

n_TOF Irradiation Updates

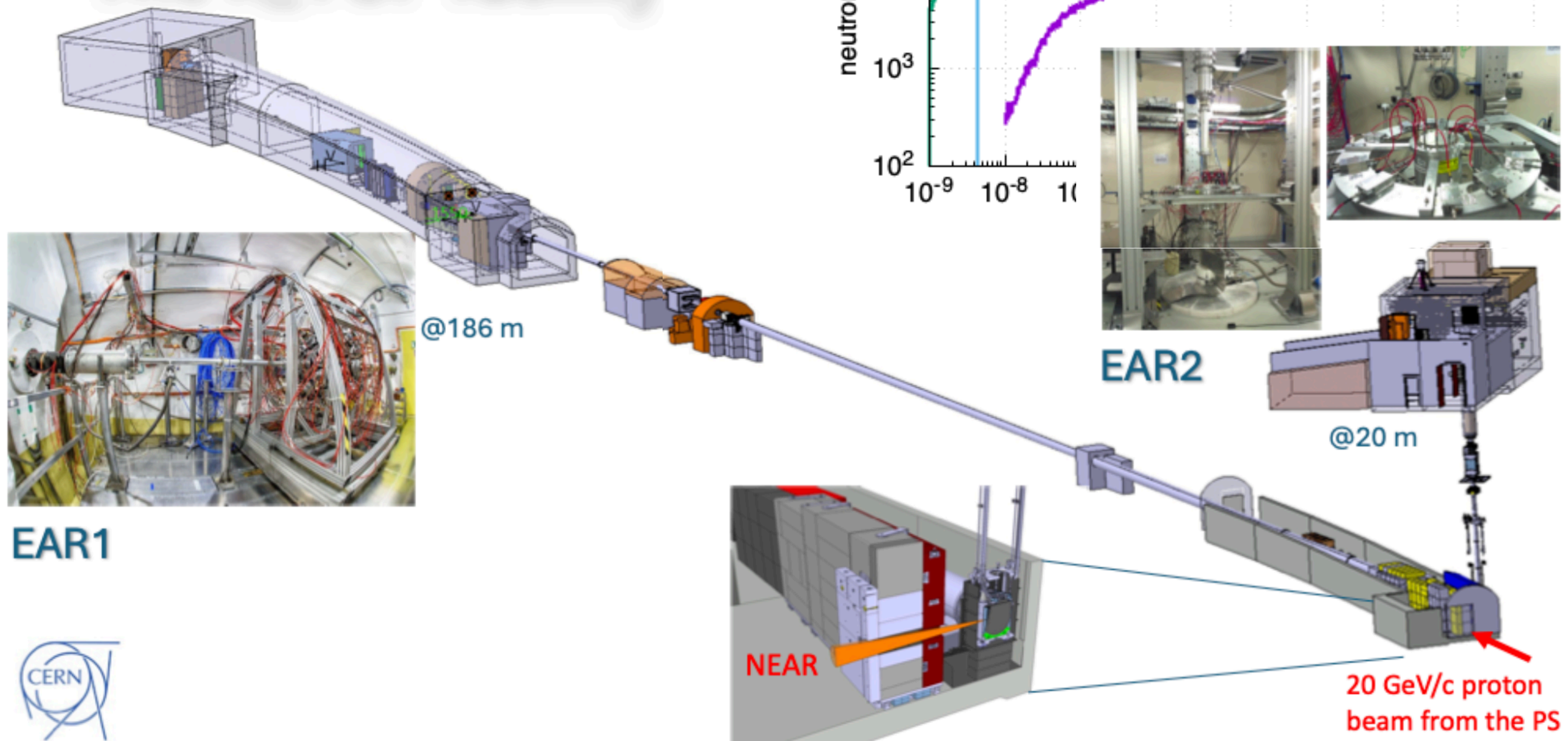
Sara Rabaglia - 23/10/2025

Recap: n_TOF facility

3 Experimental area:

The n_TOF facility

n_TOF

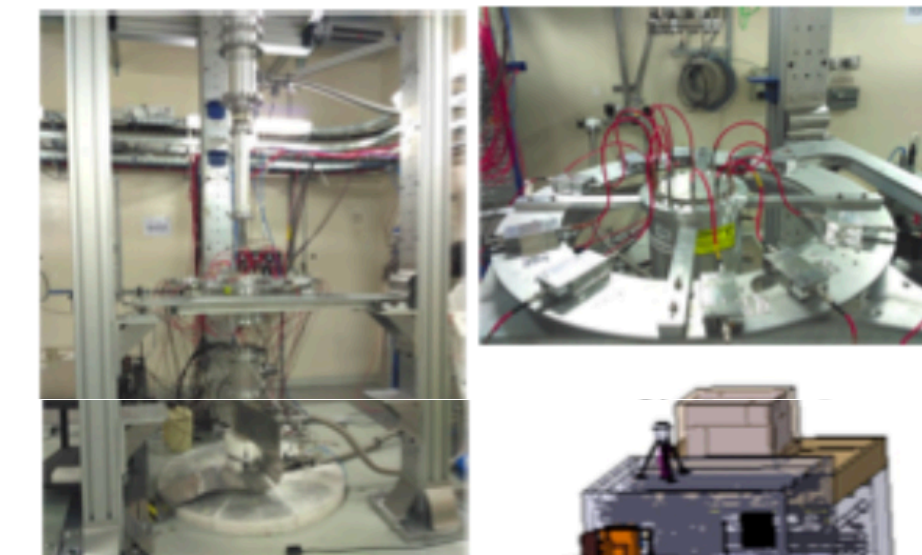
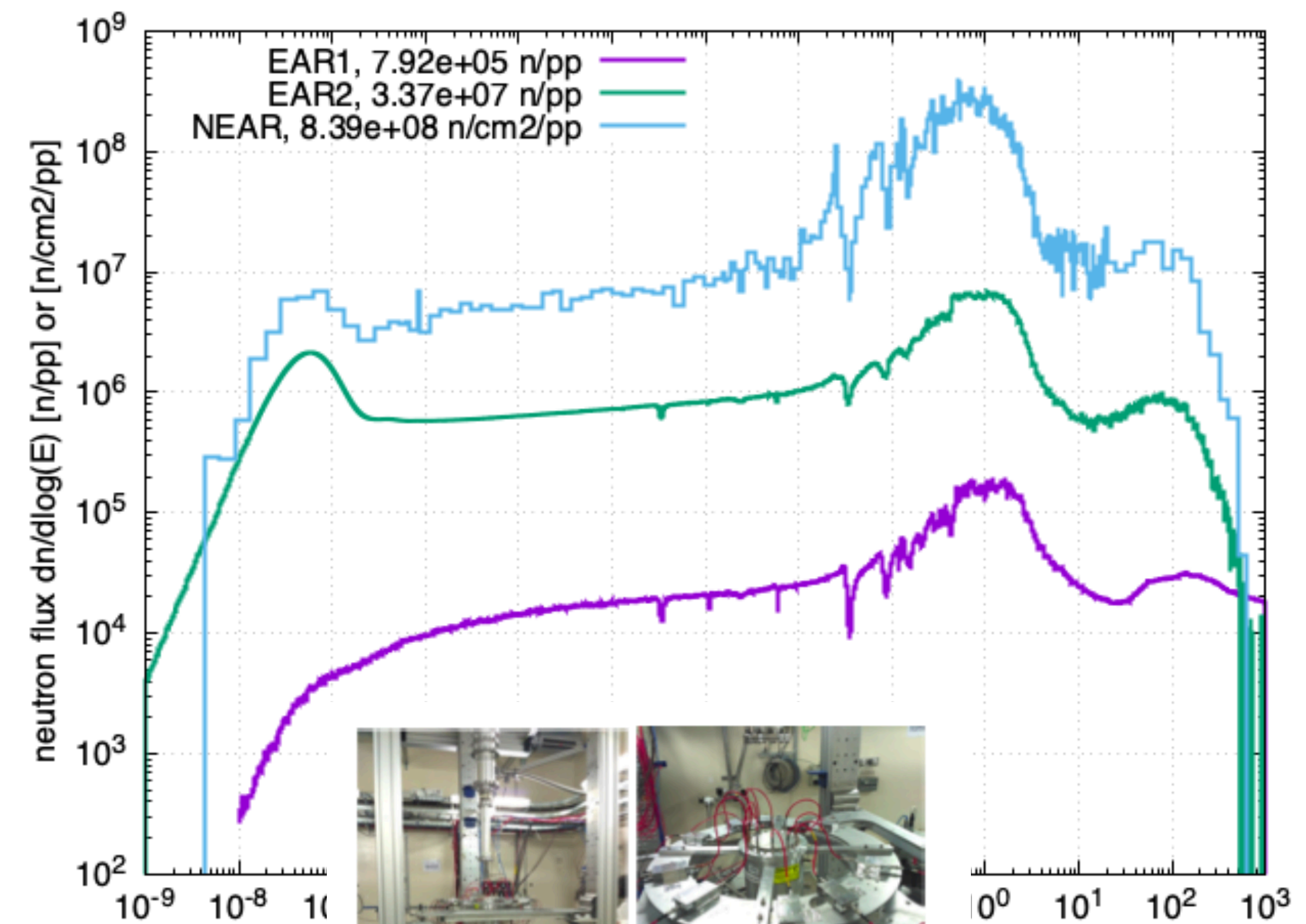
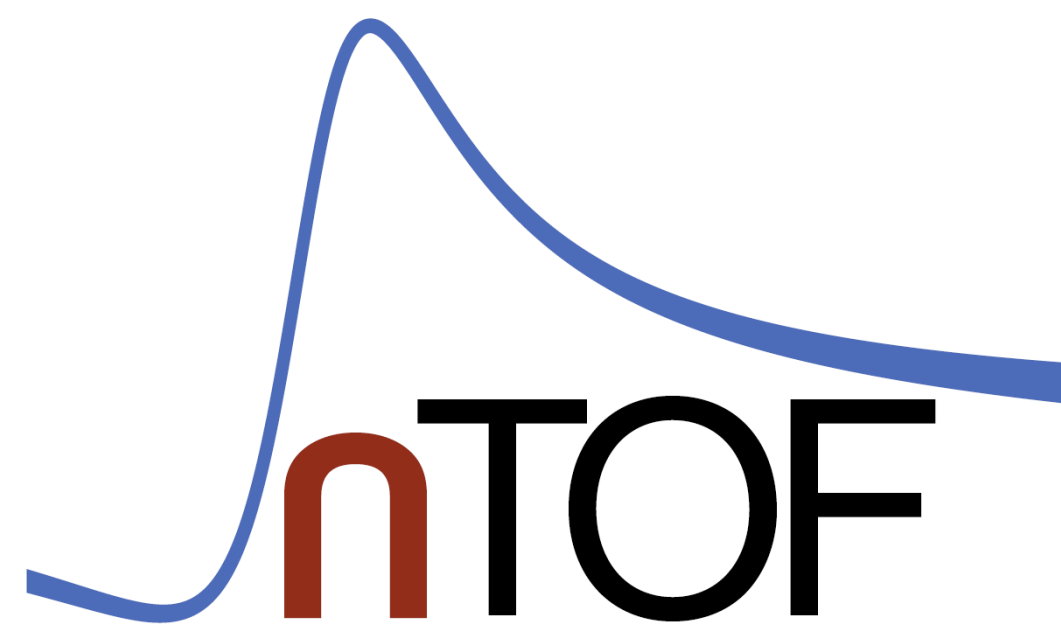


Recap: n_TOF facility

3 Experimental area:

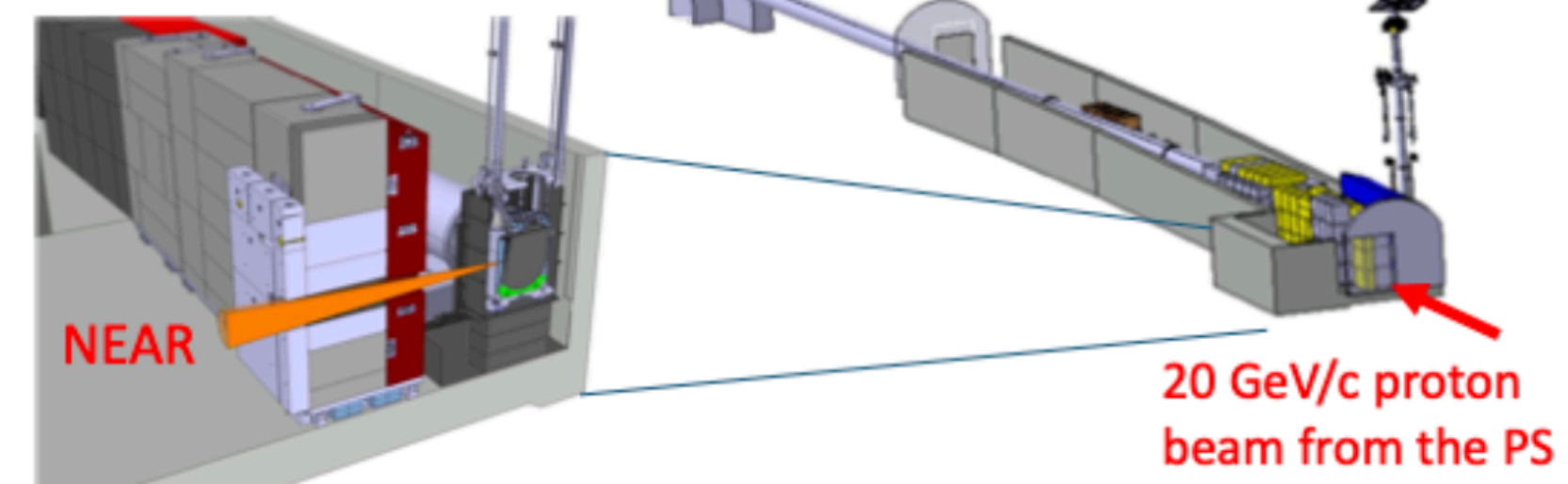
- EAR1

The n_TOF facility



EAR2

@20 m



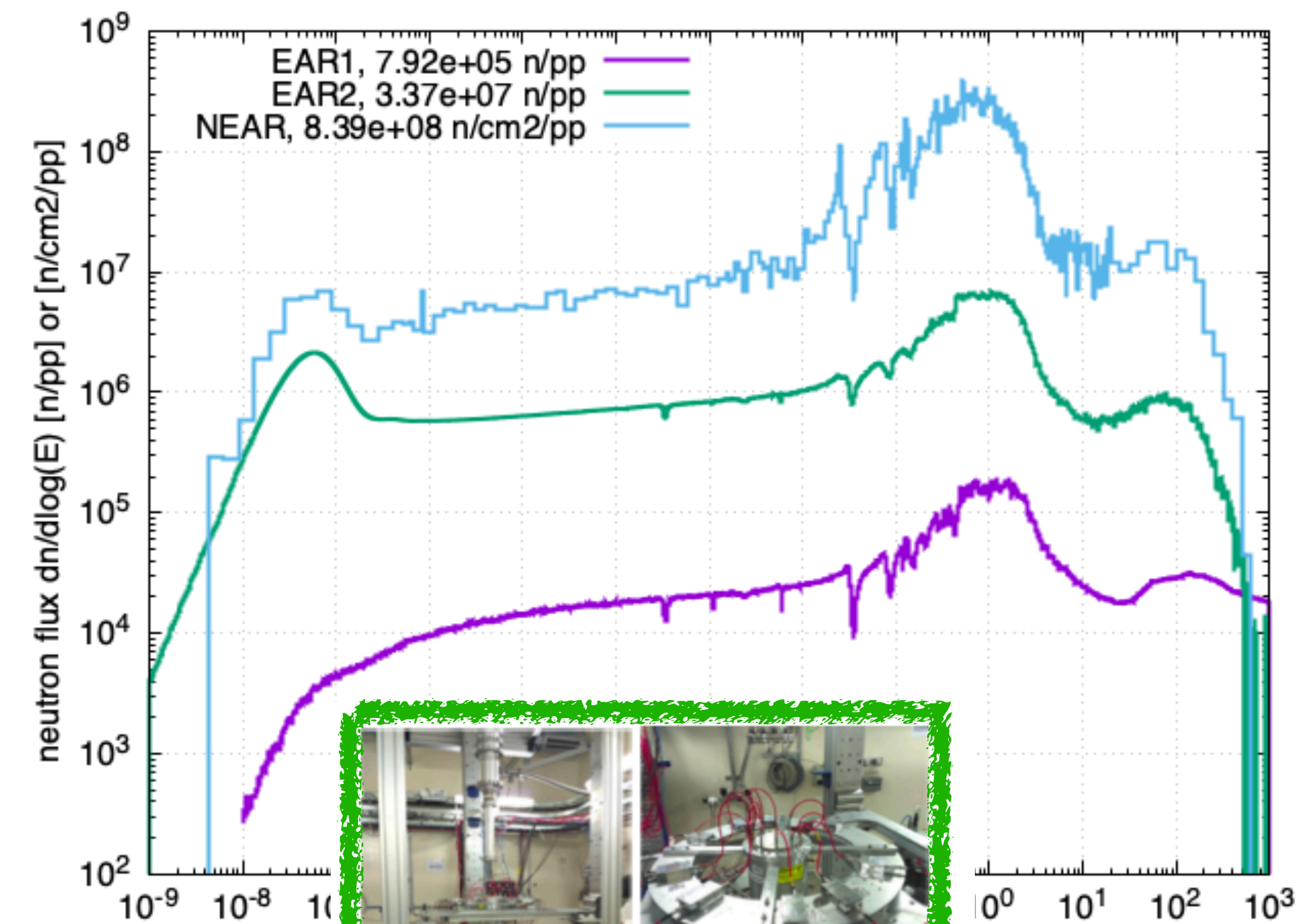
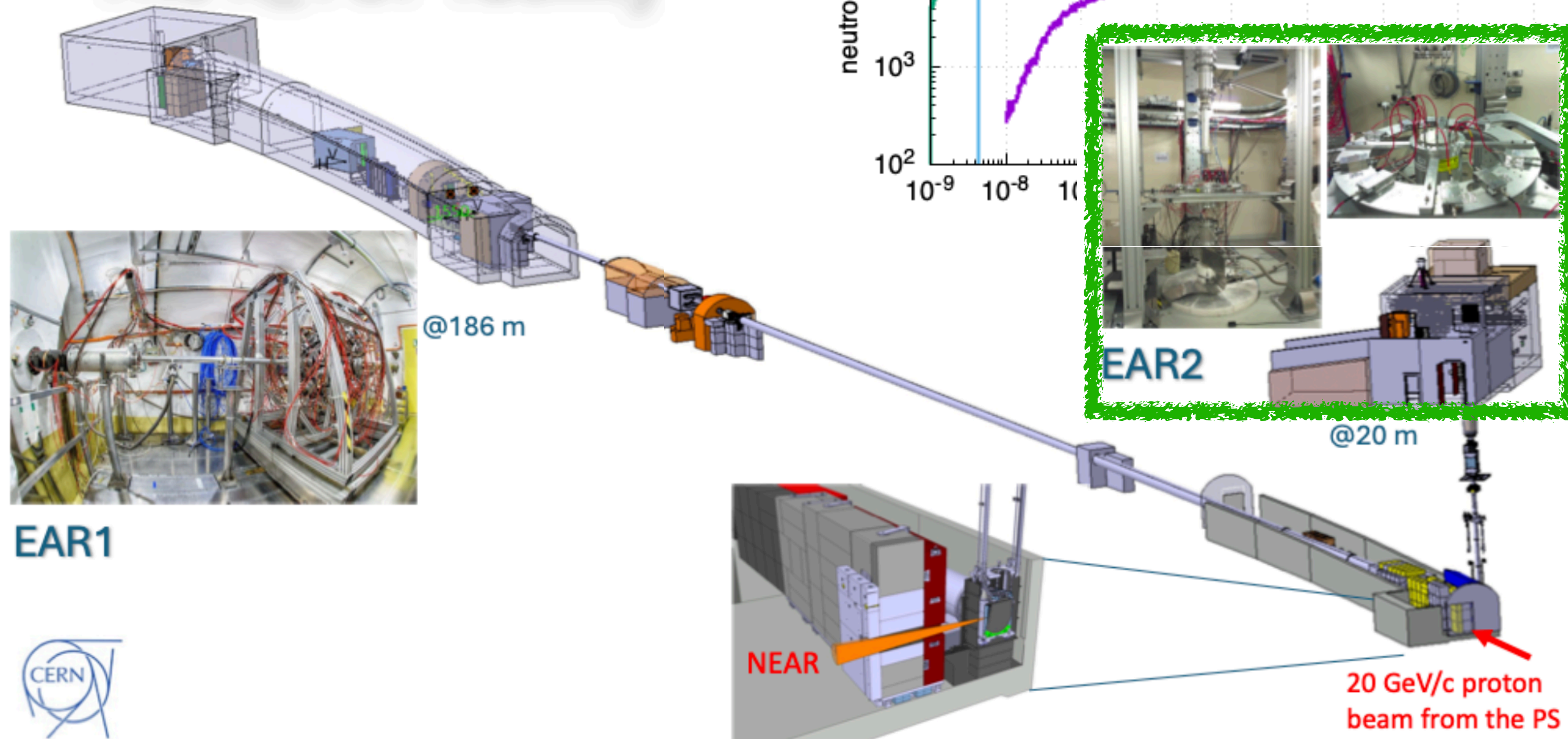
Recap: n_TOF facility

3 Experimental area:

- EAR1
- EAR2

n_TOF

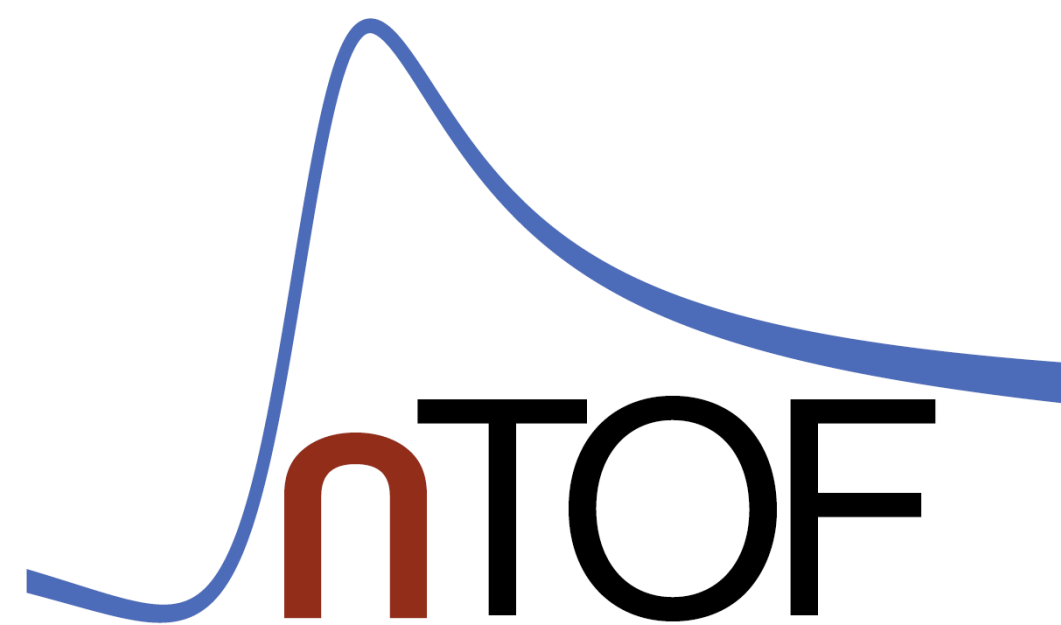
The n_TOF facility



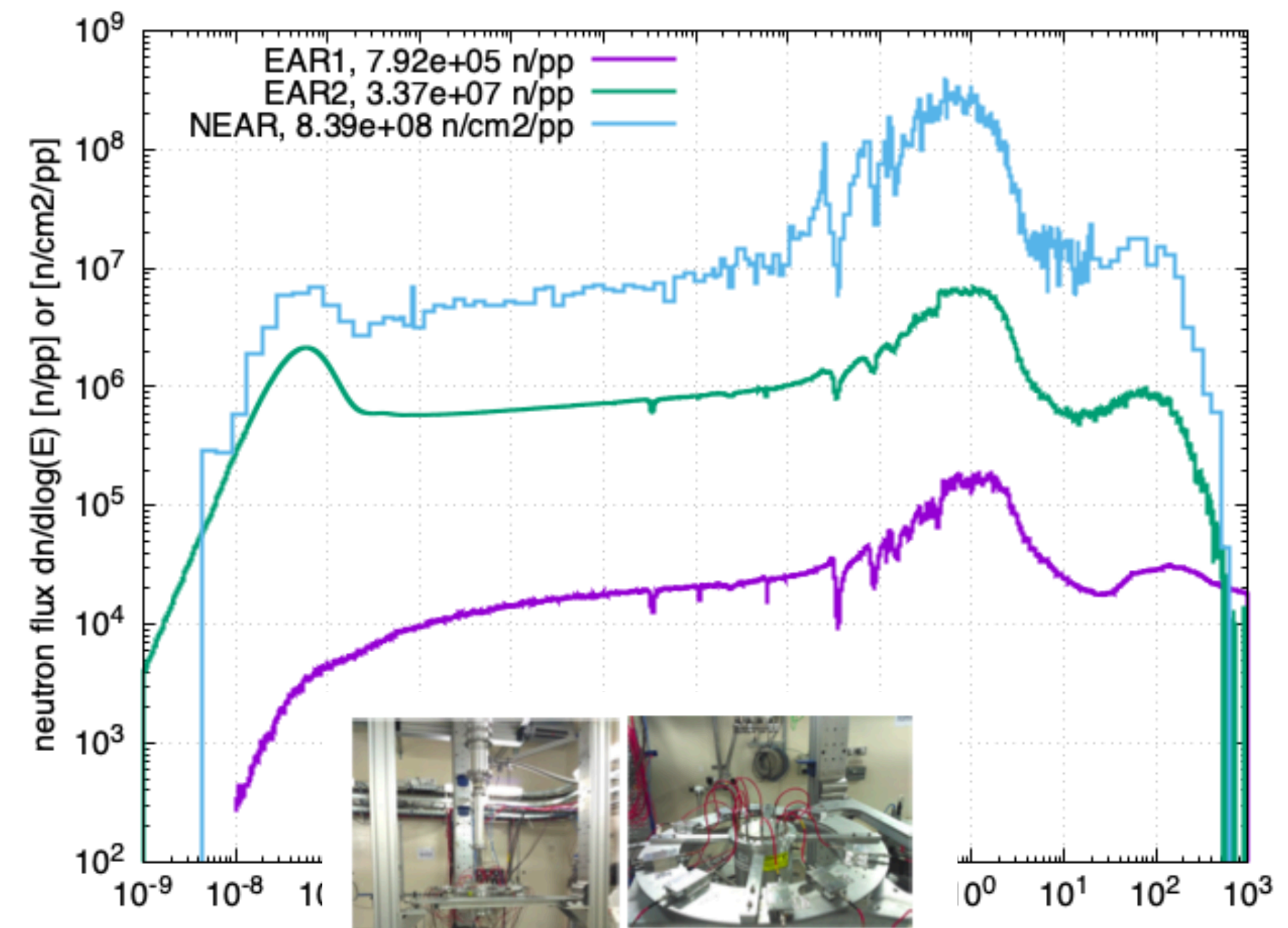
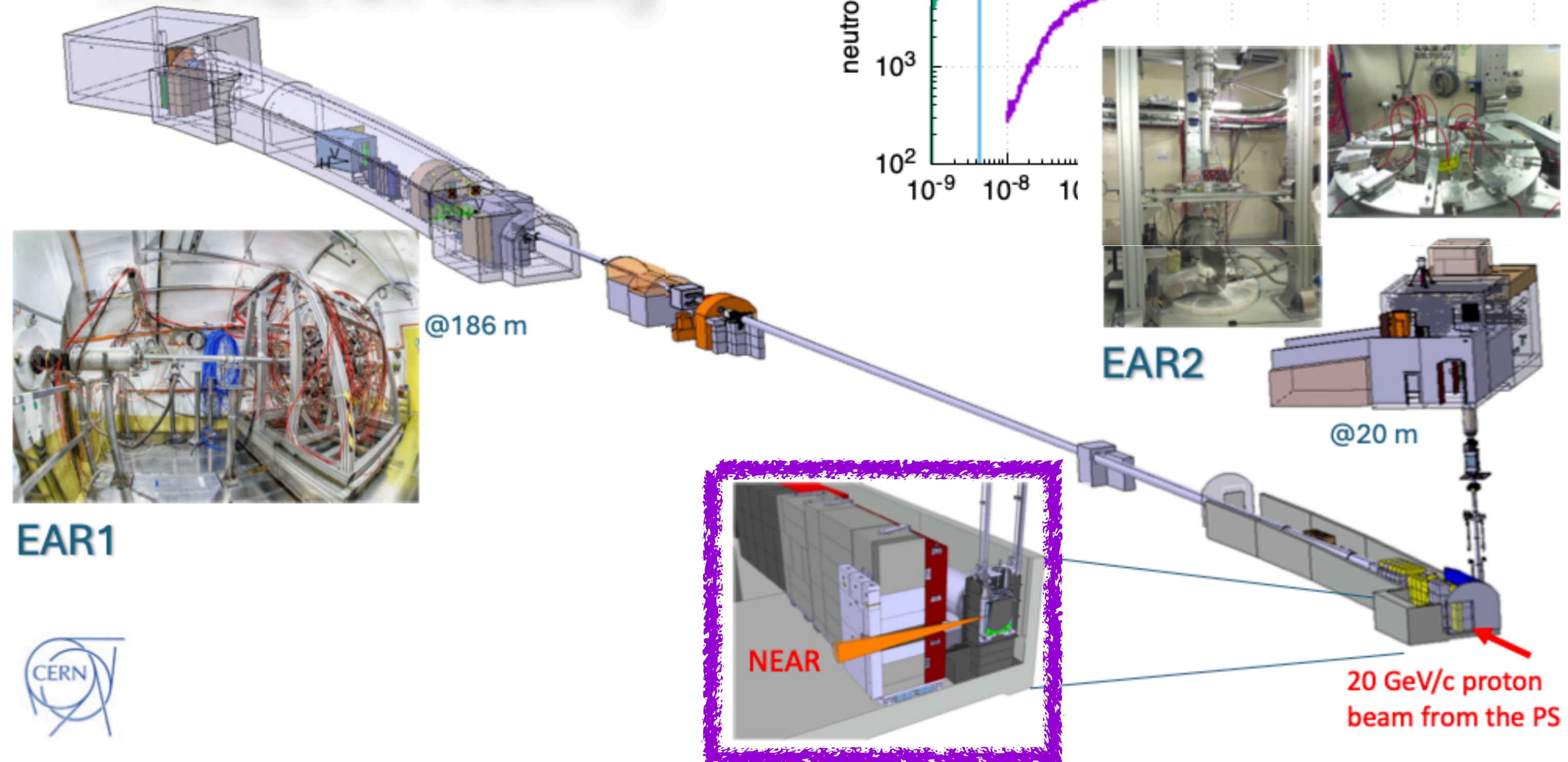
Recap: n_TOF facility

3 Experimental area:

- EAR1
- EAR2
- NEAR



The n_TOF facility



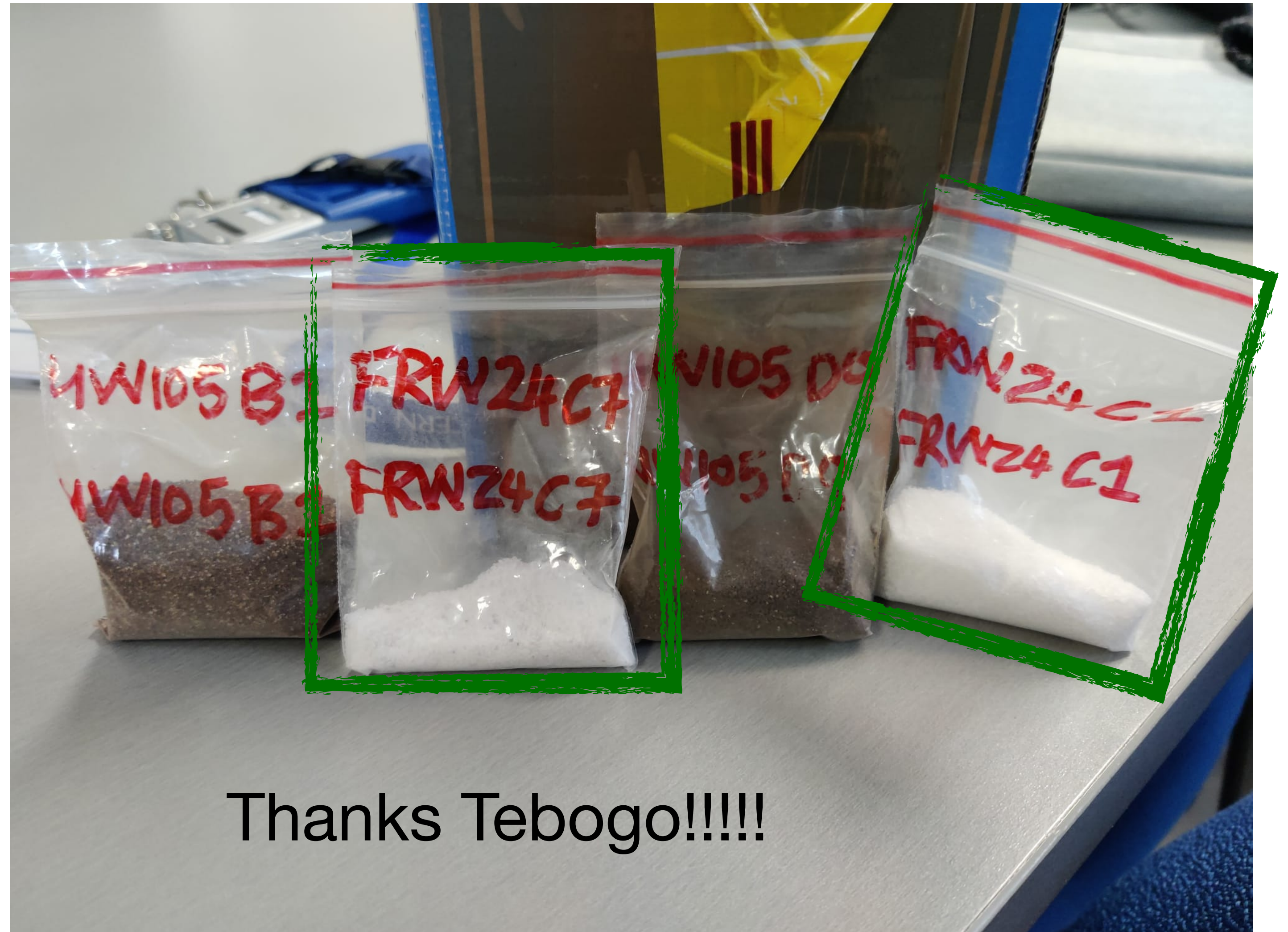
Recap: Samples



Thanks Tebogo!!!!

Recap: Samples

2 treated samples: C1 and C7

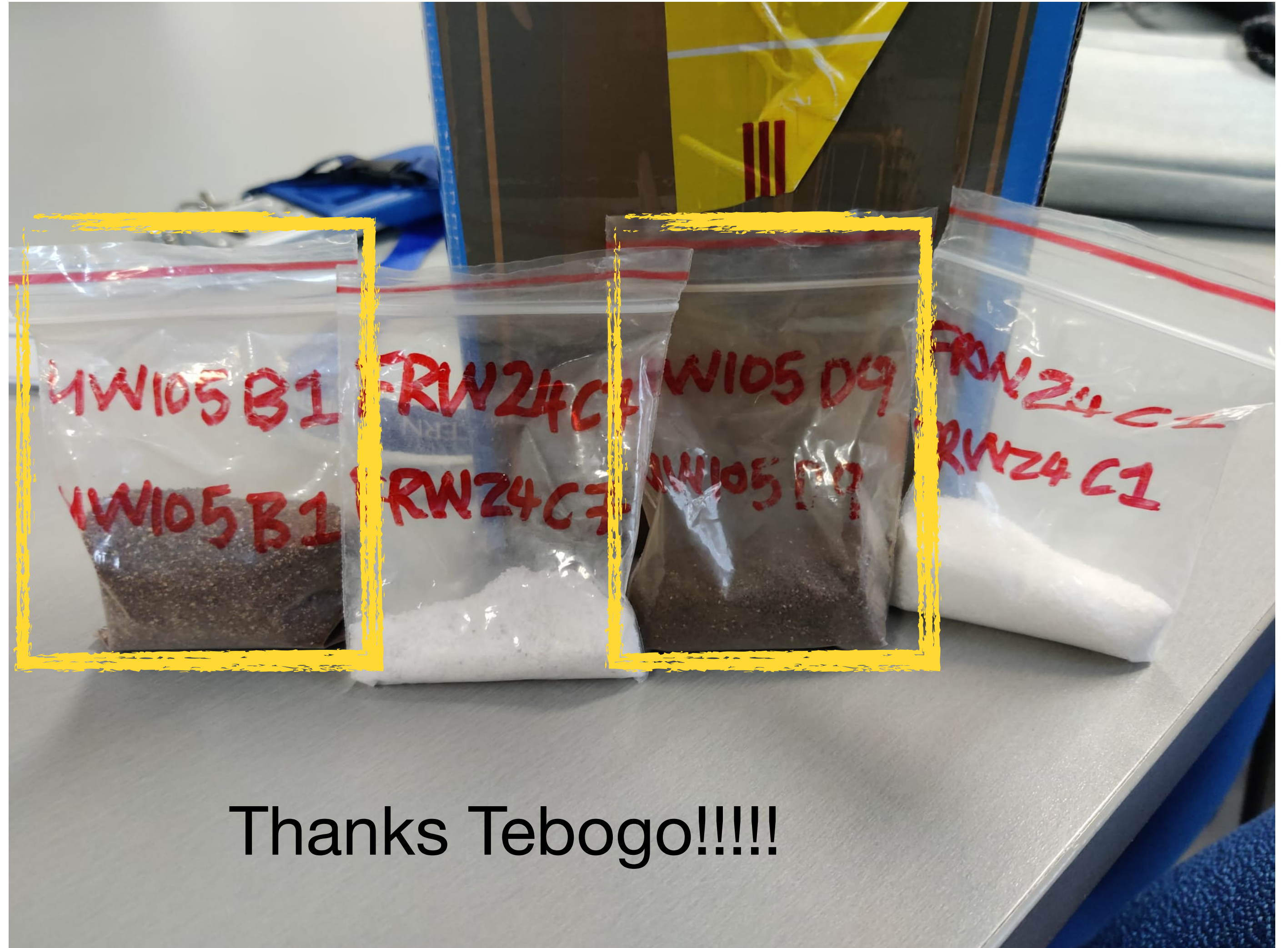


Thanks Tebogo!!!!

Recap: Samples

2 treated samples: C1 and C7

2 non-treated samples: D9
and B1

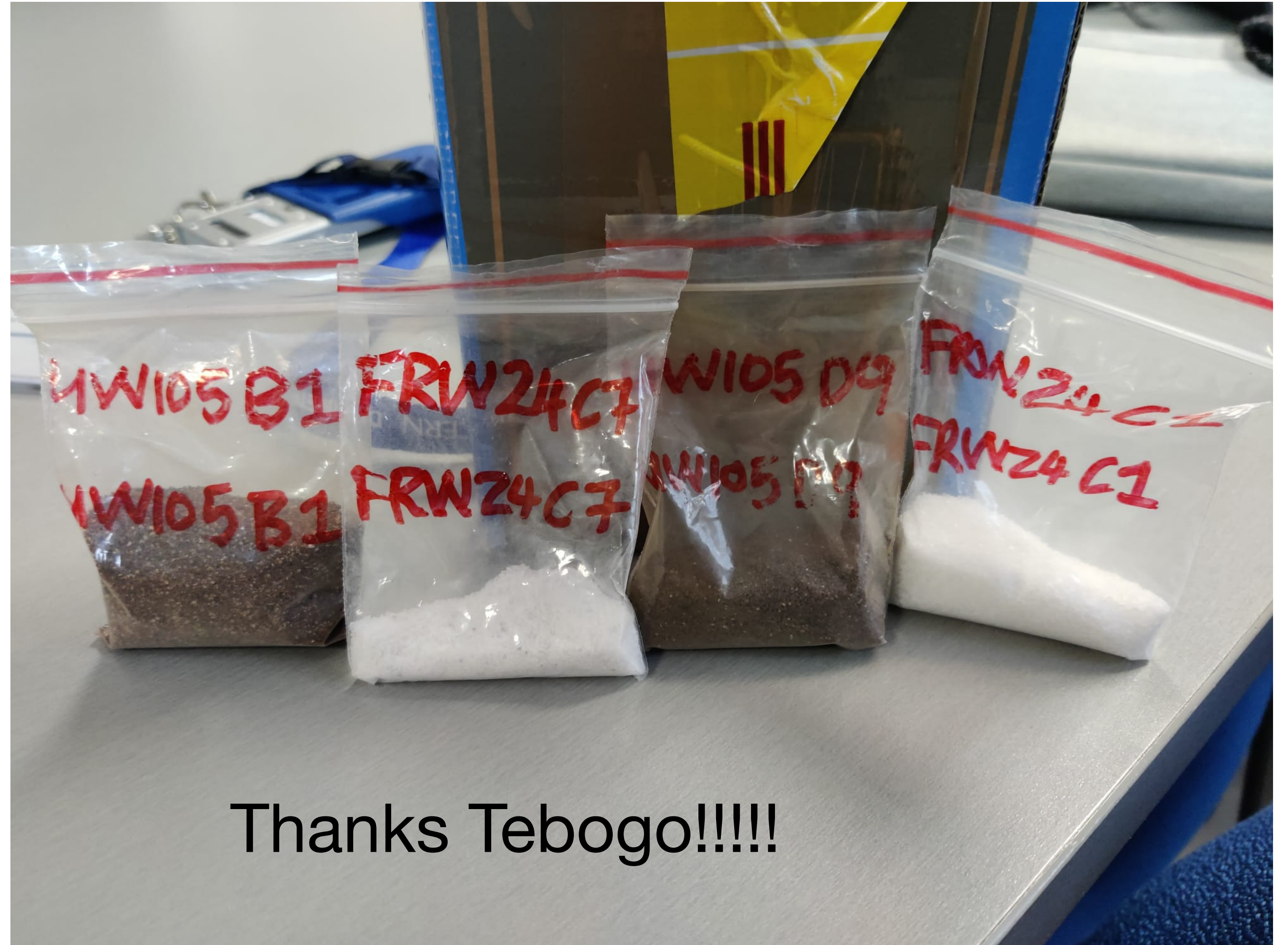


Recap: Samples

2 treated samples: C1 and C7

2 non-treated samples: D9
and B1

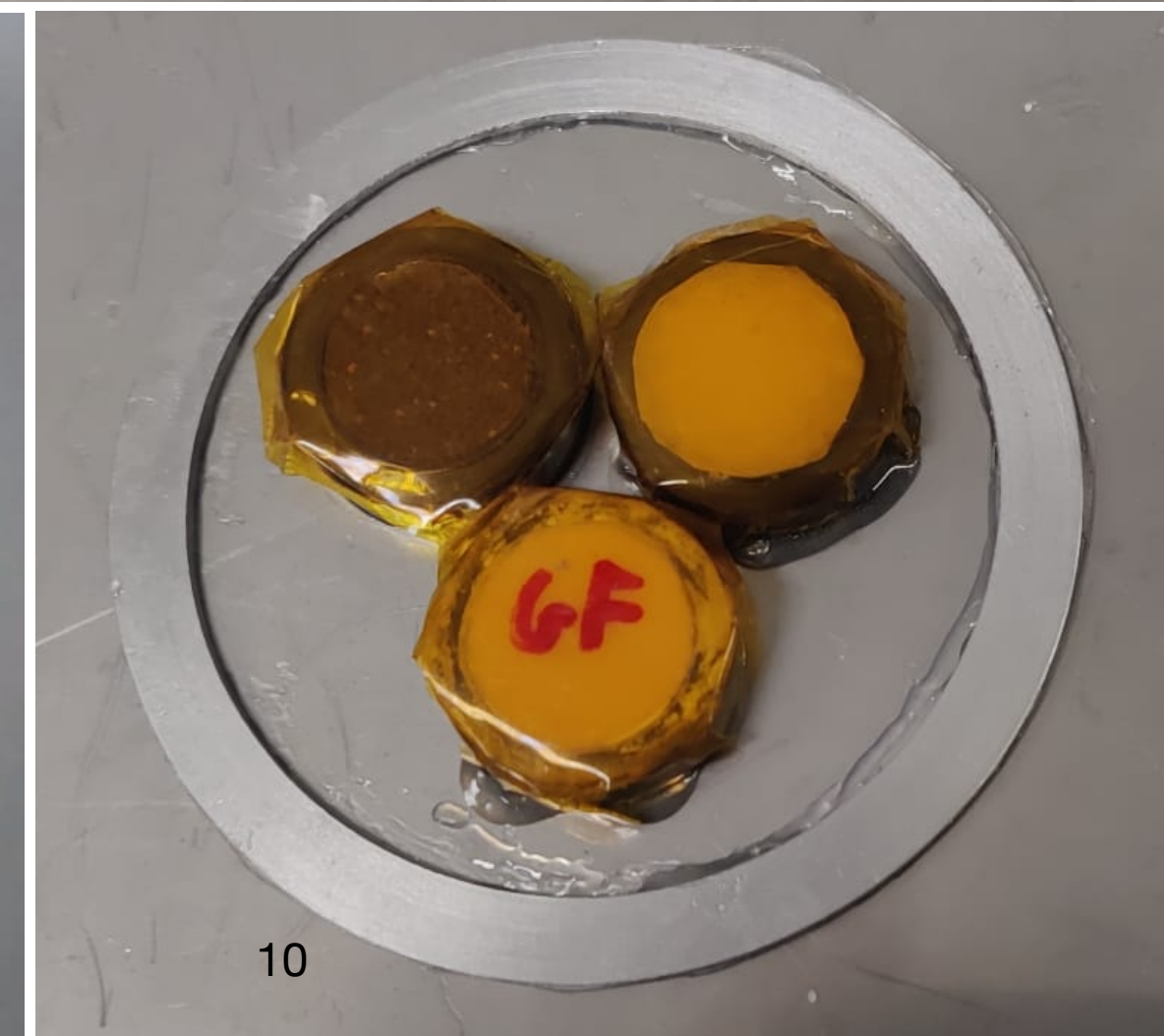
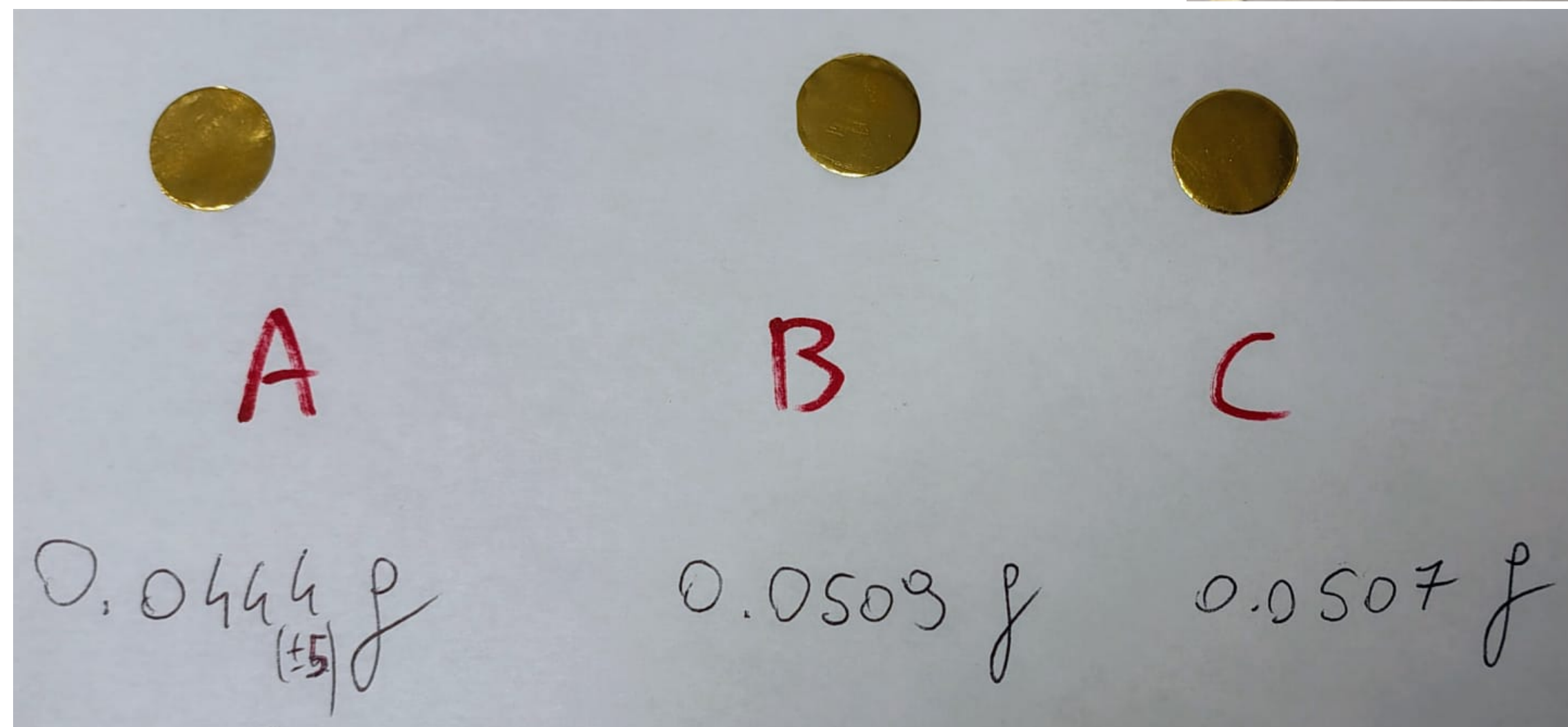
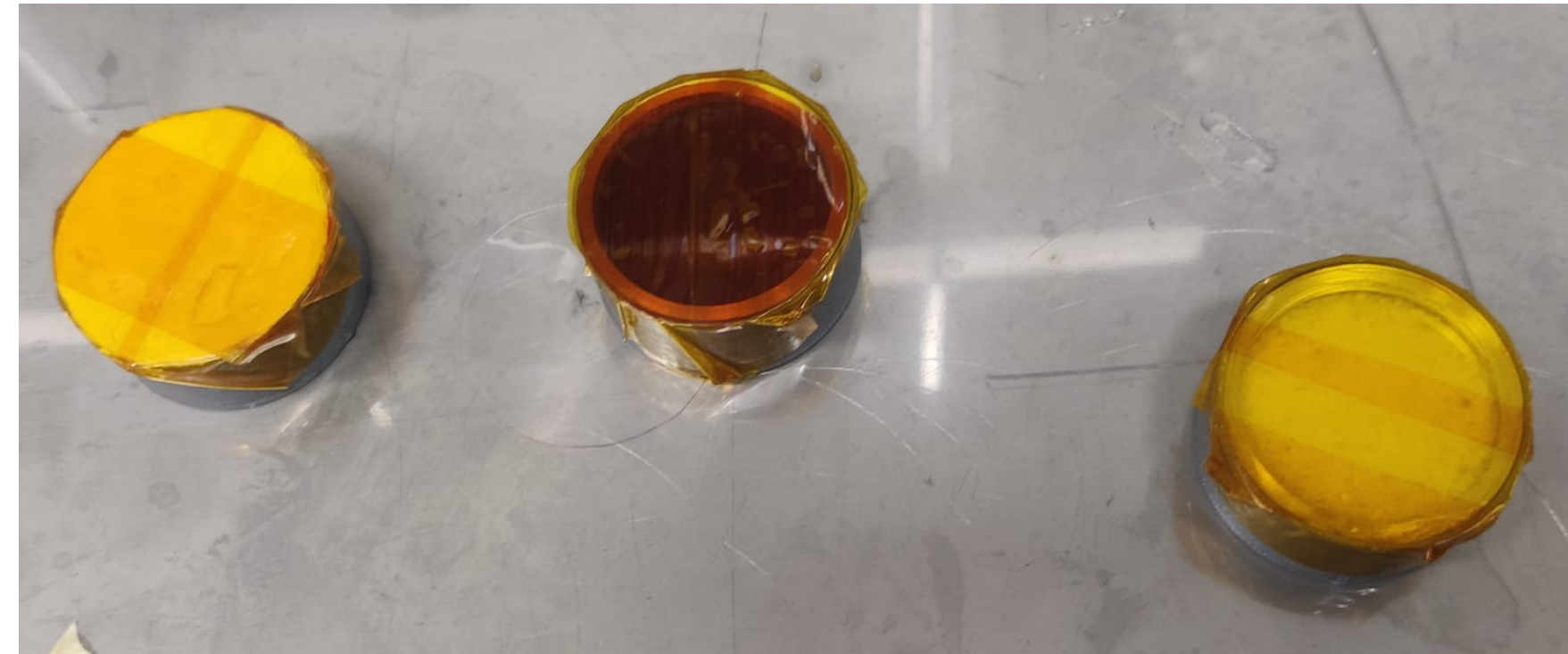
1 commercial pure quartz
powder (Goodfellow)



Thanks Tebogo!!!!

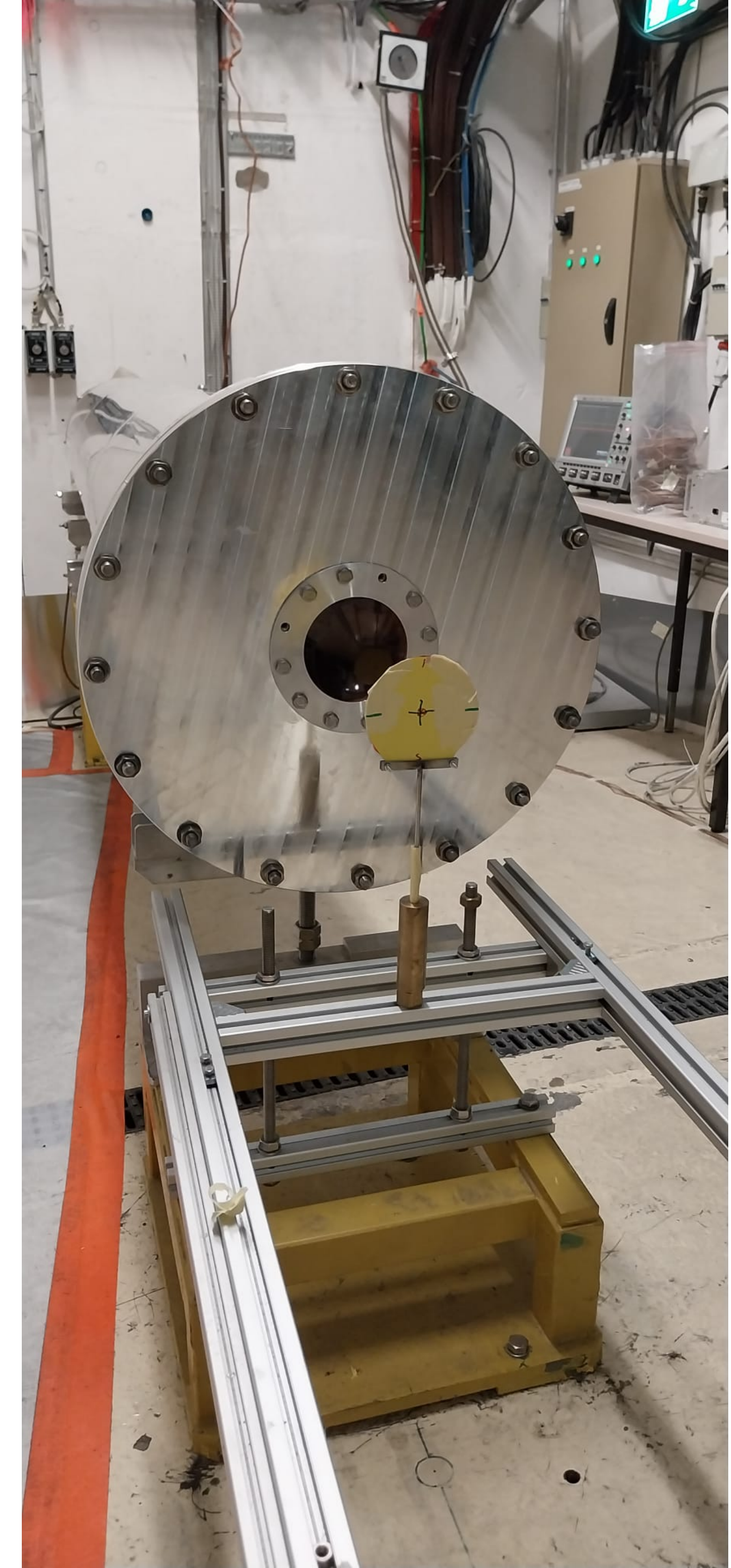
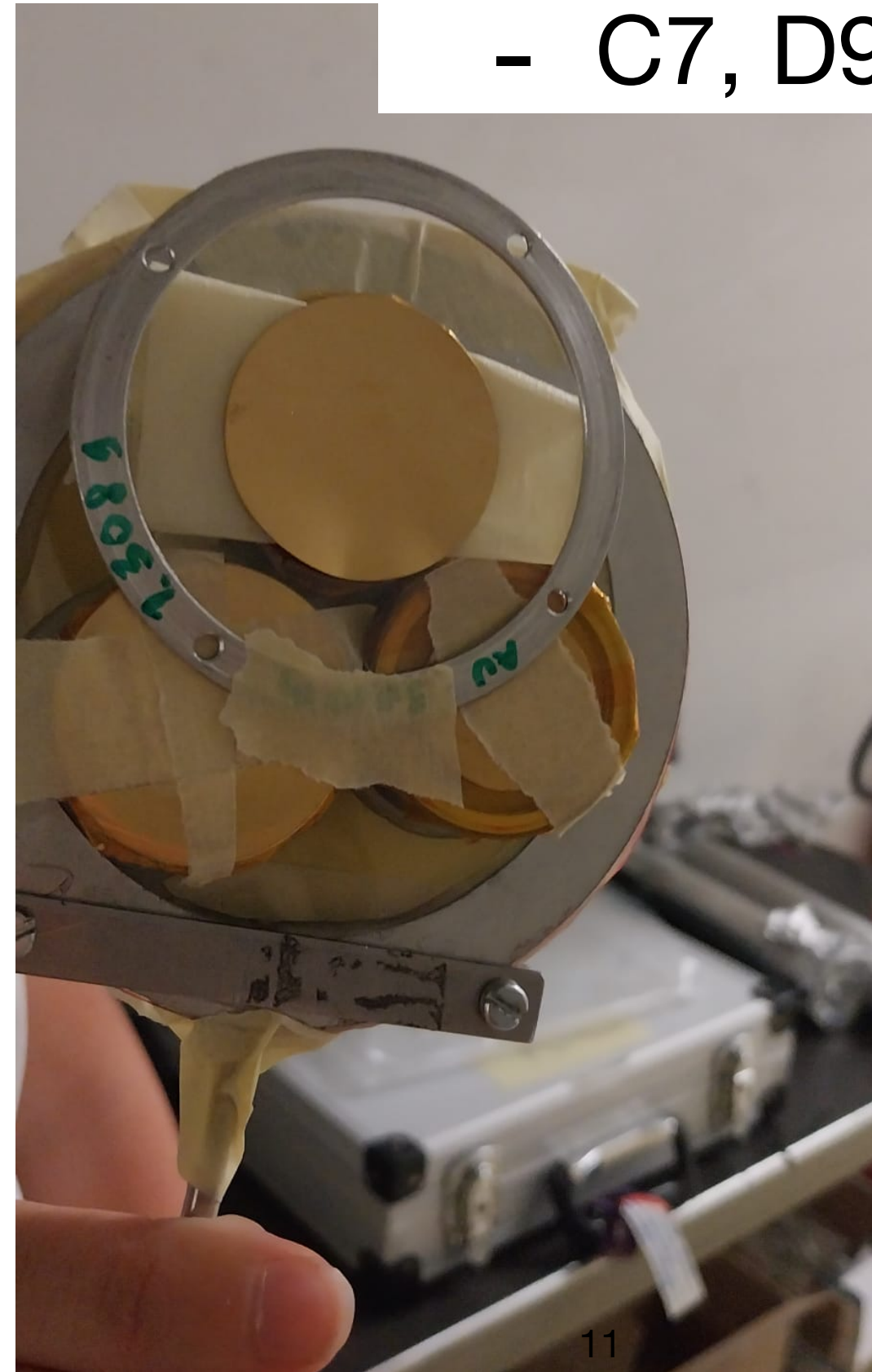
Samples preparation

1. Powder weighed and pressed into a PEEK capsule.
2. Capsule closed with a mylar foil and kapton tape.
3. In front of each capsule, a gold foil was fixed with masking tape



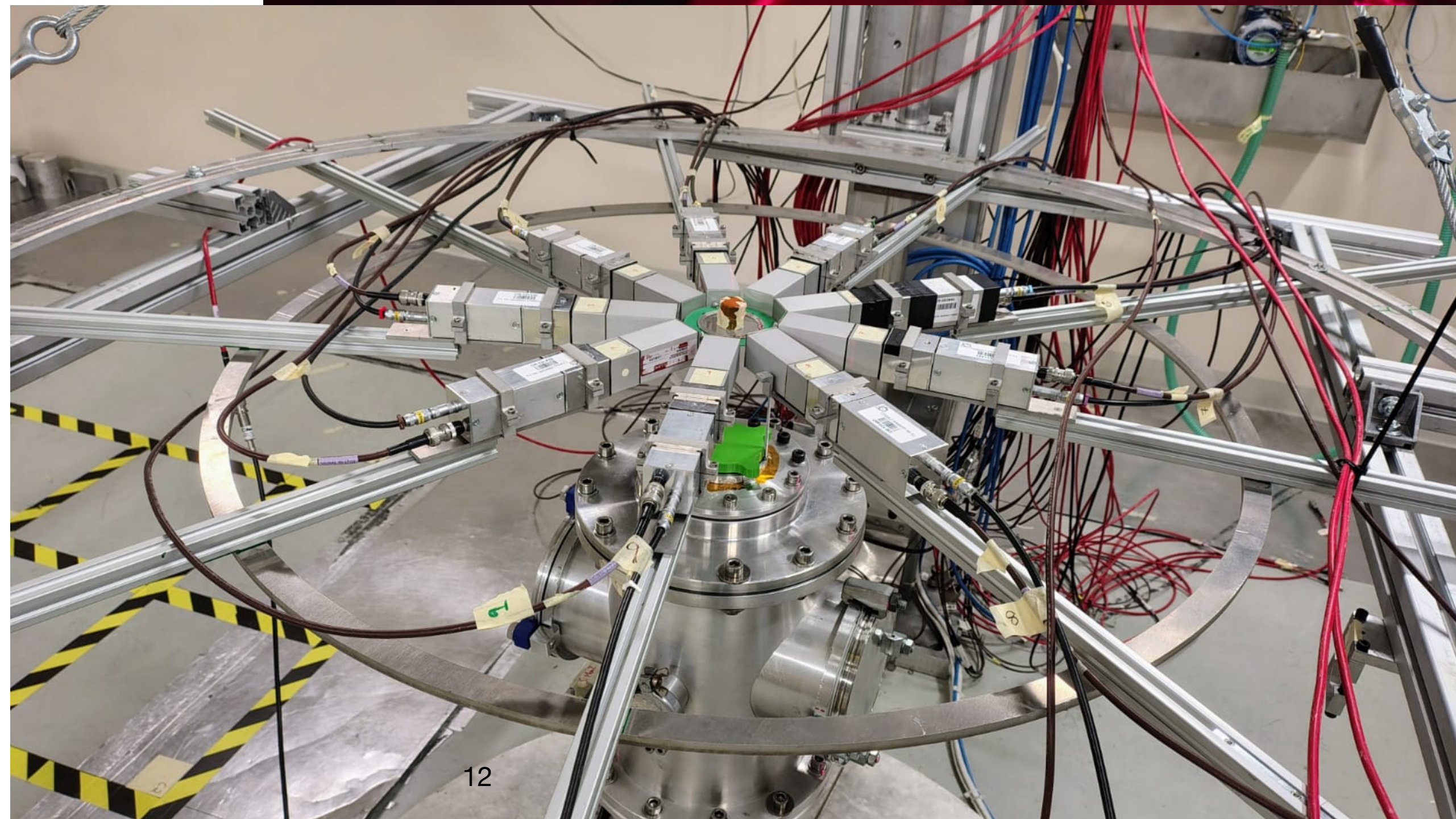
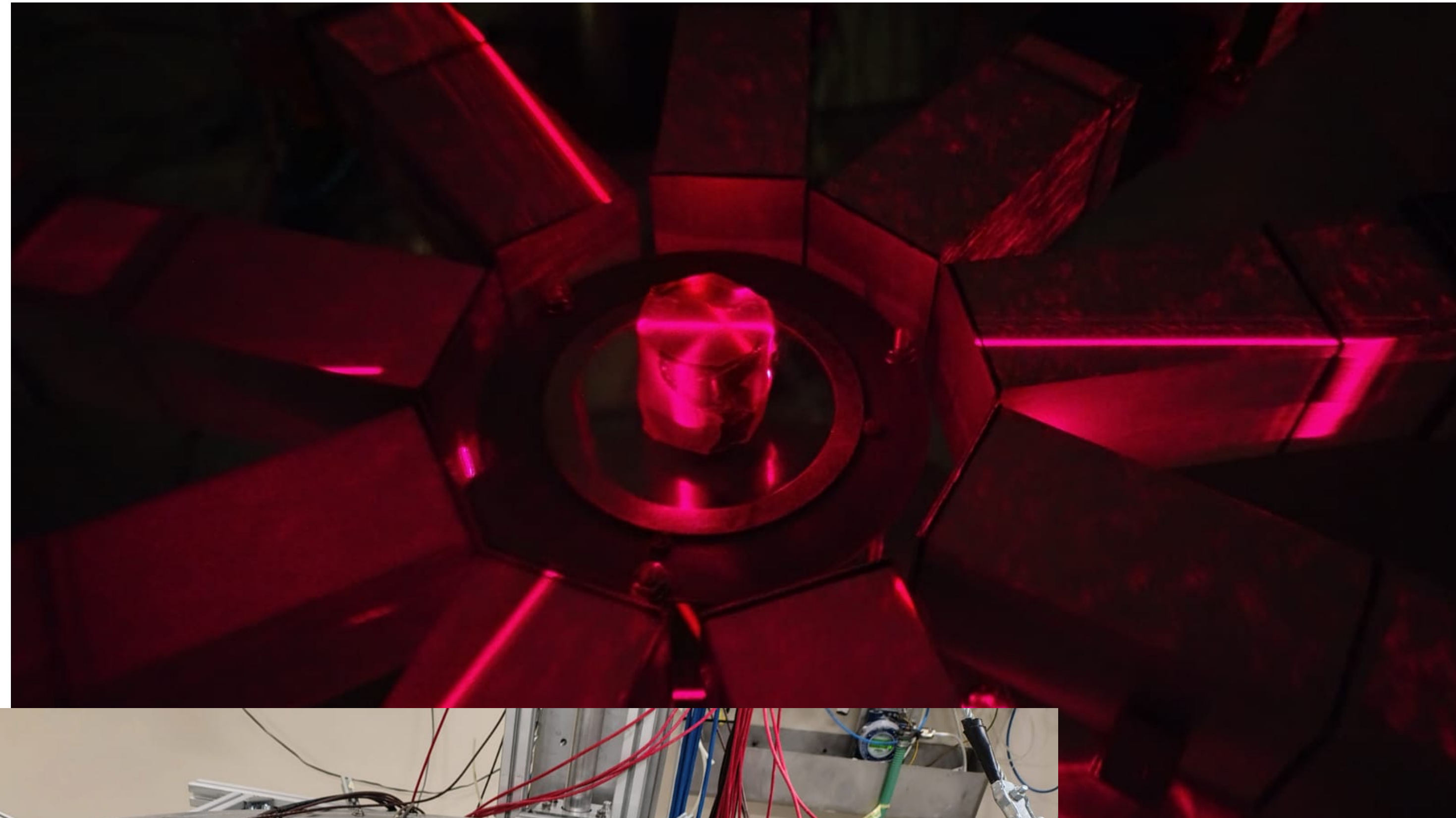
EAR1

- 2 steps of irradiation —> 6 samples (3+3)
 - Parasitic irradiation: escape line
 - 1° irradiation:
 - Fission Collimator
 - 10/09/2025 - 29/09/2025
 - 2° irradiation:
 - Capture Collimator
 - 29/09/2025 - ...
- Samples:
 - $m = 10\text{ g}$
 - $D = 30\text{ mm}$, $h = 13\text{ mm}$
 - C7, D9, GF



EAR2

- 1 irradiation $\rightarrow$ 2 samples
- Dedicated irradiation
- 1° irradiation:
 - 17/10/2025 - 27/10/2025
- Samples:
 - $m = 4.5$ g
 - $D = 20$ mm, $h = 10$ mm
 - C1 and D9



NEAR

- 2 steps of irradiation —> 6 samples (3+3) - with and without filter (B_4C)
 - Dedicate irradiation
 - 1° irradiation (without filter):
 - 16/10/2025 - 22/10/2025
 - 2° irradiation (with filter):
 - 22/10/2025 - 29/10/2025
- Samples:
 - $m = 1\text{ g}$
 - $D = 13\text{ mm}$, $h = 6\text{ mm}$
 - C1, D9, GF



Why Gold?

Pure stable gold (99.9% ^{197}Au)

Activation of gold irradiated with a neutron flux is well known.

Reaction of interest: $^{197}\text{Au}(n,2n)^{196}\text{Au}$ —> threshold = 8 MeV.

^{196}Au half-life ~ 6 days

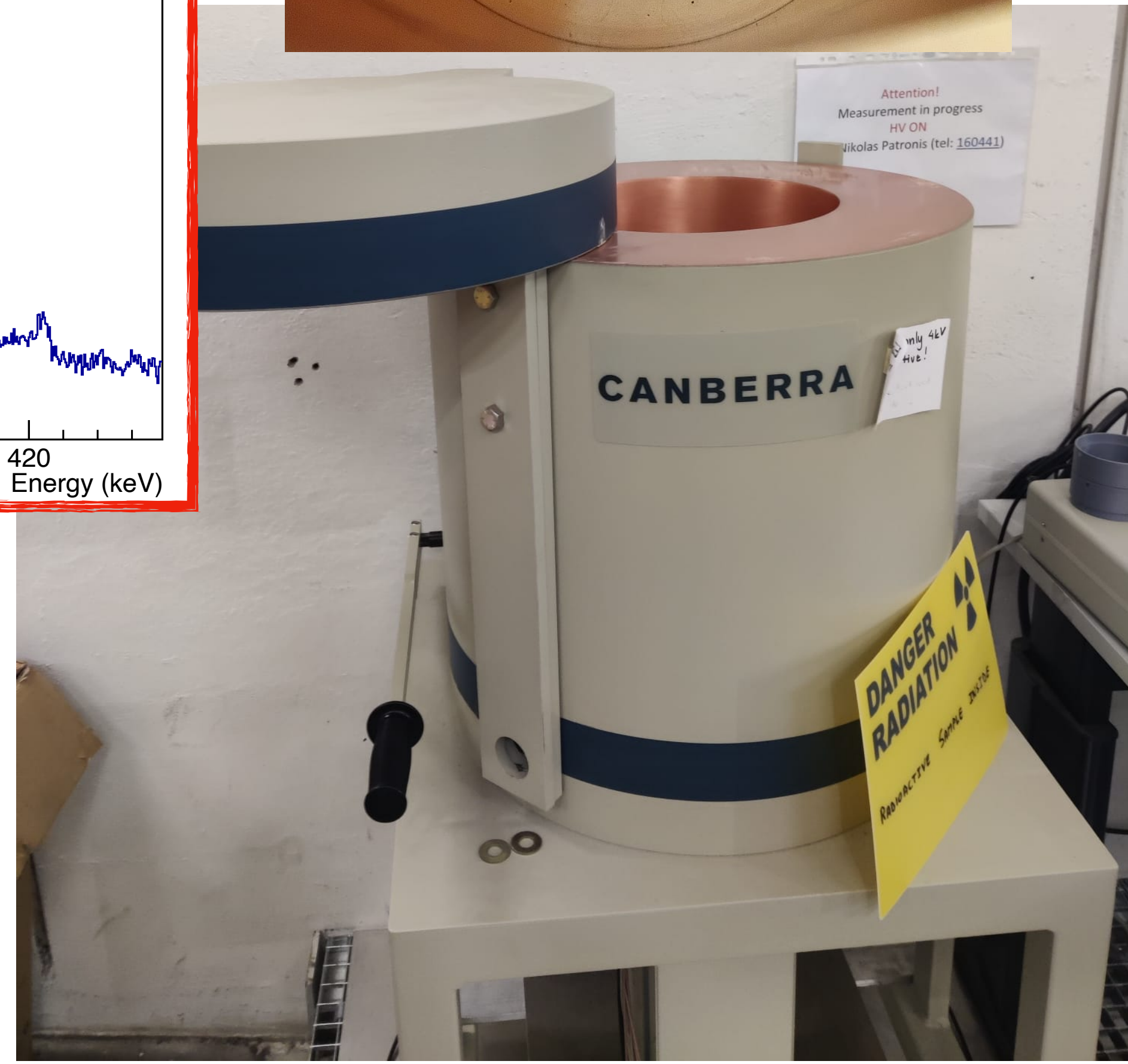
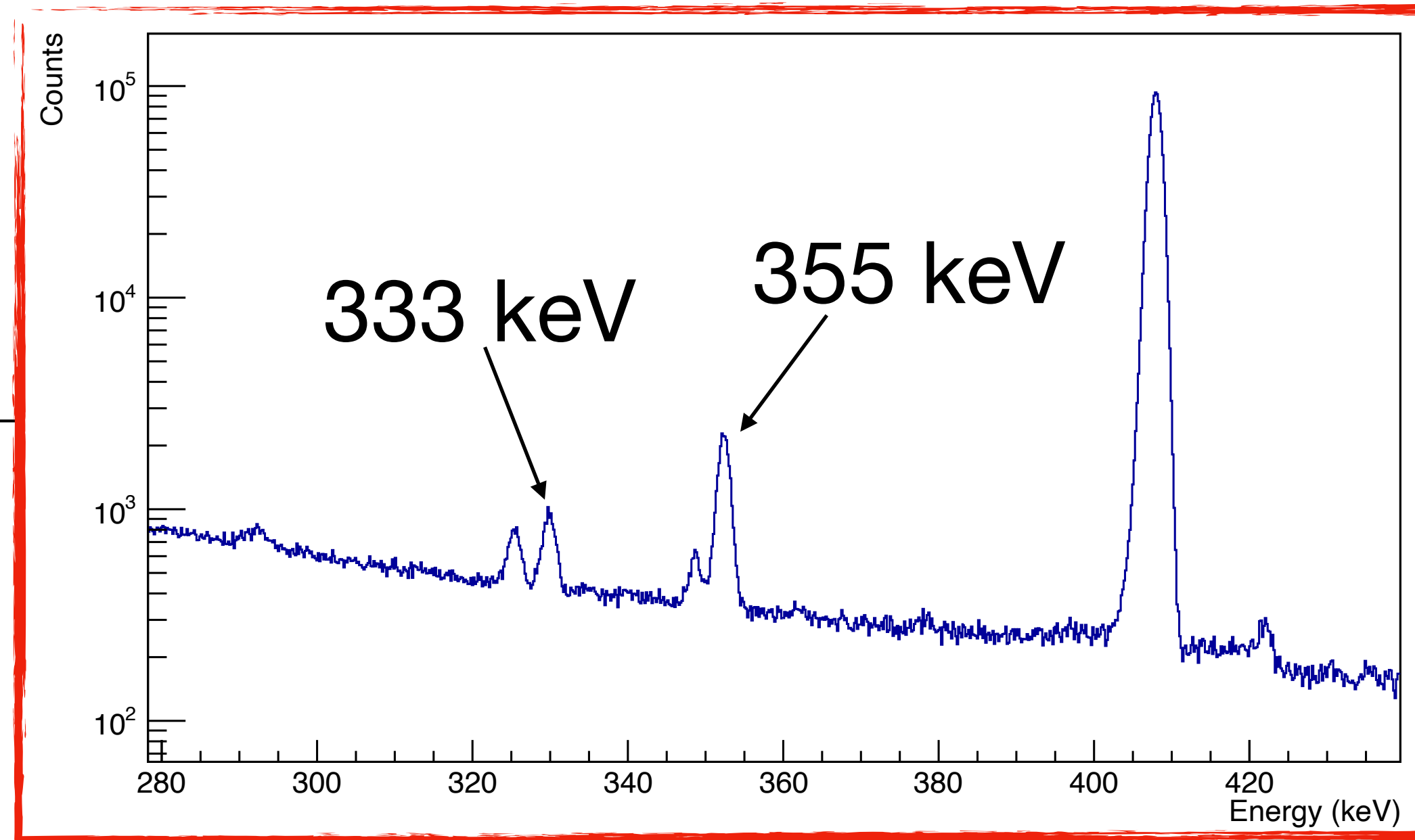
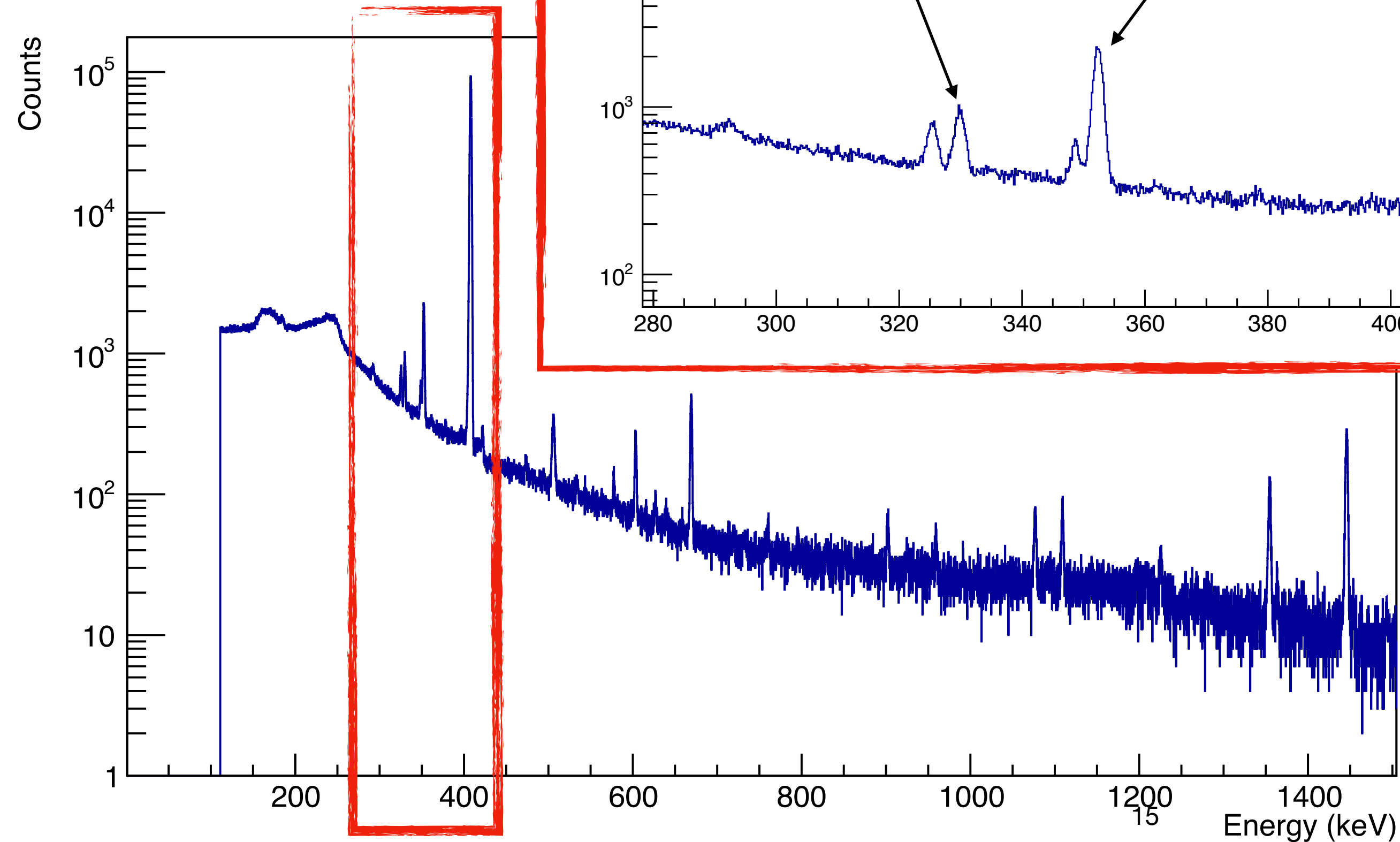
Measuring the activity after irradiation, it's possible to calculate the flux above 8 MeV that irradiates the corresponding sample.

Normalization of the flux received by each sample



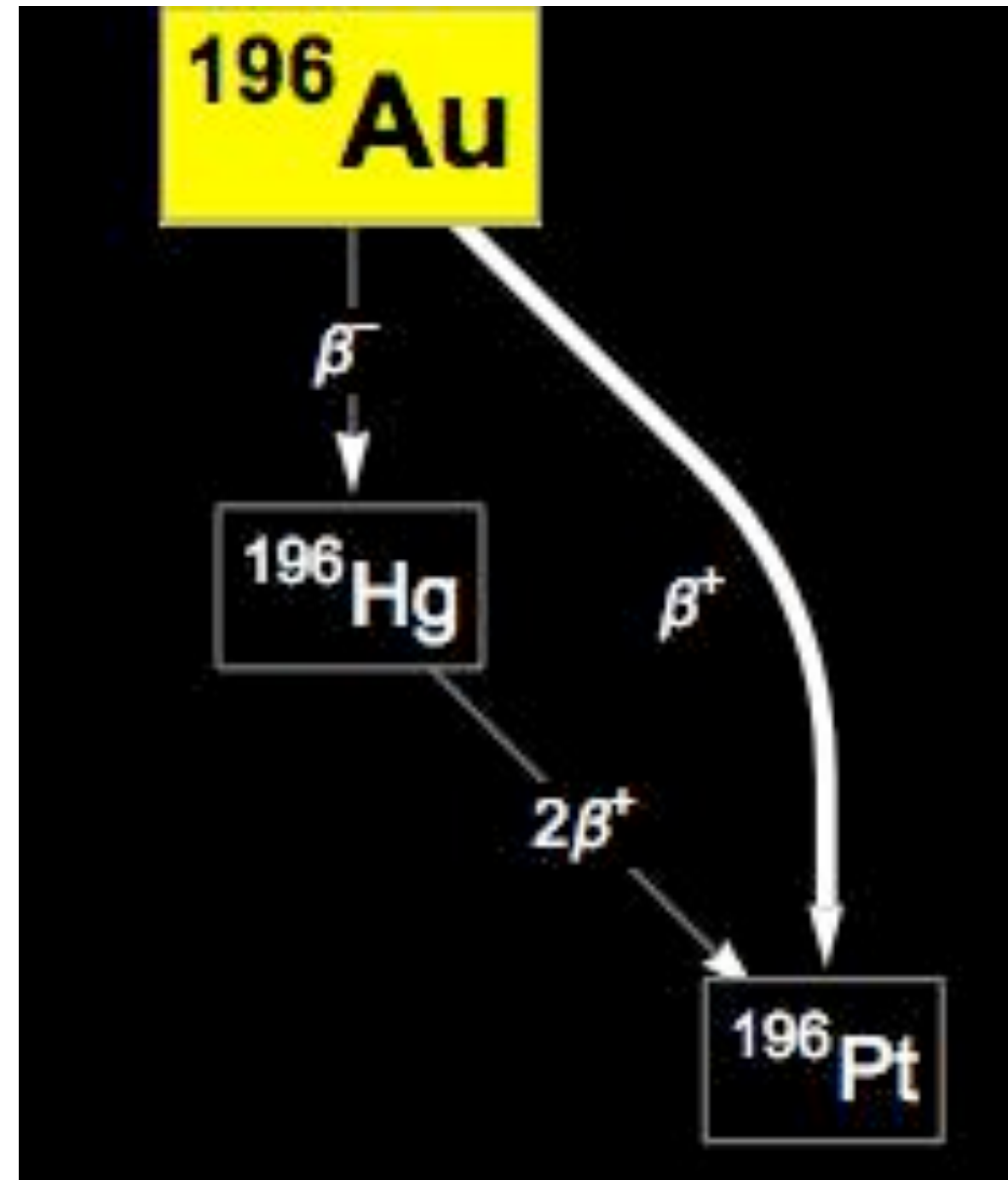
Gold activity: Ge-detector

- Germanium Detector
- Measurement of the gold activity



Conclusion

Soon the gold activity measurement will be ready.



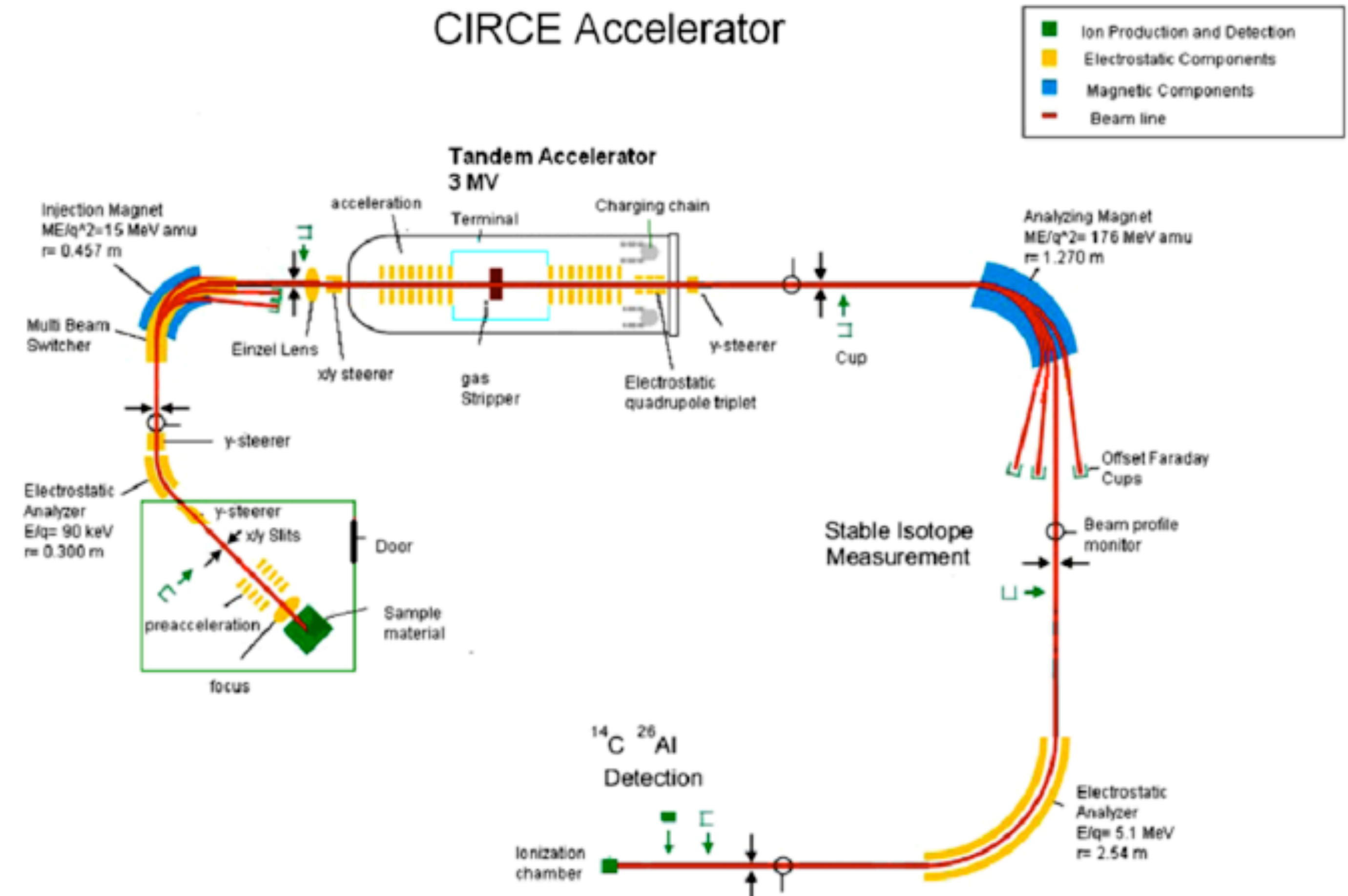
Conclusion

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All the irradiated samples are stored, ready to be shipped to CIRCE for AMS.



CIRCE Accelerator



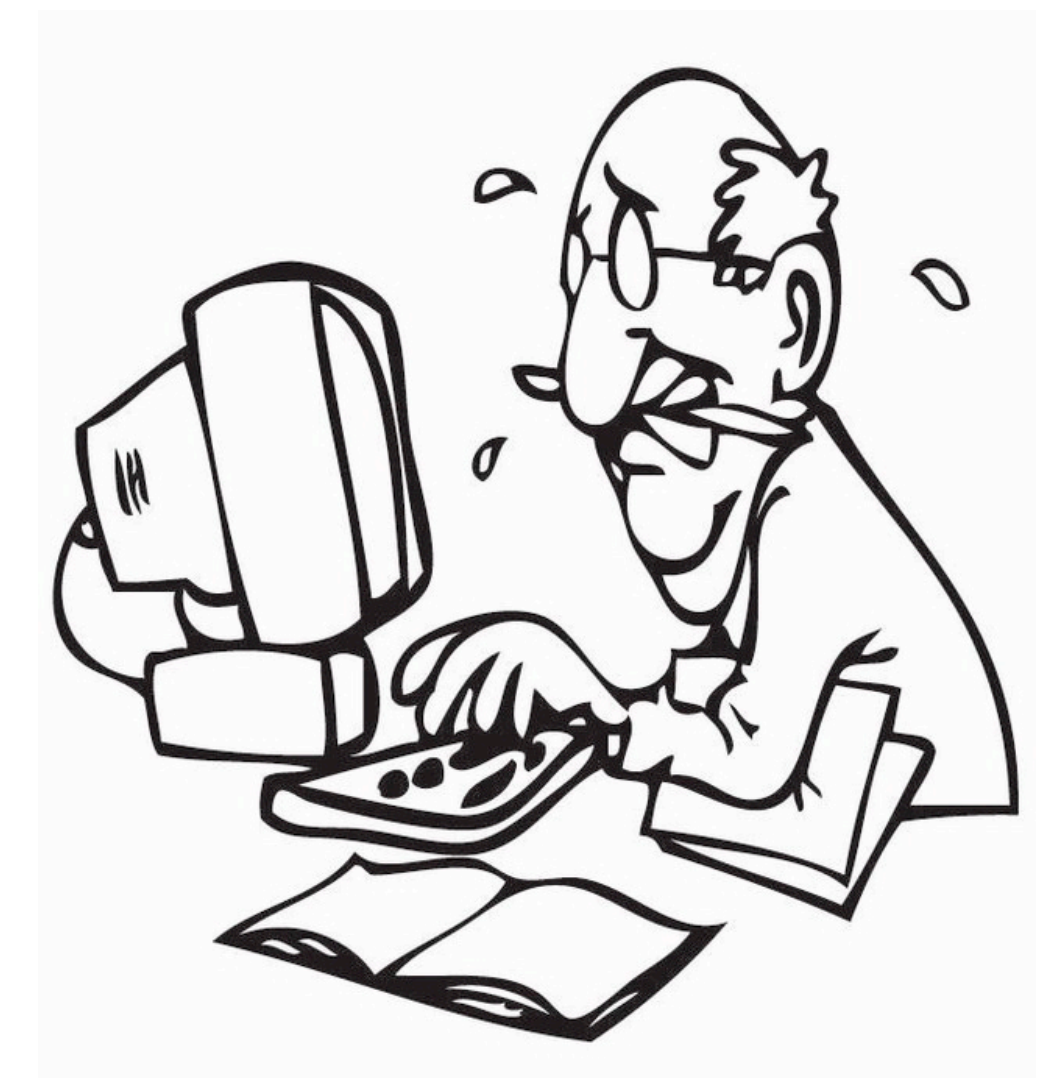
Conclusion

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All the irradiated samples are stored, ready to be shipped to CIRCE for AMS.

Theoretical framework to calculate production rate and integrated cross section is under development and almost ready.

	cm	cm^2		cm					n/cm^2/h	1 giorno	:
PESO g	RAGGIO	Area	molecole/barn	spessore	density				8.5	204	
10	3	28.2743339	0.003544841	0.306965509	1.152173913						
Formula	Peso molare			reaction/bunch		protons	bunch	neutrons	Reactions	incertezza	
SiO2	60.083		EAR1	1.01E+00		4.00E+18	5.71E+05	6.22E+10	5.79E+05	2.89E+04	
			EAR2	6.27E+00		4.00E+18	5.71E+05	1.30E+12	3.58E+06	1.79E+05	
Si	28.085		NEAR	1.16E+04		6.00E+17	8.57E+04	3.32E+12	9.97E+08	4.99E+07	
O	15.999								2.49E+08		
Sigma (b)	0.003										
	Alberto M	MISURATO	BIF	BIF fission	Michi BIF						
flux EAR1 (n/bunch)	1.09E+05	1.36E+05	7.00E-01		7.00E-01						
flux EAR2	2.27E+06	2.00E+06	2.60E-01		2.00E-01						
flux NEAR (n/cm^2/pp)	3.87E+07		3.56E+07		3.56E+07						
Contenuto MAX	1.00E+06 Be								5.79E+03	76.0604	
	4.00E+06 Al										
					BIF						
						r=1 cm	r=1.5cm				
				PPAC	EAR1 capture	0.83	0.97	measured			
				TC rescaled	EAR1 NEL	0.51	0.78	simulated			
				PPAC	EAR2 capture	0.34	0.61	measured			
				TC rescaled	EAR2 top pipe	0.13	0.26	simulated			



Conclusion

Soon the gold activity measurement will be ready.

All the irradiated samples are stored, ready to be shipped to CIRCE for AMS.

Theoretical framework to calculate production rate and integrated cross section is under development and almost ready.

Irradiation continues!

