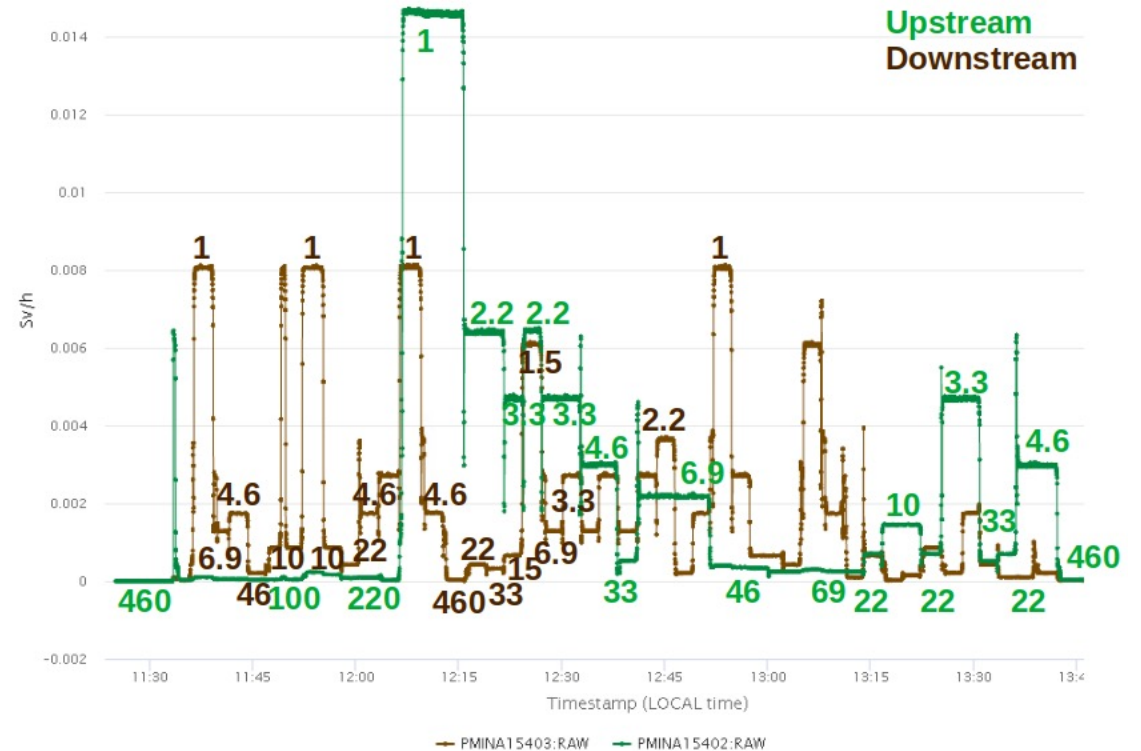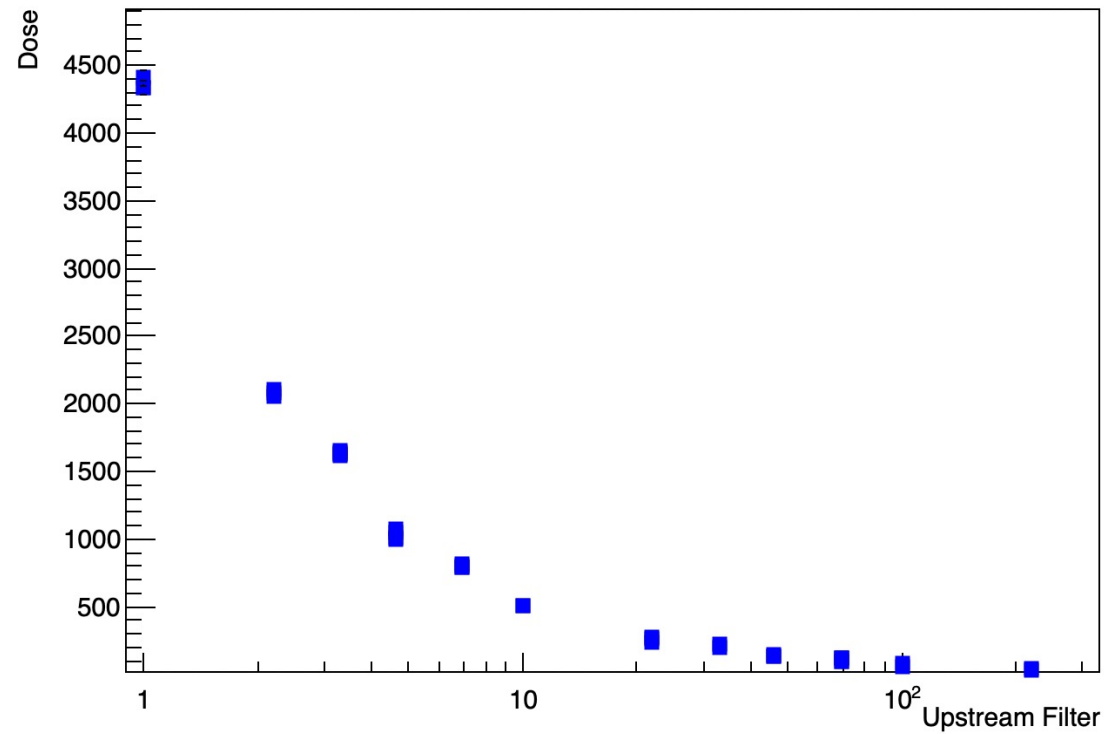
Further studies on 2022
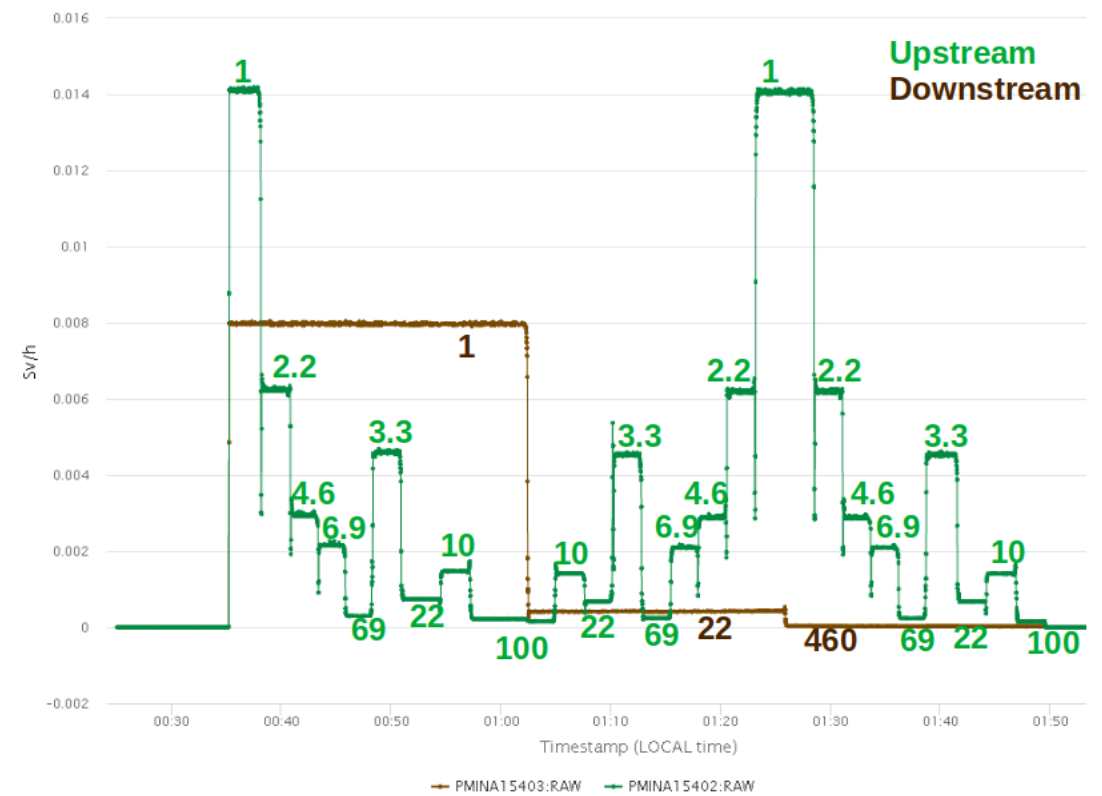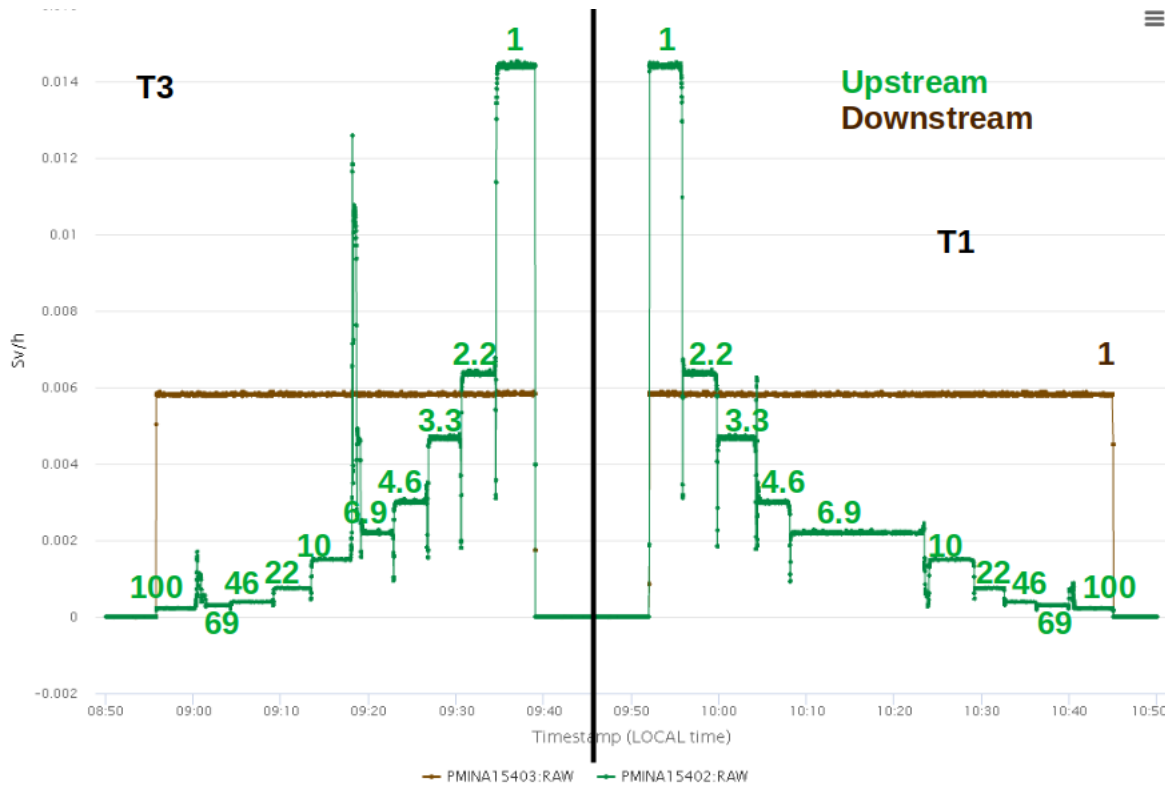
No obvious justifications for 2022 data ➡ to be discussed
➢ Any input?
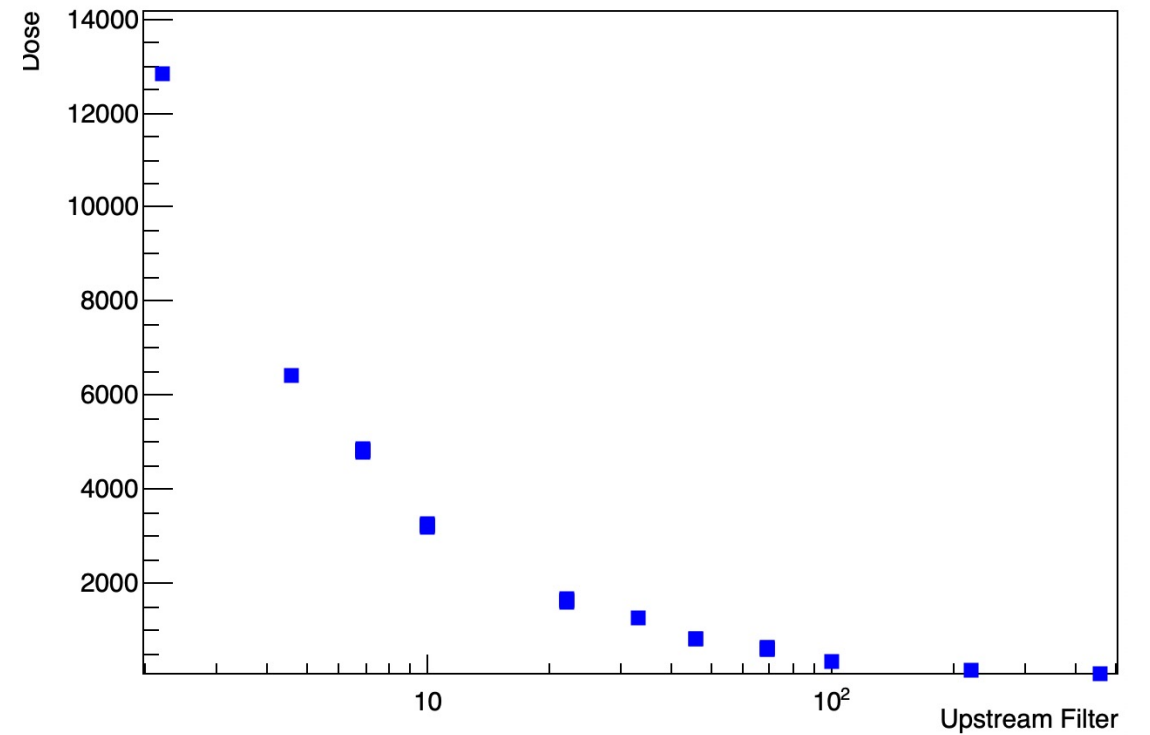➢ Any other plot you would like to see?

Backup Slides

Analysis 2021

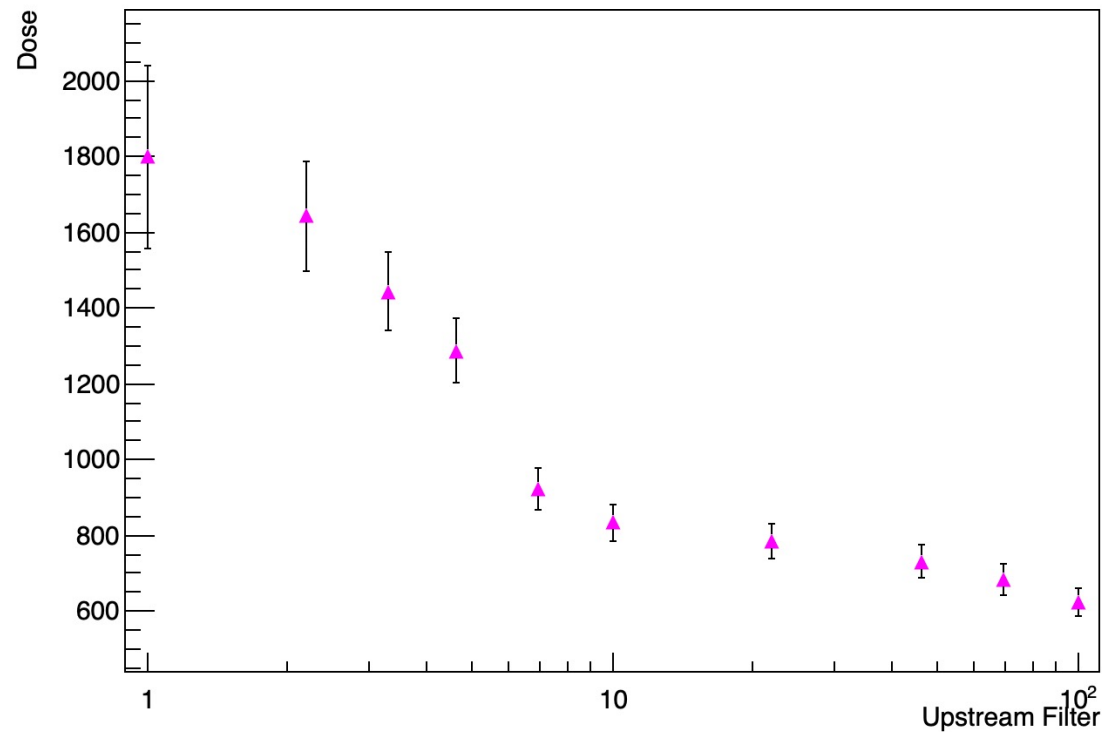Dose(Upstream Filters) T1 2021
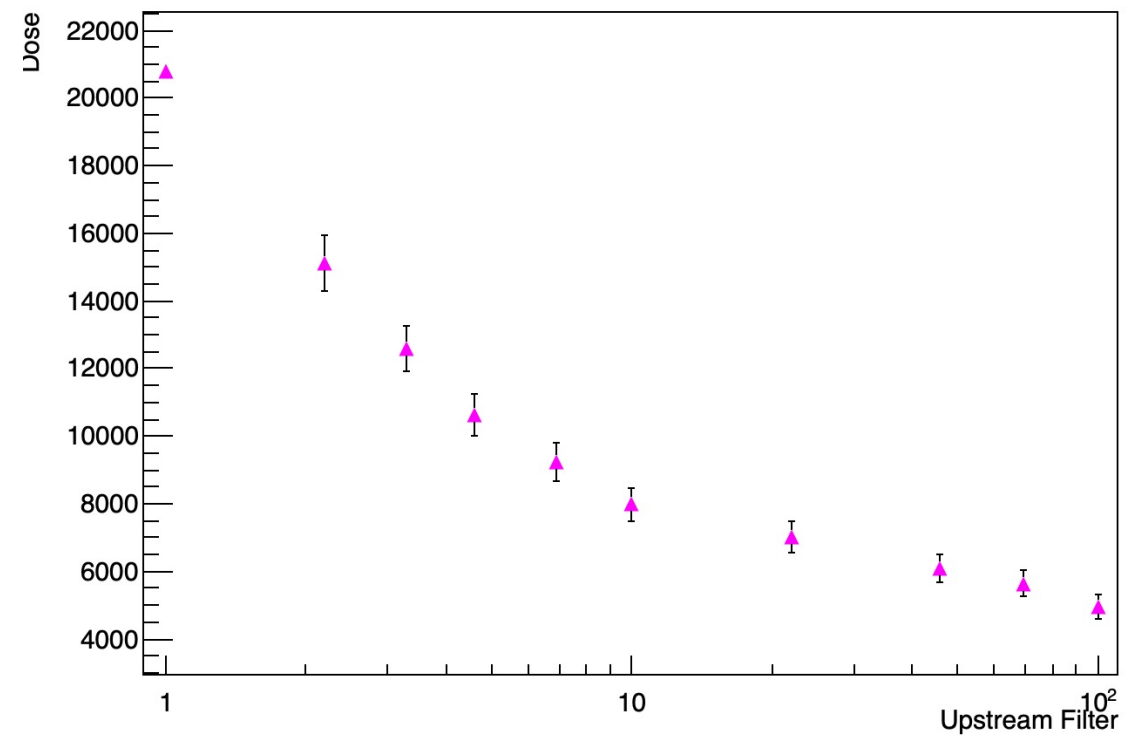
Dose(Upstream Filters) T3 2021

Analysis 2022

Dose(Upstream Filters) T1 2022

Dose(Upstream Filters) T3 2022

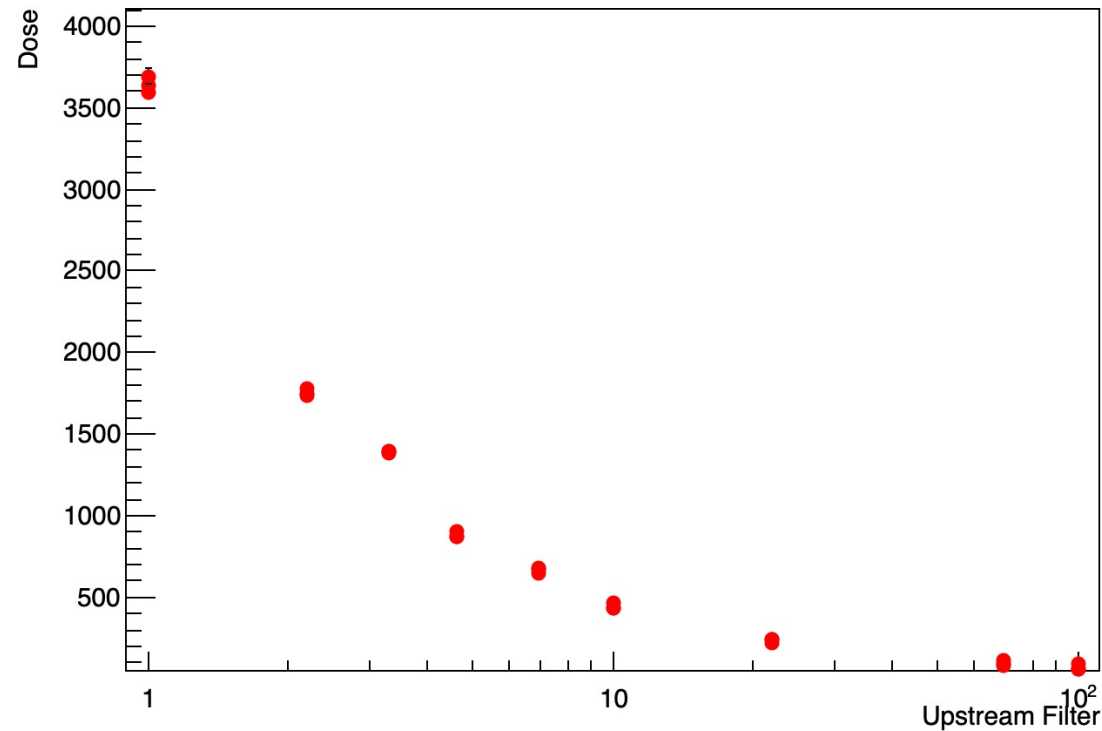# Analysis 2023

Dose(Upstream Filters) T1 2023

Dose(Upstream Filters) T3 2023