



n_TOF Technical Report at the 71st INTC Meeting

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08/11/2022

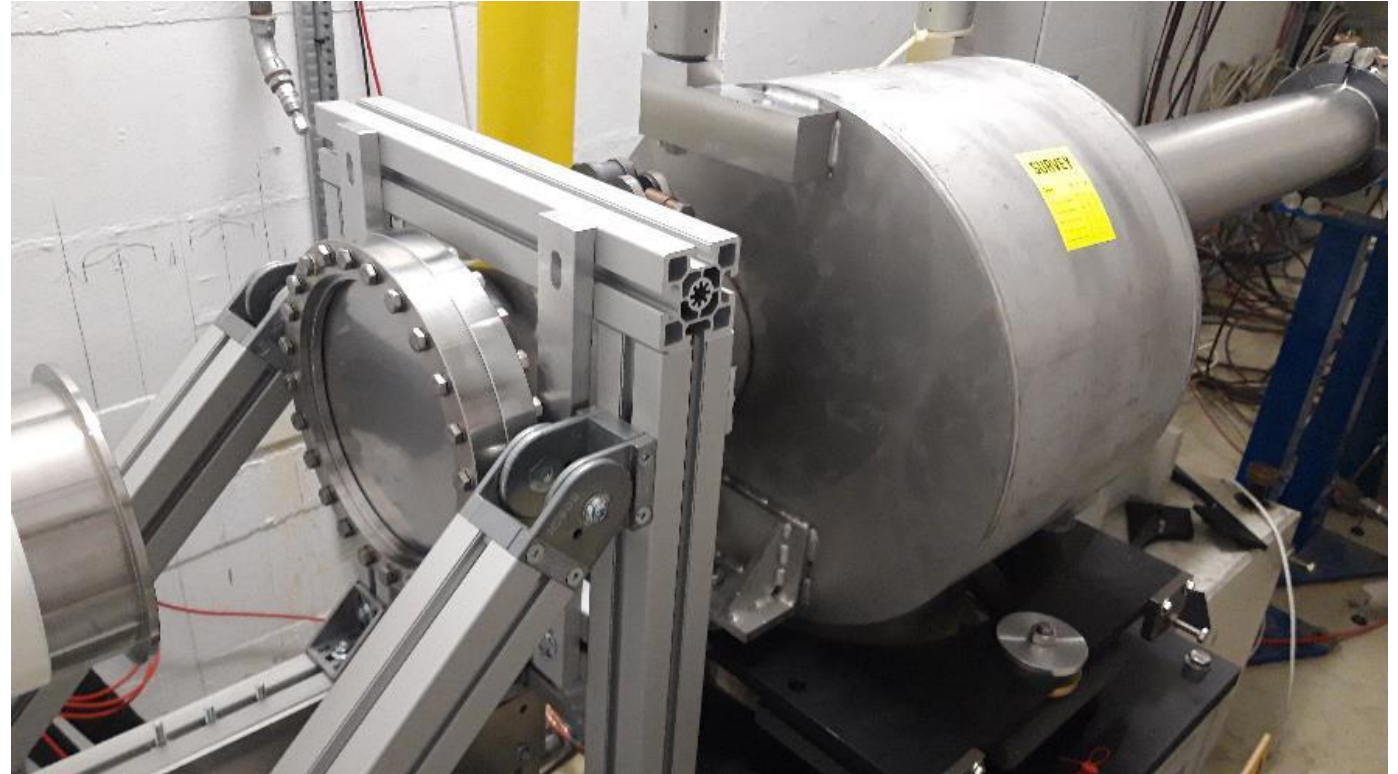
Agenda

1. FTN line

2. Target in operation

3. NEAR

FTN line now 2022



Increased diameter DN160 to DN 200: Operation fully under control

FTN line

Beam size of
17x15 mm²

Beam size back
to 17x6 mm²

Beam size of 30x13 mm² and
removal of QFO.465 and
QDE.480

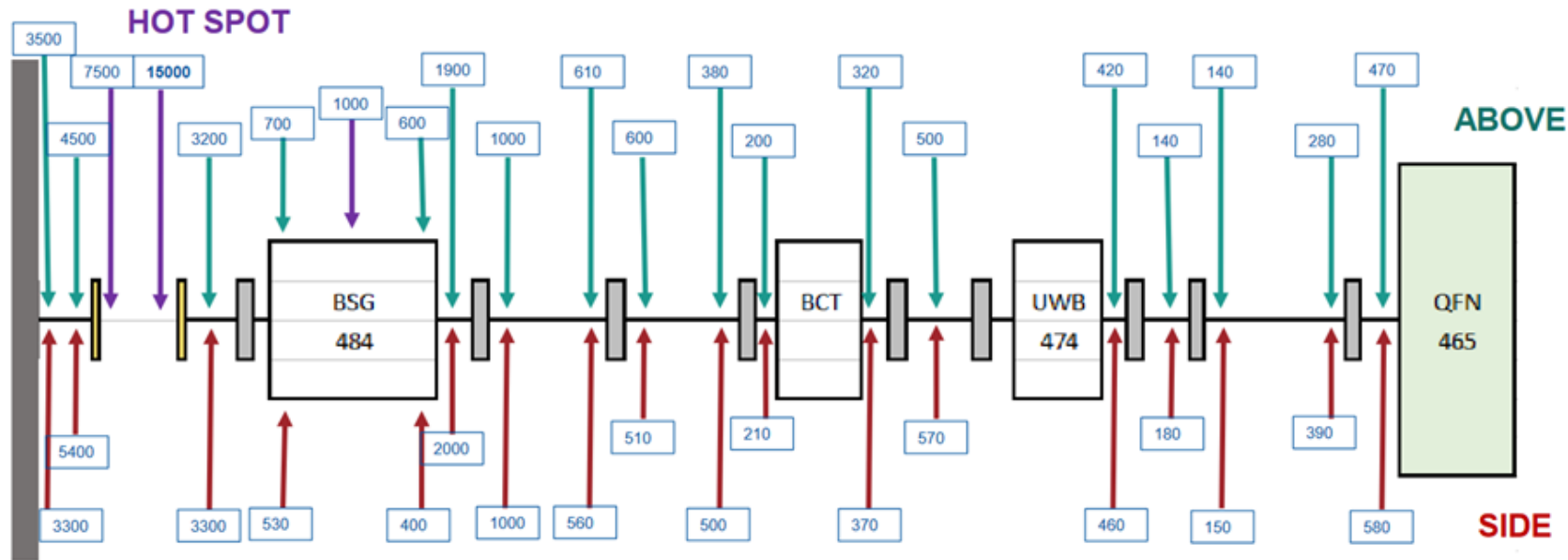
courtesy F. Pozzi

ID	Reference	Position	Dose rate [μ Sv/h]	Dose rate [μ Sv/h]	Dose rate [μ Sv/h]	Dose rate [μ Sv/h]	Dose rate [μ Sv/h]	Dose rate [μ Sv/h]	Dose rate [μ Sv/h]
			Date: 22-07-21	Date: 28-07-21	Date: 26-08-21	Date: 15-09-21	Date: 28-09-21 (8:15)	Date: 16-11-21 (14:50)	Date: 17-05-22 (13:15)
			Cool down time: 15 h	Cool down time: 2 h	Cool down time: 3 h	Cool down time: 30 h	Cool down time: 30 h	Cool down time: 30 h	Cool down time: 30 h
1	-	Start of FTN	0.2	-	-	3	2.5	1	0.8
2	QFO.435	UPSTREAM	0.7	1.7	10	4	2.5	2	1.7
3	QFO.435	DOWNSTREAM	1	1.7	12	4	3.5	2	3
4	DHZ.436	DOWNSTREAM	1.3	1.4	11	3.5	1.7	2	1.3
5	QDE.450	UPSTREAM	9	8	81	33	18	12	12
6	QDE.450	DOWNSTREAM	12	7.5	88	38	18.5	13	15
7	DVT.451	DOWNSTREAM	11	4.5	52	13	3.6	4	10
8	-	Between DVT.451 and FTN.BTV454	20	-	-	-	30 (below)	-	-
9	-	Between DVT.451 and FTN.BTV454	30	-	-	-	-	-	-
10	FTN.BTV454	UPSTREAM	60	40	135	97	32	20	15
11	FTN.BTV454	DOWNSTREAM	90	22	180	193	42	25	14
12	BHZ 456	MIDDLE	130	36	-	360	76	45	20
13	BHZ 456	DOWNSTREAM	52	10	120	116	35	25	17
14	BHZ 459	DOWNSTREAM	23	9	127	74	28.5	19	36
15	BHZ 462	DOWNSTREAM	17	12	126	70	26	20	60
16	QFO.465	DOWNSTREAM	15	17	115	50	25	21	-
17	UWB.474	UPSTREAM	-	-	-	-	-	-	67
18	UWB.474	DOWNSTREAM	17	20	120	62	25.7	32	64
19	QDE.480	UPSTREAM	30	32	180	83	53.5	56	-
20	QDE.480	DOWNSTREAM	50	60	237	126	82	93	-
21	BSG.484	UPSTREAM	-	-	-	-	-	-	154
22	BSG.484	DOWNSTREAM	46	65	292	127	100	99	150
23	-	Vacuum chamber in the wall	-	-	-	-	-	-	124

FTN line – RP survey during TS2

Radiation Survey data

- BE-OP asked for dedicated measurements at contact of the beam line to find location of beam losses
- Contact measurement with AD-6 ($\mu\text{Sv/h}$) 14/09/2022 9h30 (47h cool down time)



Hot spot a sum of several contributors

- Beam windows (independent of aperture)
- SEM wires
- Target
- Losses on beam pipes and tanks

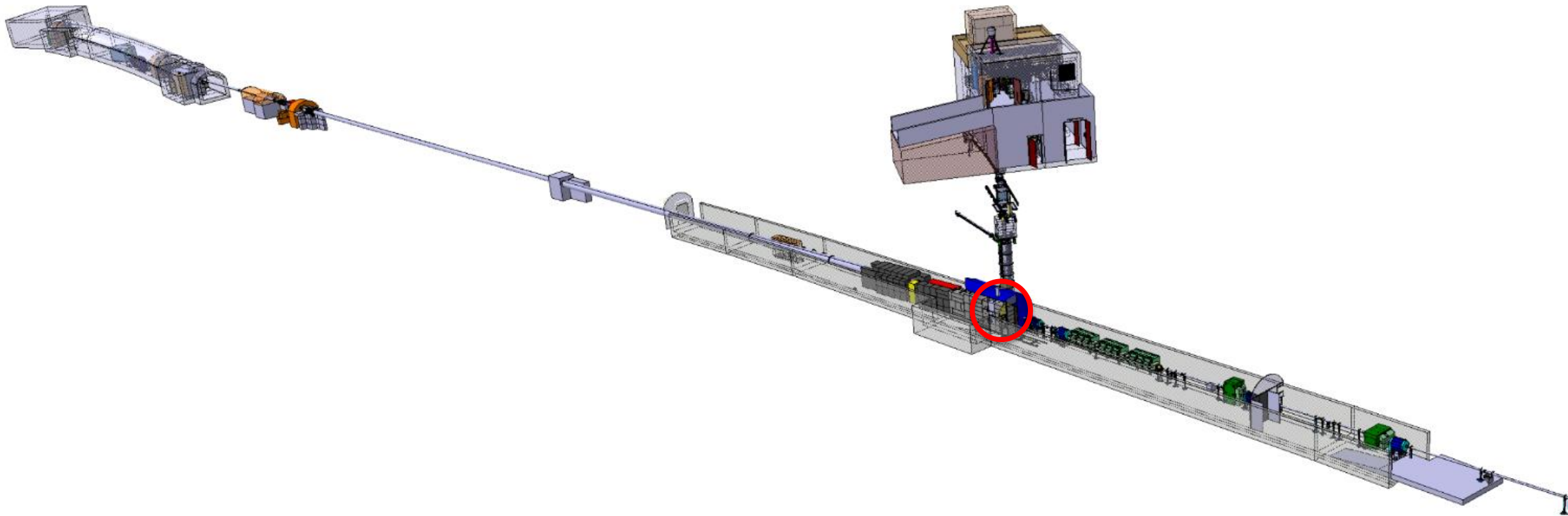
Possible dose reduction deemed small compared to effort needed – This configuration is now base line until LS3.

Maintenance and spare situation for Ti-beam window and SEM grid to be revised



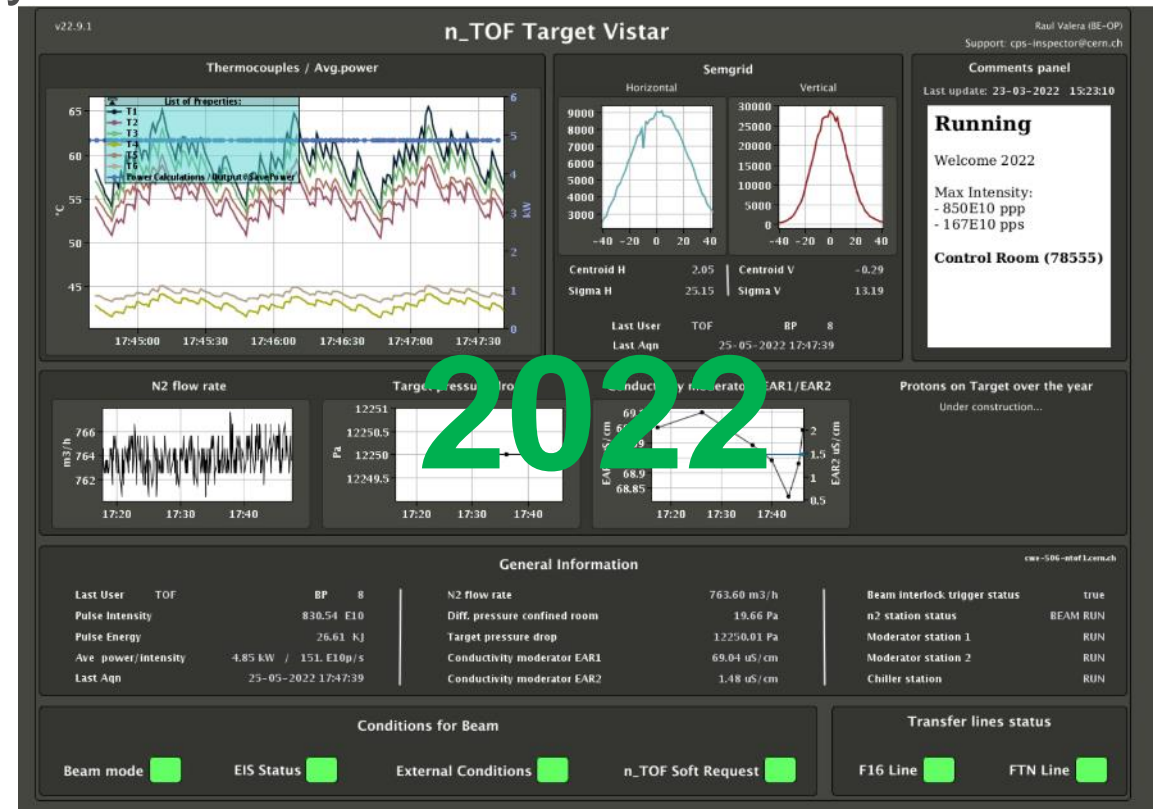
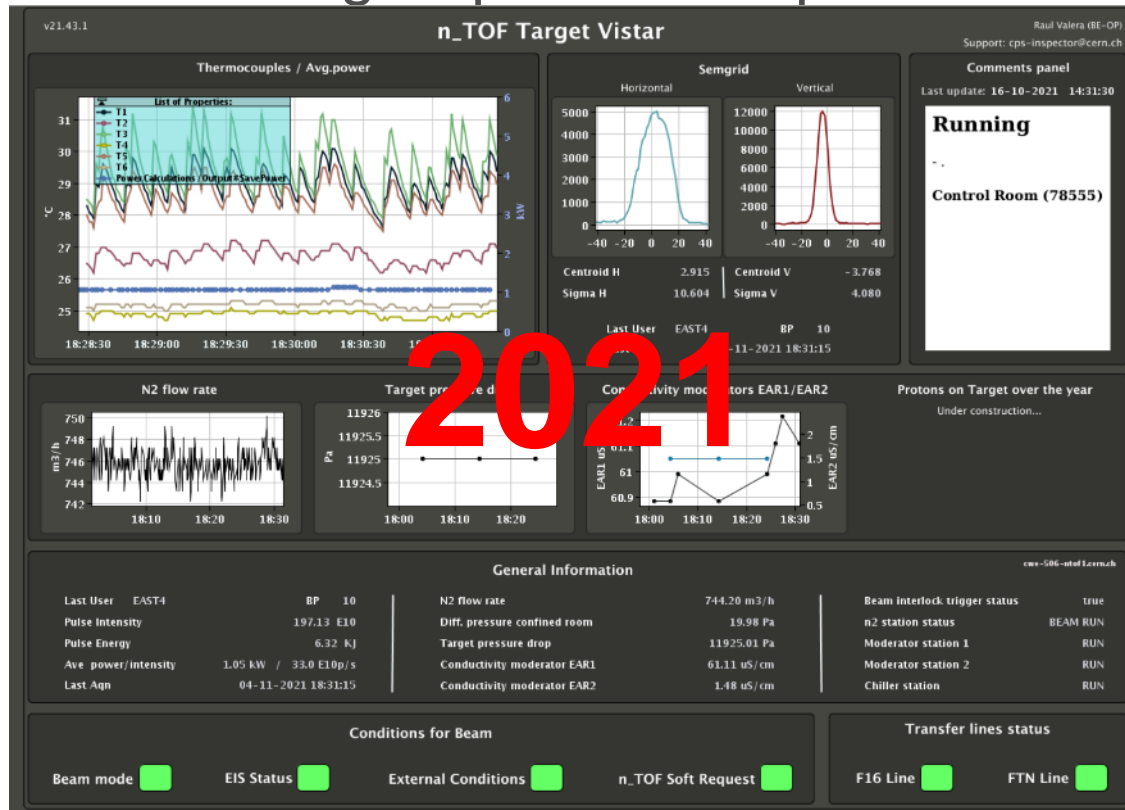
https://indico.cern.ch/event/1209843/attachments/2534812/4362242/20221018_Minutes_6th_FTN_Meeting.pdf

n_TOF target



n_TOF spallation target #3

- First beam on target received on 19th July 2021
- Work on optics and proton line modifications, defined setting during 2022.
- MD during September to push intensity limits

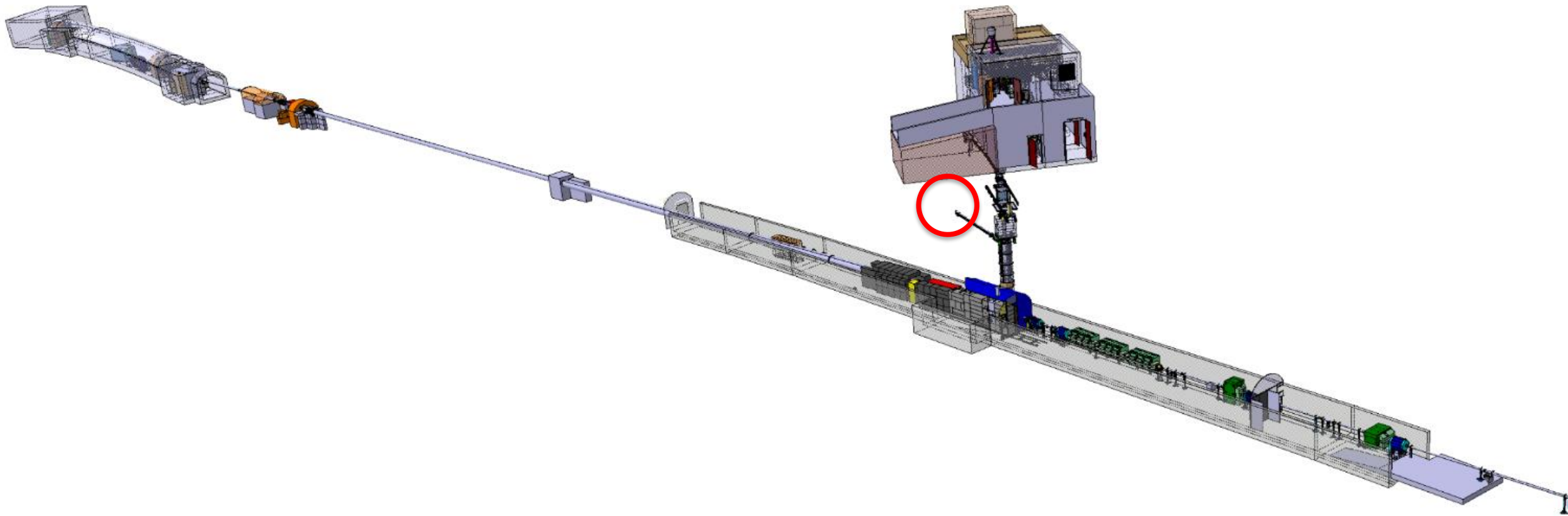


n_TOF spallation target #3

MD on Wednesday 28.September: Increase of average intensity for the n_TOF beam

- 8h07: 200e10 p/s
<https://logbook.cern.ch/elogbook-server/GET/showEventInLogbook/3624599>
- 9h38: 220e10 p/s
<https://logbook.cern.ch/elogbook-server/GET/showEventInLogbook/3624641>
Around 12h increase N₂ flux of the target cooling loop.
- 15h30: back to 160e10 p/s
<https://logbook.cern.ch/elogbook-server/GET/showEventInLogbook/3624872>
- From operation no issue for these changes in intensity. The limitation is the availability of PS cycles

n_TOF water cooling station



Target #3 cooling and moderator station

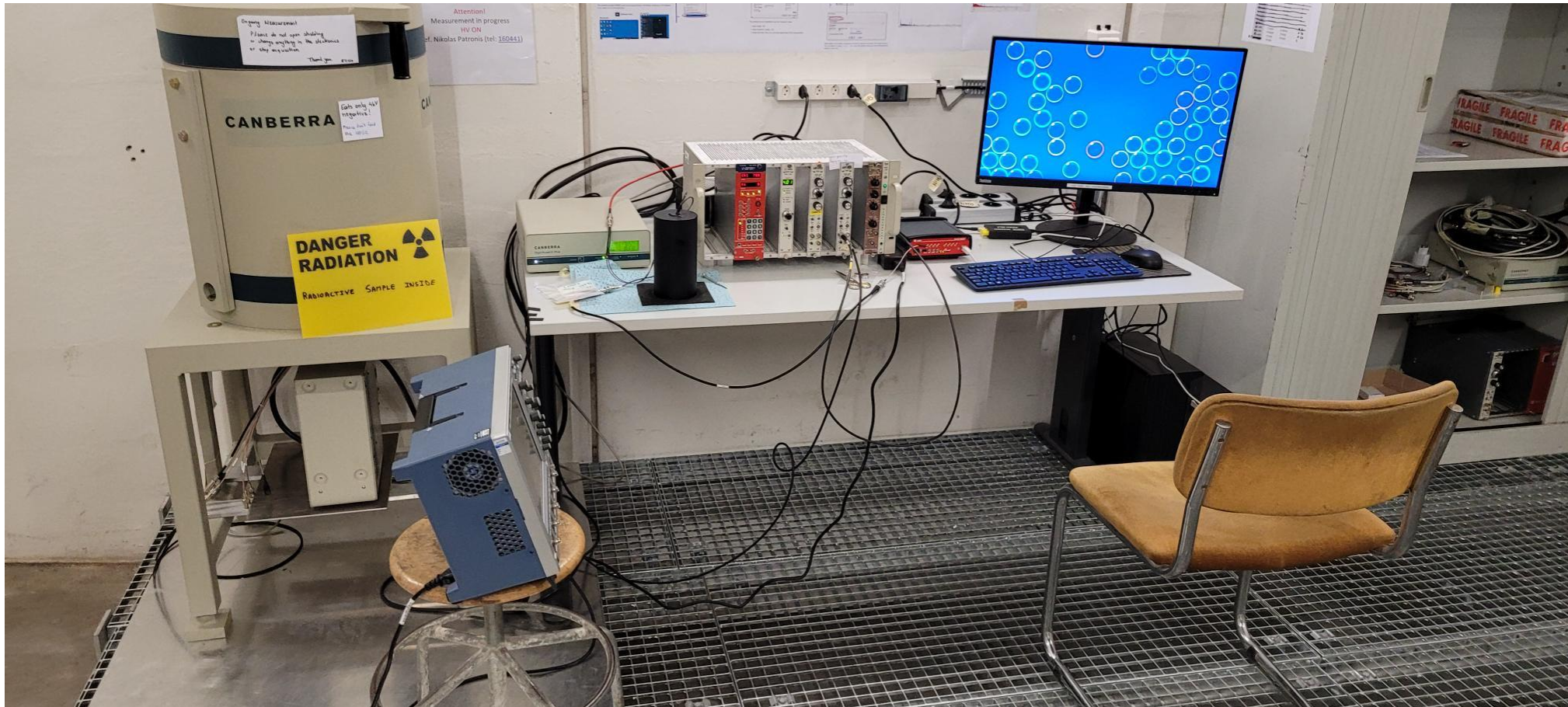
- Target nitrogen cooling required the full replacement of the target cooling and moderator circuits
- Major efforts from CV to develop the technology to match the specifications and RP requests ([EDMS 2068336](#))
- Comments from the visit of the French and Suisse authorities (global confinement)
- Running with nominal operation settings for cooling (e.g. 780 (Nm³/h) for nitrogen cooling) and both moderator loops, efficiency as specified. Leak rate well below the design values!



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n_TOF Experiment activities

- New Ge-detector in B804 (next to entry door of EAR1)

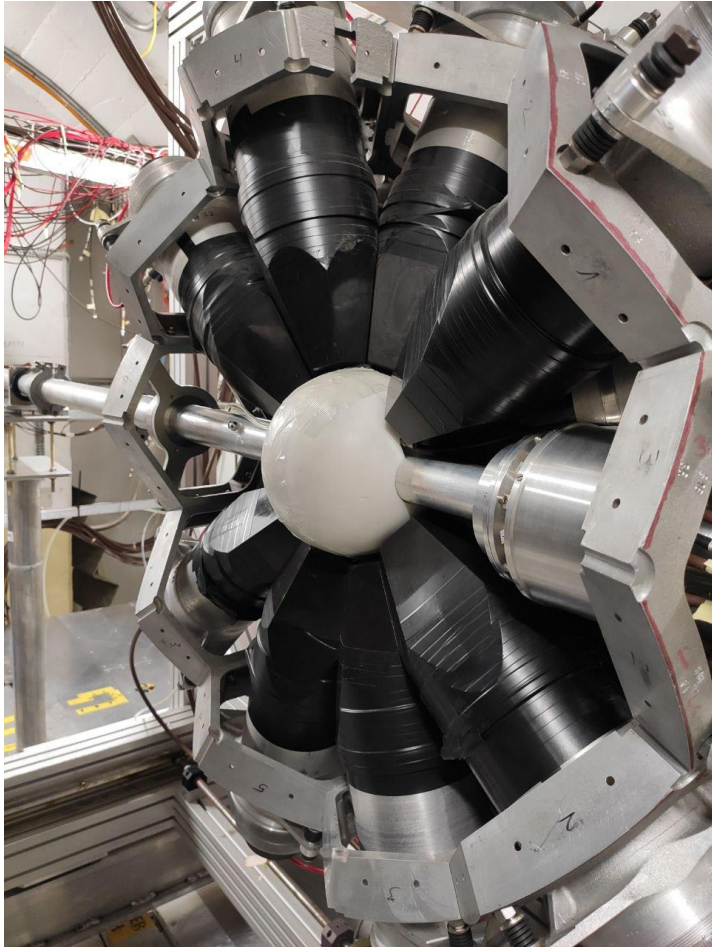


n_TOF Ventilation – EAR1

- Renovation of ventilation for the type A area 1.
- Controls to be updated to the CV standard.
- More flexibility to handle operational situation for access, beam and flush mode.
- Remote access to intervene on faults and error messages

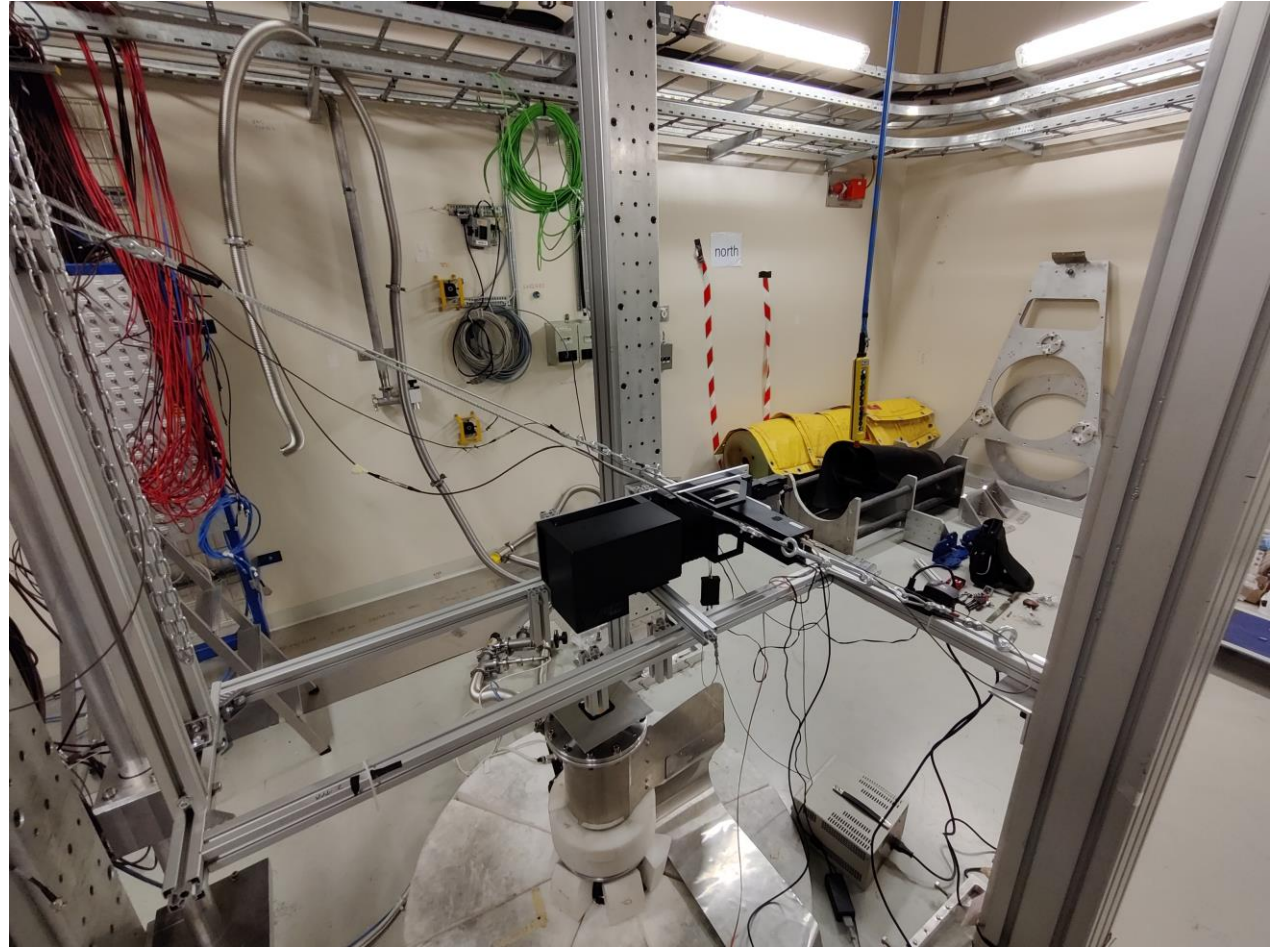
Intervention scheduled for December, the ventilation system will be disabled during several periods. Combined with the annual maintenance work and filter exchange.

EAR 1: Pu-239 capture setup



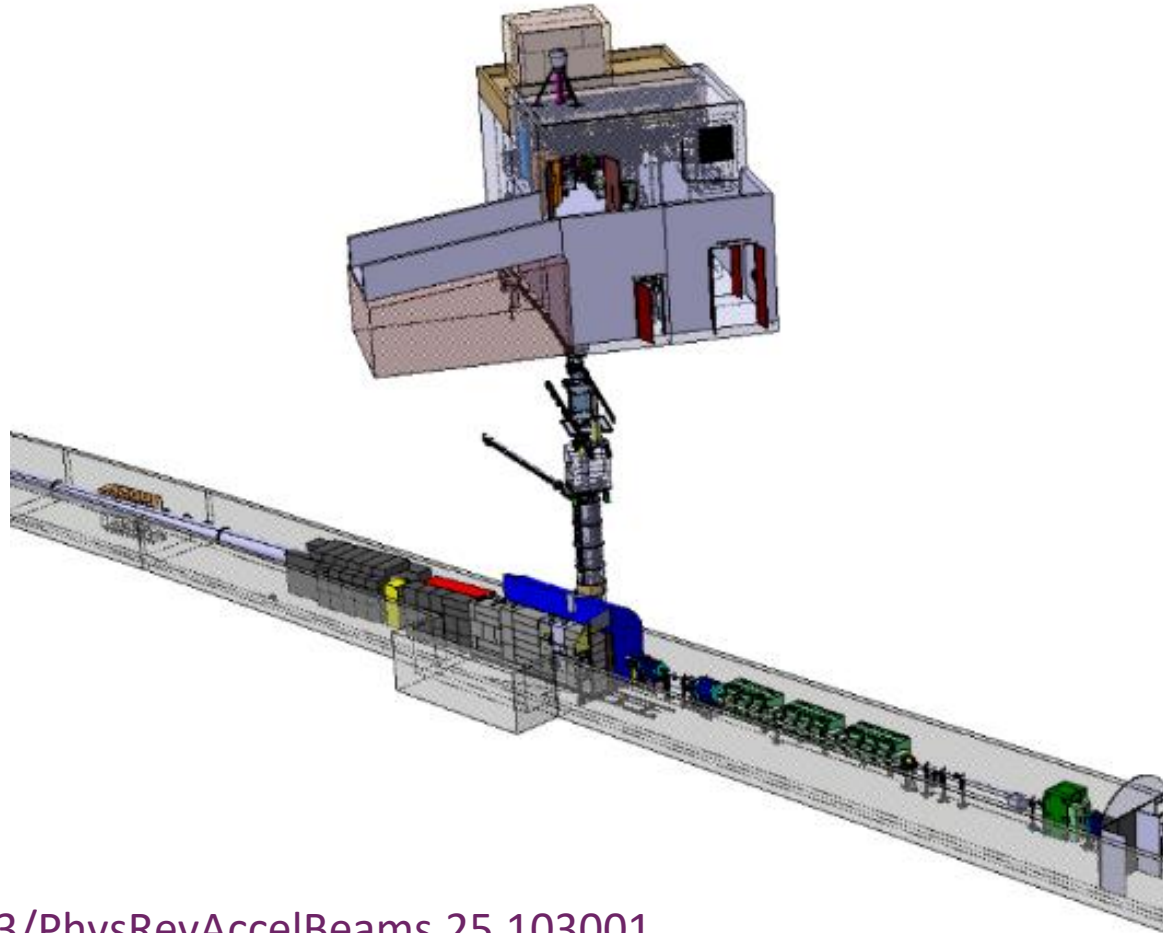
Two measurements running at the moment...

EAR 2: Neutron imaging



many more in Nikolas' talk

n_TOF target shielding - NEAR



recently published paper

<https://journals.aps.org/prab/abstract/10.1103/PhysRevAccelBeams.25.103001>

2022 – NEAR n-TOF activities - parasitic

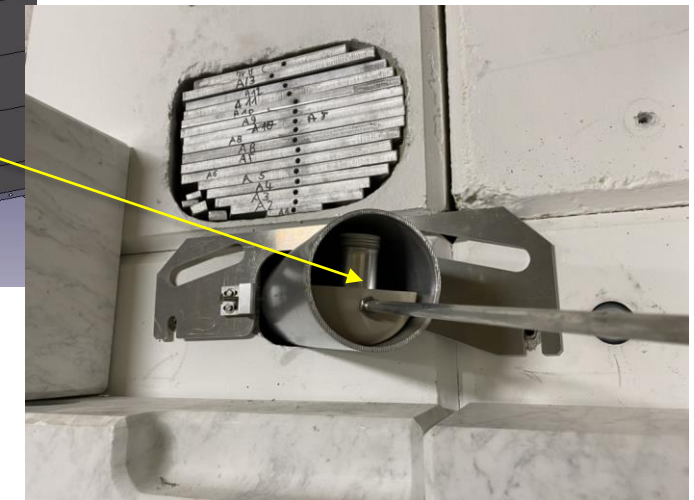
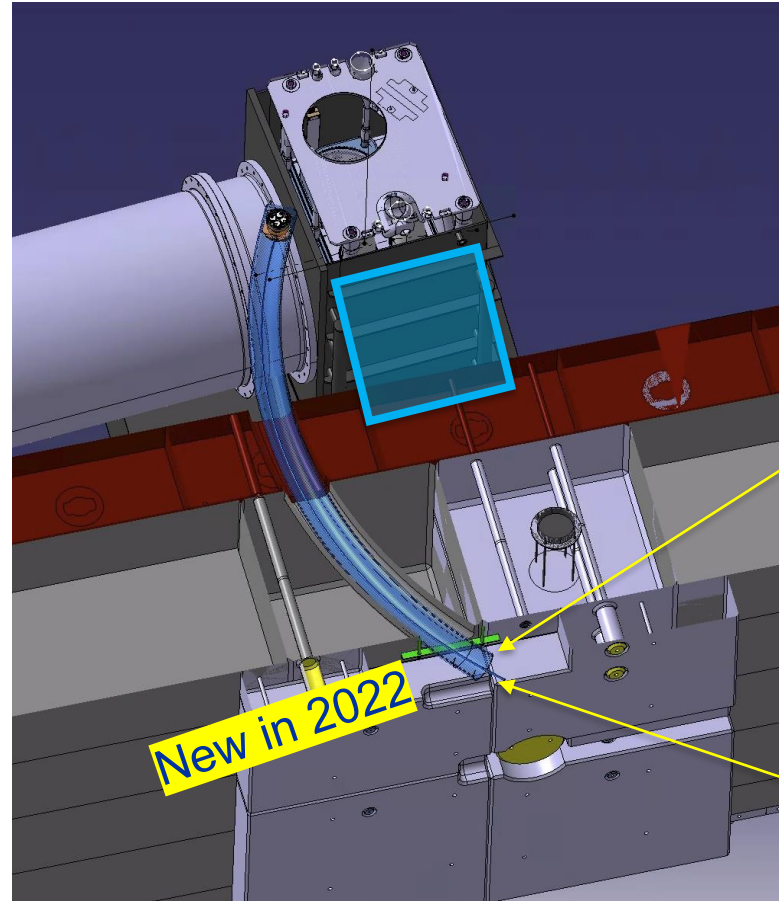
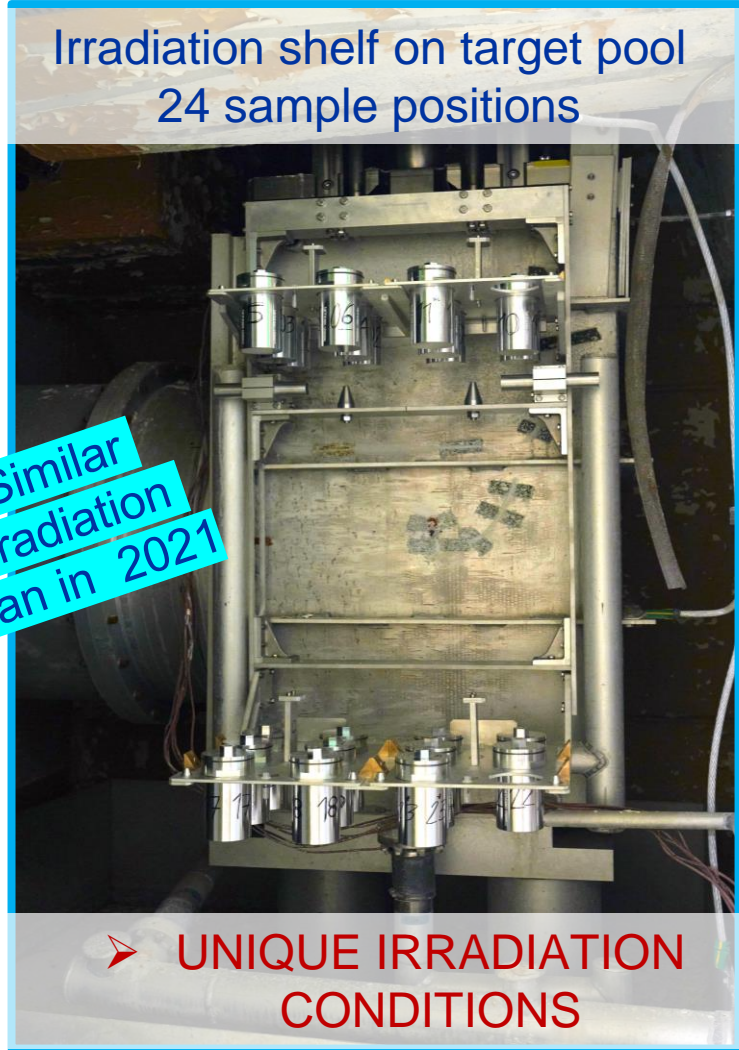
New organisation – Access every two weeks
Very successful

INTC-I-241 Measurement of the radiation background at the n_TOF NEAR facility to study the feasibility of cyclic activation experiments



INTC-P-623 Neutron capture cross section measurements by the activation method at the n_TOF NEAR Station (19 access in 2022)

2022 - R2M activities

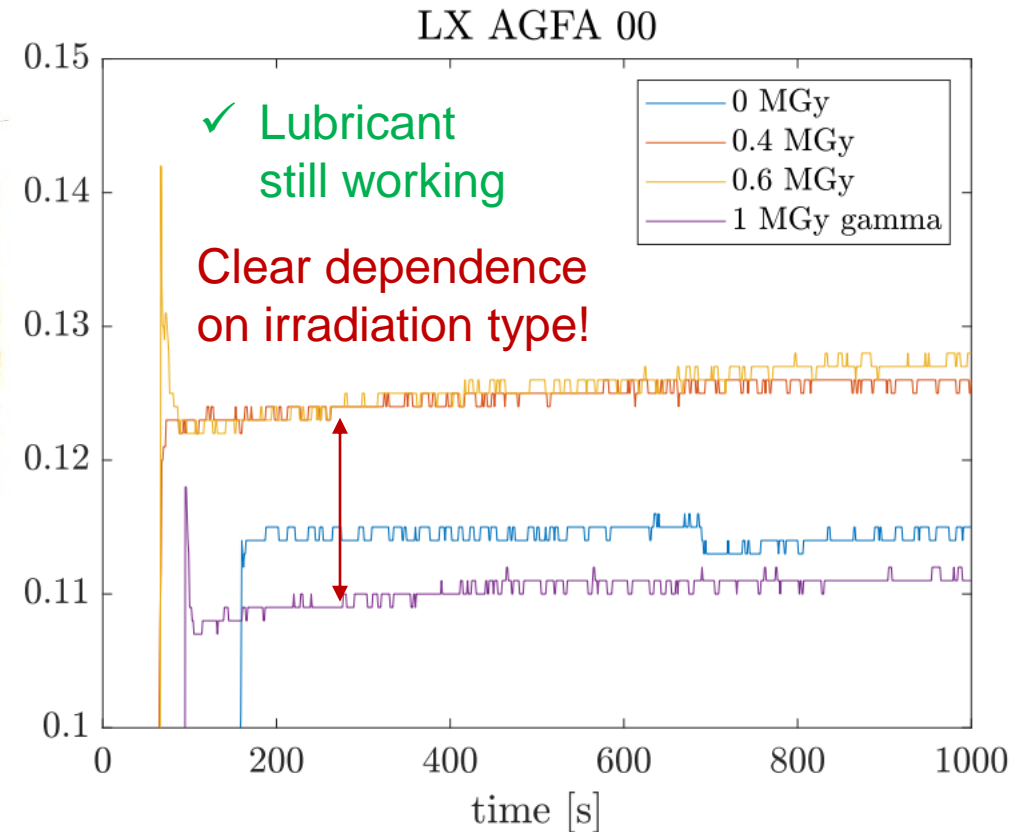
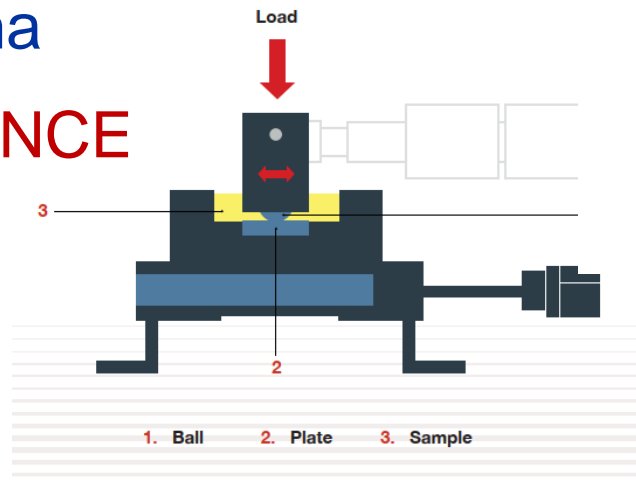


2022 - R2M activities

- 11 commercial lubricants
- 0.4 - 2.5 MGy by end 2022
- Neutron component 67 - 81% in organic materials
- Wide range of analyses ongoing (structural, chemical, tribological...), differences with gamma

➤ PROOF OF RELEVANCE

Testing of friction coefficient on lubricants using HFRR
PCS, HFRR brochure

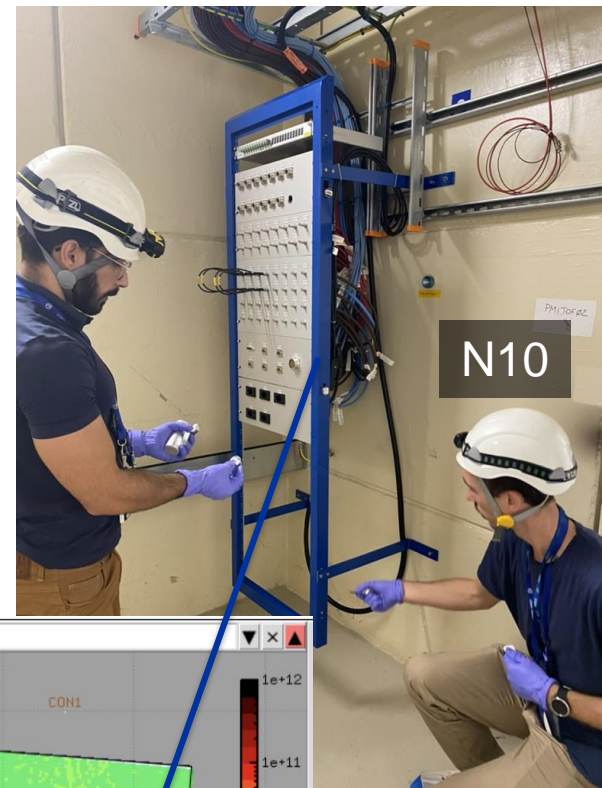
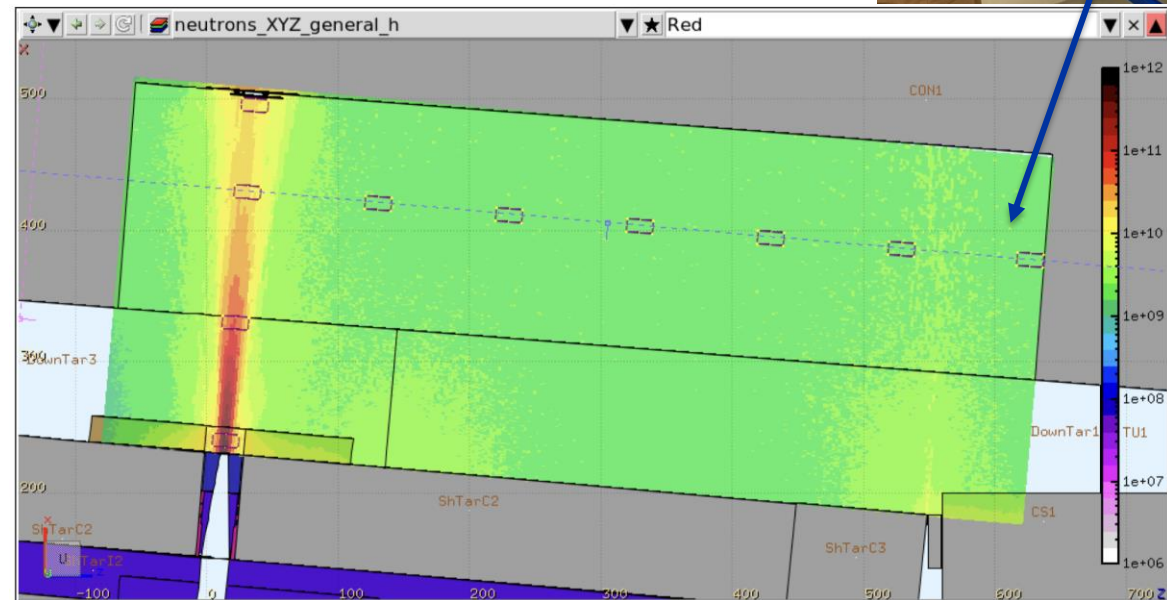
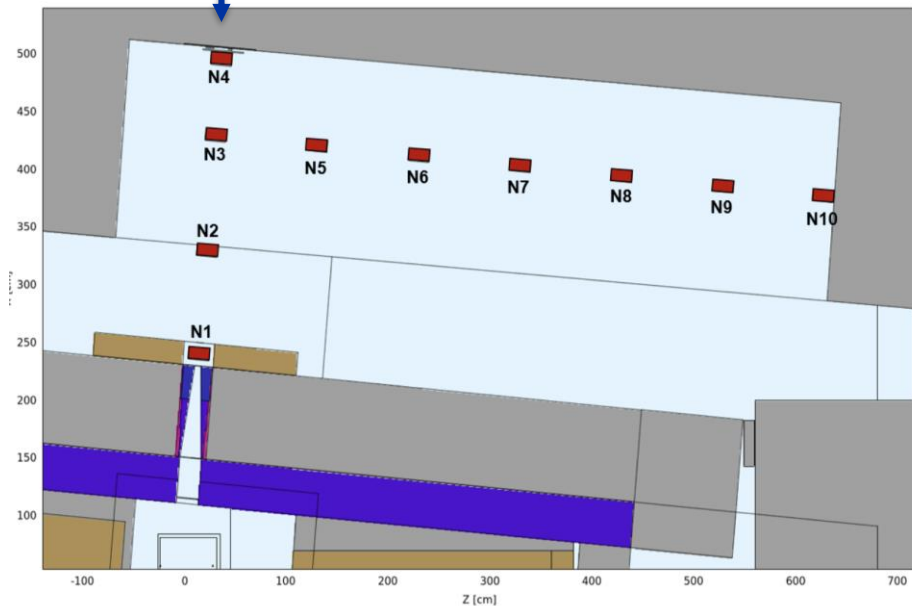
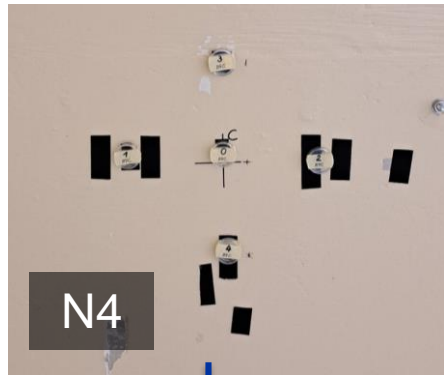


HRFF test results for fresh and irradiated grease Lubrilog LX AGFA 2
25°C, 10Hz, 0.25mm stroke, 1kg load

2022 - R2E activities

FLUKA study on the typical radiation quantities used for R2E irradiation campaigns - [EDMS 2769573](#) by Matteo Cecchetto

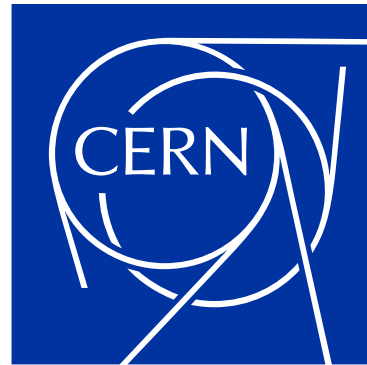
High-Level Dosimeters* installed at NEAR to confirm NEAR FLUKA simulations



*results will be available during next YETS - [EDMS 2698775](#)

Conclusions

- Target performance without limitations, FTN beam line modifications successful
- Excellent performances and availability of the facility during 2022!
- Implementation of the ASN-OFSP safety recommendations ongoing
- New safety file includes modifications implemented during LS2
[EMDS 2604713 - n_TOF Target Facility Safety Overview](#)
- New safety file for EAR 1 in work
- New Ge detector installed, NEAR activities settled
- Consolidation of the alignment system – ongoing



Thank you!

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