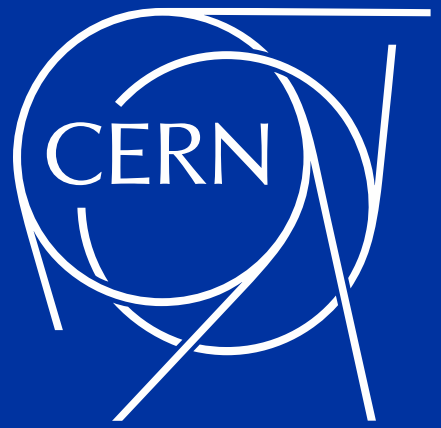


n_TOF Technical Report at the 69th INTC Meeting

Oliver Aberle, SY-STI-TCD

09/02/2022

Outlook

Main activities during YETS 2021/22:

- Modifications in the FTN line
- Update on NEAR
- Visit ASN/OFSP

FTN line

- RP discovered a hot(s) spot end of August
- Location identified and confirmed in the center of the first dipole
- Beam size measured with the new SEM at the end of the line
- Discrepancy with post-LS2 beam size and applied settings

- Dedicated meeting series launched in September (https://indico.cern.ch/event/1080293)

Improvement proposal

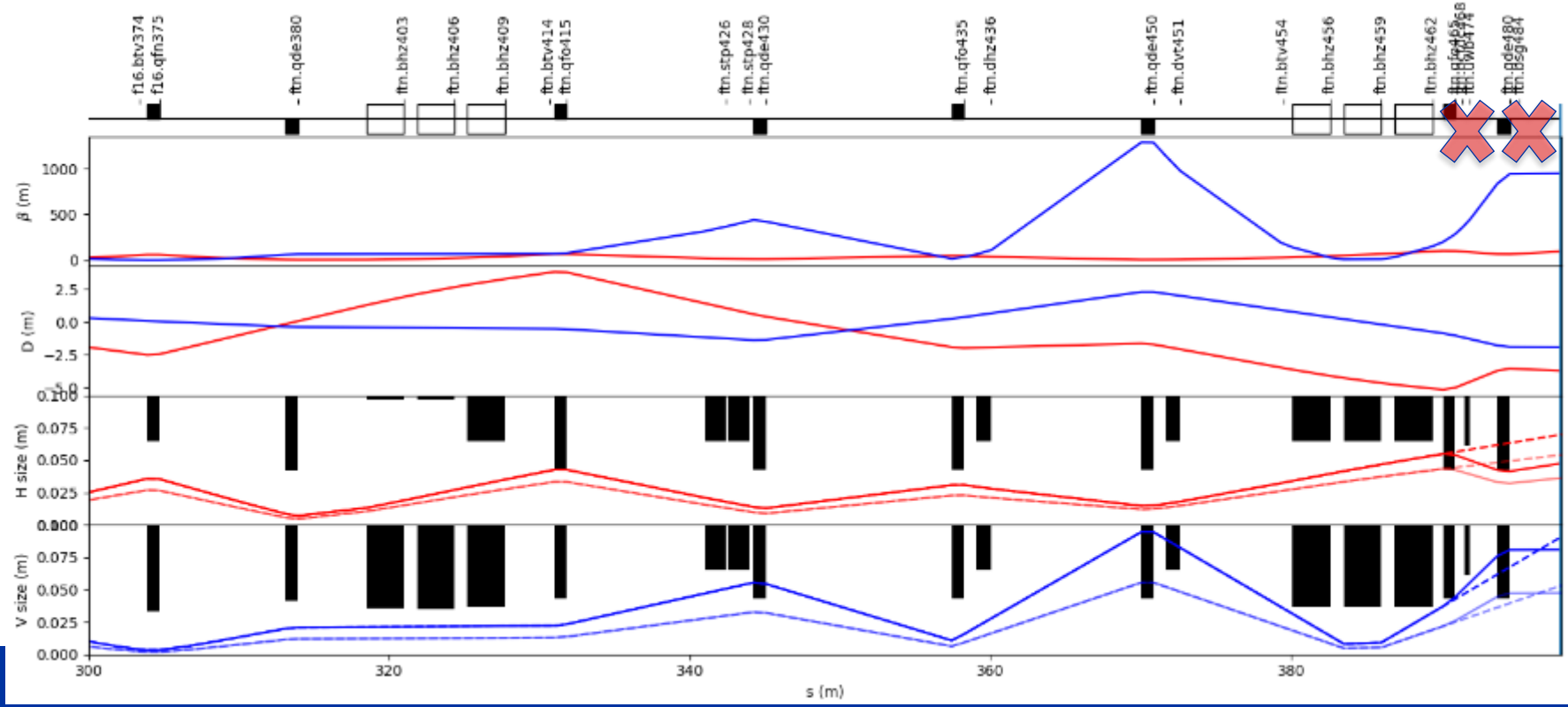
presented by Matthew Alexander Fraser and Yann Dutheil

Removal of quadrupoles 465 & 480

Removal or displacement upstream of the other aperture limitations such at BCT

New vacuum chambers needed

Replacement of the last 3 dipoles for larger aperture ones as they will be the next aperture limit



Conclusion

Optics of FTN and evolution of the beam size on target is understood

The implementation and tuning of new optics is demonstrated

Efficiency of steering improved using beam loss and optimizer

Proposed actions (timeline to be discussed):

Incoherence between optics DB, magnet DB and CCD on vacuum chamber sizes for the quadrupole, used round apertures of 86mm here

Short term solution: removal of equipment downstream the last dipoles and handover steering optimizer to OP for steering on target

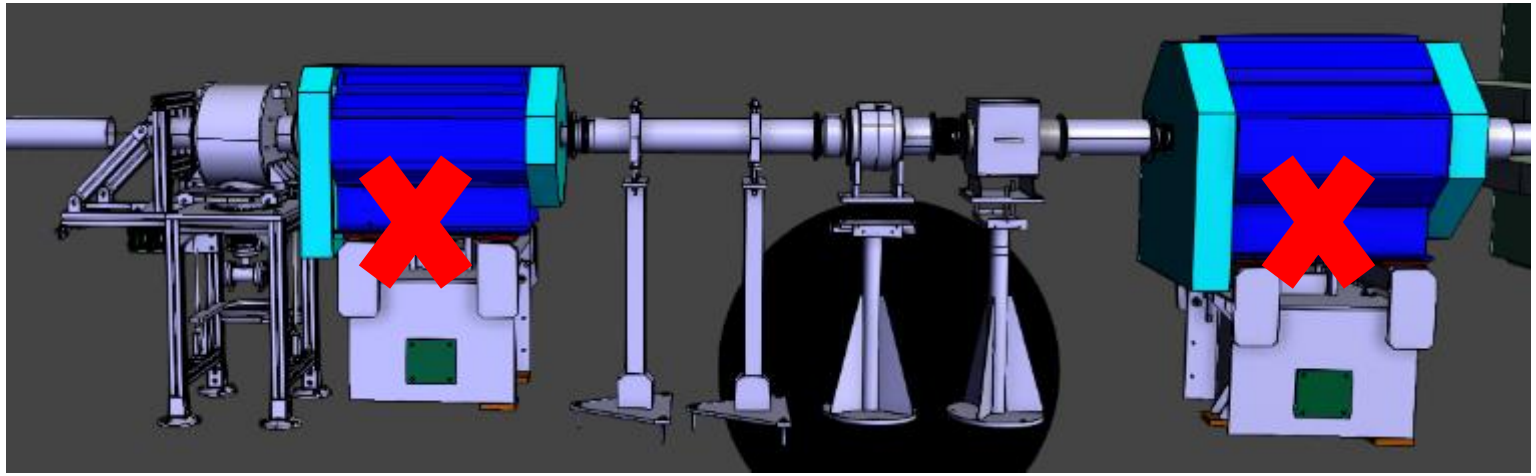
- This should give us some margin in the vertical plane to increase the V beam size

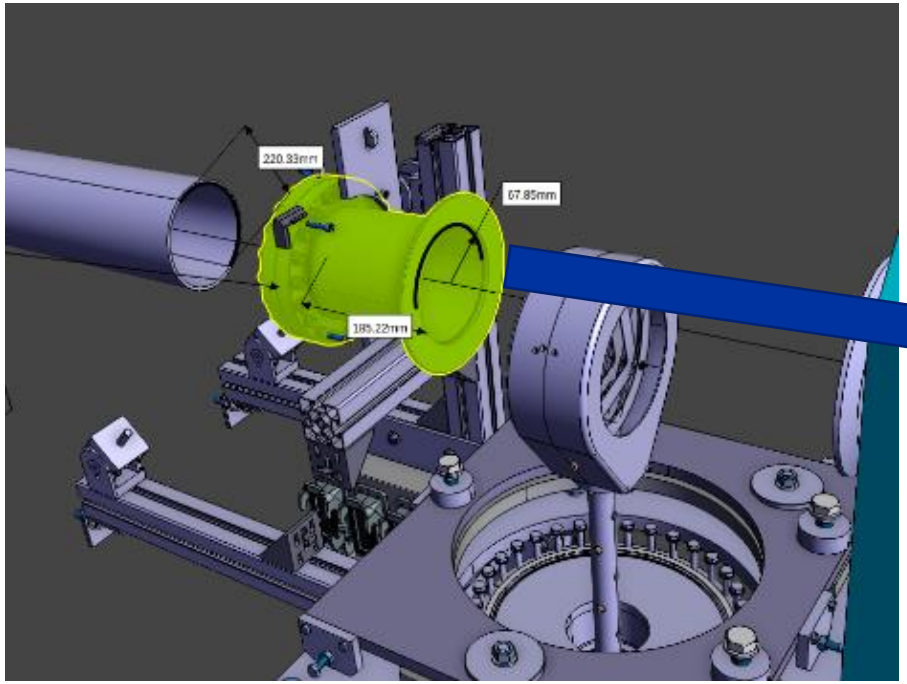
Longer term solutions: installation of instrumentation, trajectory correctors and review of transfer line design

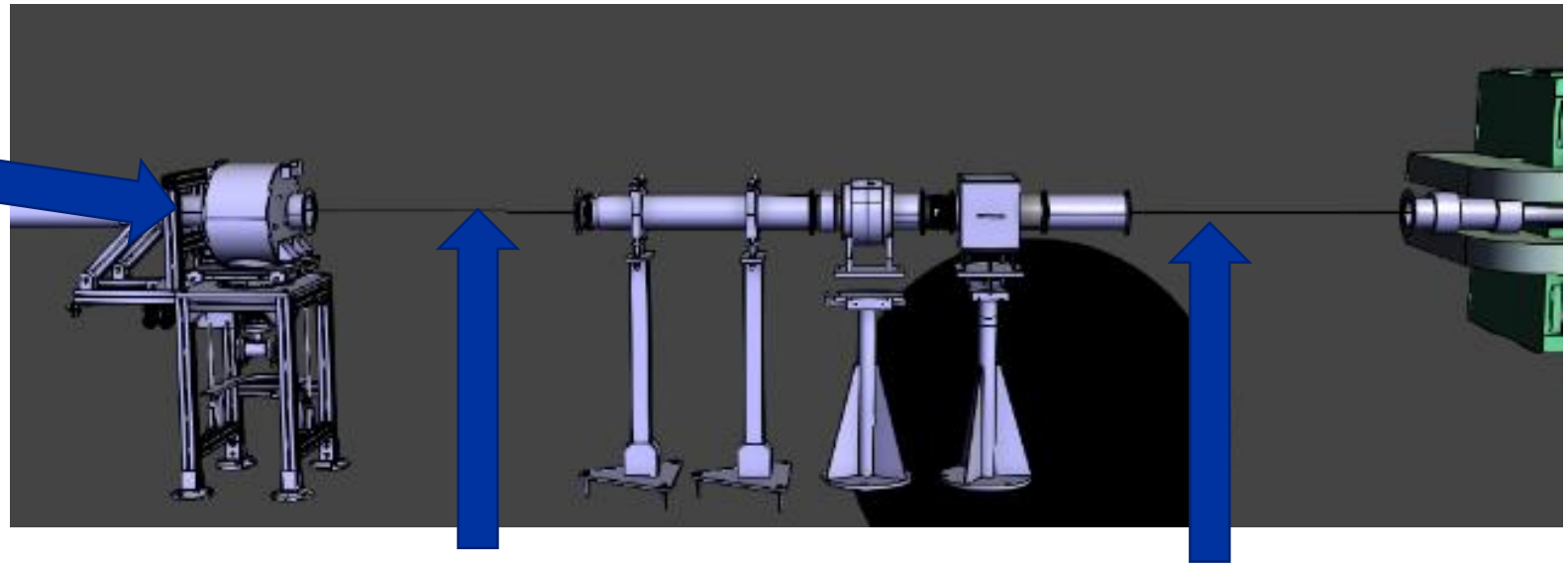
- Aim at removing dispersion at target and increase aperture to improve operational margin for beam loss with independently powered quadrupoles
- Prepare larger aperture dipoles for installation in the future to remove vertical aperture bottleneck

480

465





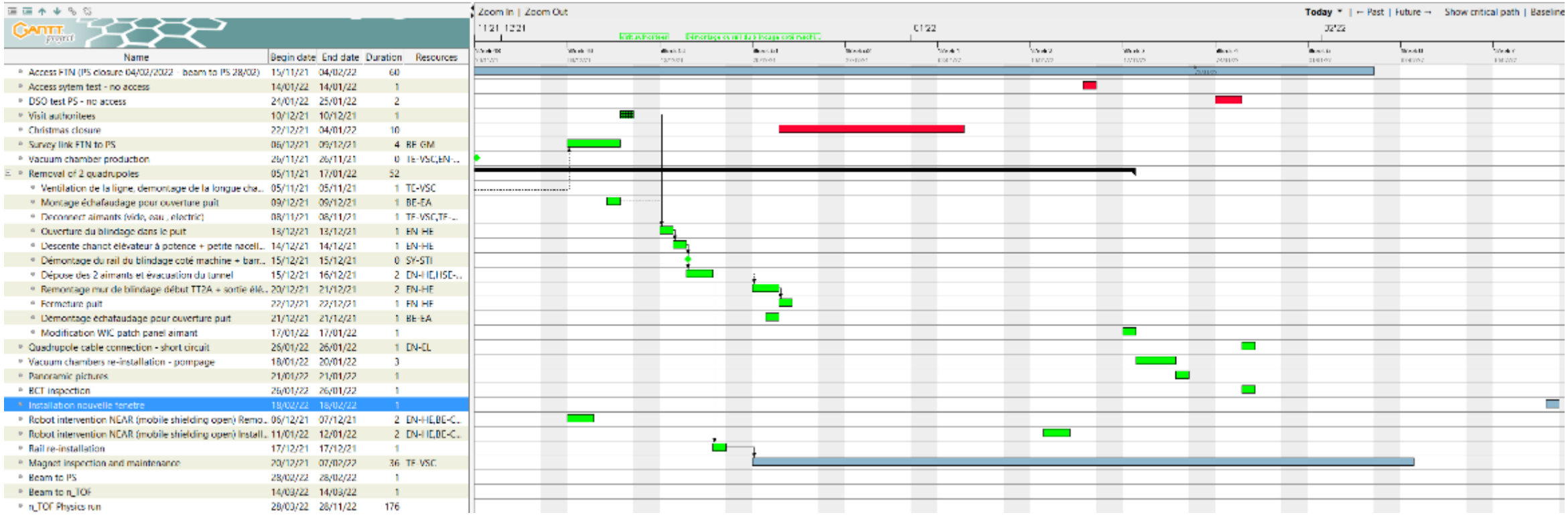


new chamber

new chamber

FTN line

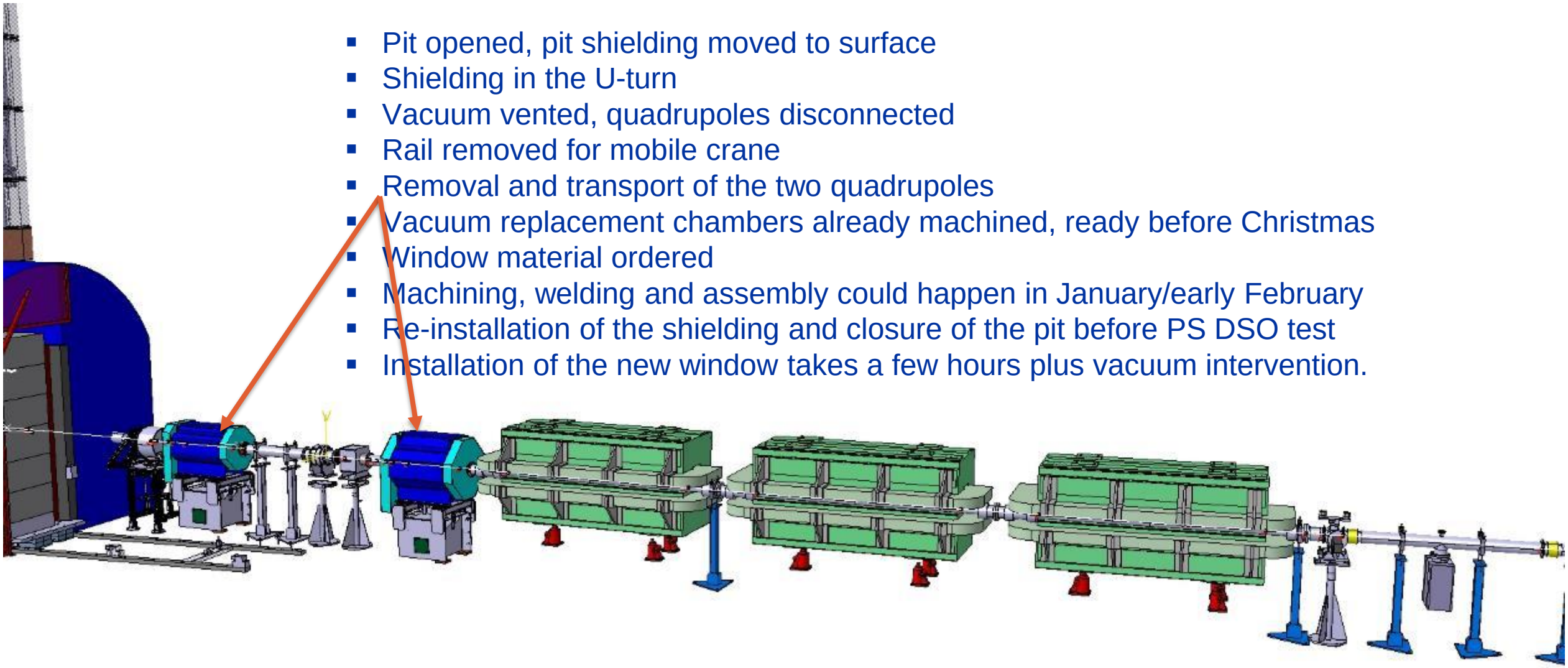
- 2 Quadrupoles removed and replaced by new vacuum chambers
- Conditions for beam recovered (shielding in place, pit closed, vacuum restored…)



Name	Begin date	End date	Duration	Resources
Access FTN (PS closure 04/02/2022 - beam to PS 28/02)	15/11/21	04/02/22	60	
Access sytem test - no access	14/01/22	14/01/22	1	
DSO test PS - no access	24/01/22	25/01/22	2	
Visit authoritees	10/12/21	10/12/21	1	
Christmas closure	22/12/21	04/01/22	10	
Survey link FTN to PS	06/12/21	09/12/21	4	BE-GM
Vacuum chamber production	26/11/21	26/11/21	0	TE-VSC,EN-...
Removal of 2 quadrupoles	05/11/21	17/01/22	52	
Ventilation de la ligne, demontage de la longue cha...	05/11/21	05/11/21	1	TE-VSC
Montage échafaudage pour ouverture puit	09/12/21	09/12/21	1	BE-EA
Deconnect aimants (vide, eau , electric)	08/11/21	08/11/21	1	TE-VSC,TE-...
Ouverture du blindage dans le puit	13/12/21	13/12/21	1	EN-HE
Descente chariot élévateur à potence + petite nacell...	14/12/21	14/12/21	1	EN-HE
Démontage du rail du blindage coté machine + barr...	15/12/21	15/12/21	0	SY-STI
Dépose des 2 aimants et évacuation du tunnel	15/12/21	16/12/21	2	EN-HE,TSE-...
Remontage mur de blindage début TT2A + sortie élé...	20/12/21	21/12/21	2	EN-HE
Fermeture puit	22/12/21	22/12/21	1	EN-HE
Démontage échafaudage pour ouverture puit	21/12/21	21/12/21	1	BE-EA
Modification WIC patch panel aimant	17/01/22	17/01/22	1	
Quadrupole cable connection - short circuit	26/01/22	26/01/22	1	EN-CL
Vacuum chambers re-installation - pompage	18/01/22	20/01/22	3	
Panoramic pictures	21/01/22	21/01/22	1	
BCT inspection	26/01/22	26/01/22	1	
Installation nouvelle fenetre	18/02/22	18/02/22	1	
Robot intervention NEAR (mobile shielding open) Remo...	06/12/21	07/12/21	2	EN-HE,BE-C...
Robot intervention NEAR (mobile shielding open) Install...	11/01/22	12/01/22	2	EN-HE,BE-C...
Rail re-installation	17/12/21	17/12/21	1	
Magnet inspection and maintenance	20/12/21	07/02/22	36	TE-VSC
Beam to PS	28/02/22	28/02/22	1	
Beam to n_TOF	14/03/22	14/03/22	1	
n_TOF Physics run	28/03/22	28/11/22	176	

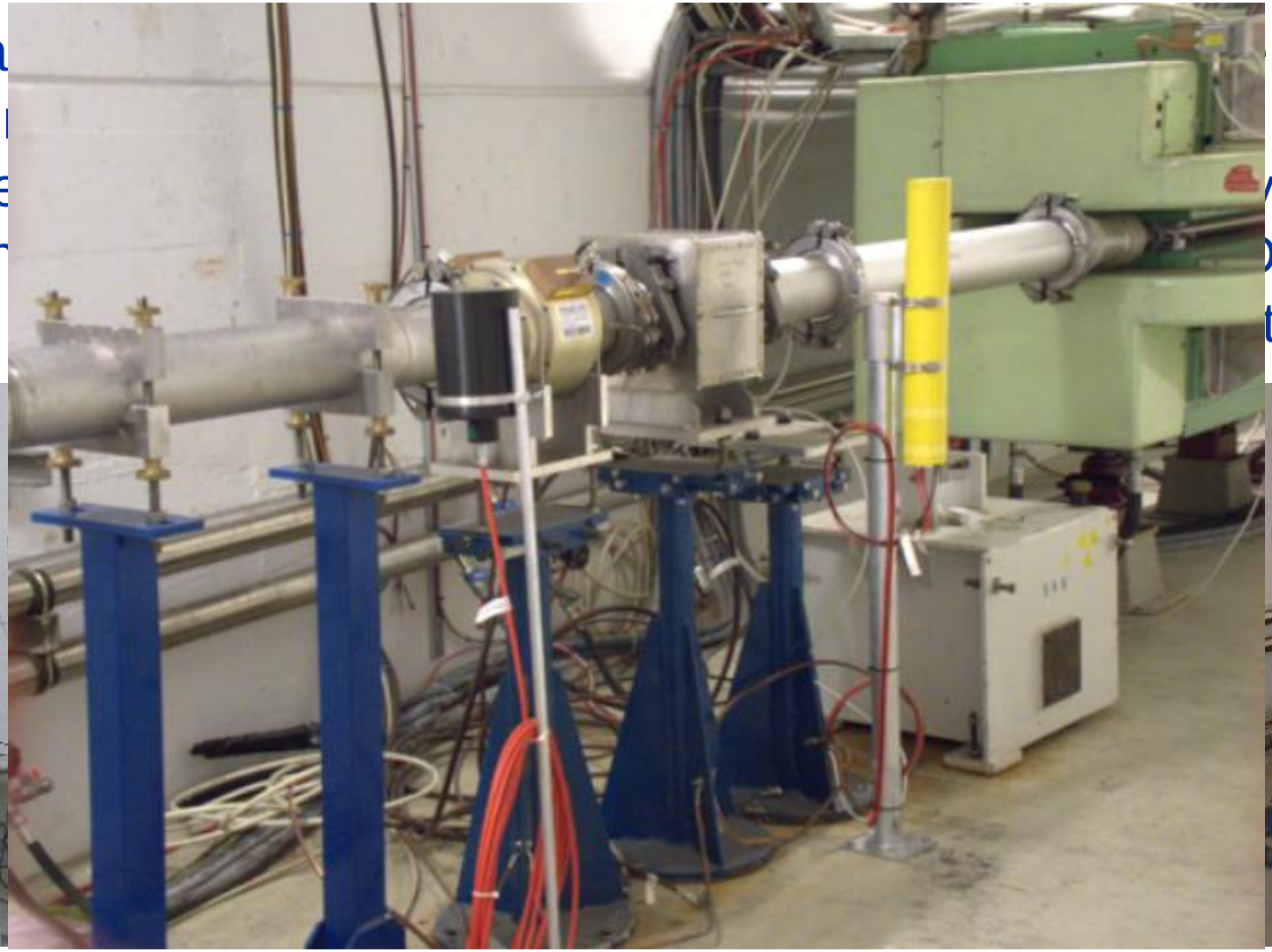
FTN line (proton line upstream of n_TOF target)

- Pit opened, pit shielding moved to surface
- Shielding in the U-turn
- Vacuum vented, quadrupoles disconnected
- Rail removed for mobile crane
- Removal and transport of the two quadrupoles
- Vacuum replacement chambers already machined, ready before Christmas
- Window material ordered
- Machining, welding and assembly could happen in January/early February
- Re-installation of the shielding and closure of the pit before PS DSO test
- Installation of the new window takes a few hours plus vacuum intervention.



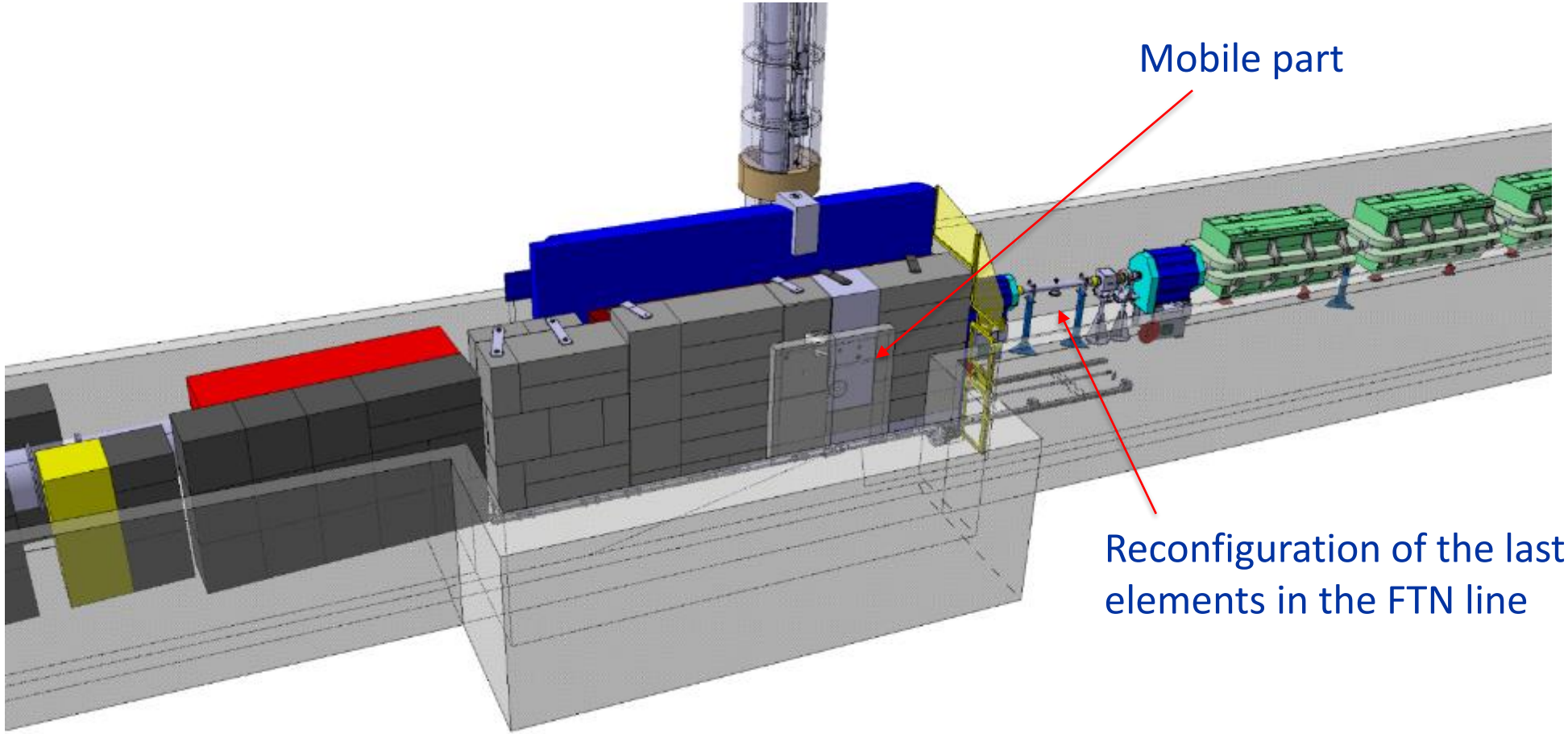
FTN line (proton line upstream of n_TOF target)

- Vacuum repla … Christmas
- Window mate…
- Machining, we… February
- Re-installation … SO test
- Installation of … tervention.



n_TOF target shielding and NEAR

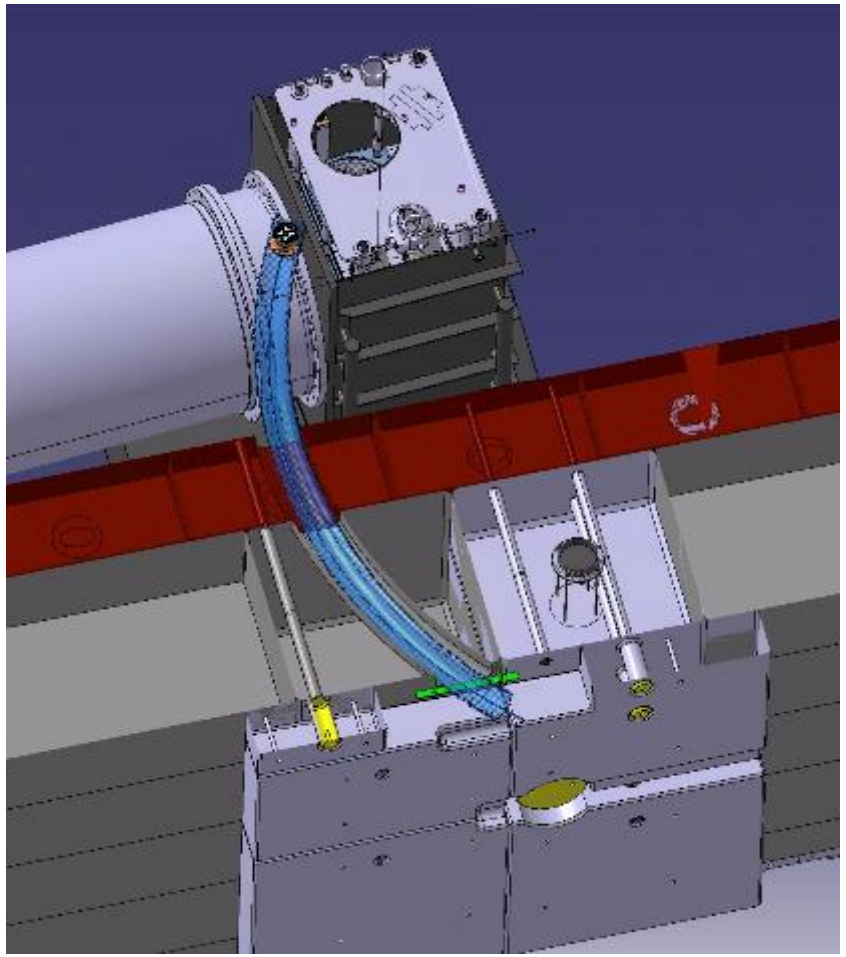
Third Generation n_TOF Spallation Target and Vertical Neutron Beam Line
EDMS TOF-TAR-EC-0001

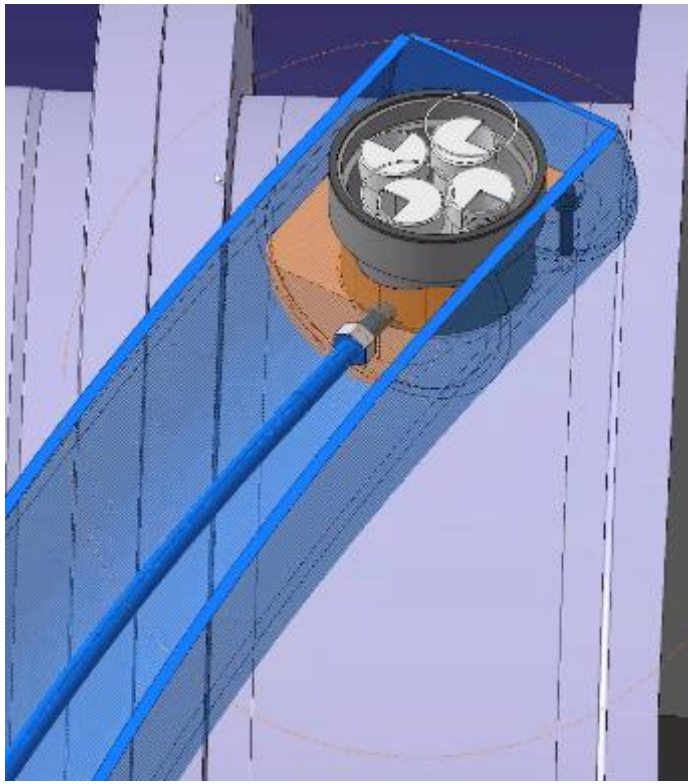


n_TOF NEAR

No change on support – waiting for Letter Of Intent (LOI) feed-back

Rabbit 2 pipe installed





Access to samples possible during operation (short access)

R2M samples ready for 2022 irradiation

"Design development and implementation of a neutron irradiation station at the n_TOF NEAR facility at CERN"
by M. Ferrari et al. under preparation

Acknowledgements
AP Bernardes, O.Fjeld, M.Ferrari, D.Senajova SY-STI, JF.Gruber HSE-RP, L.R.Buonocore, L.Barbosa Pina Pereira, E.Romagnoli, C.Veiga Almagro BE-CEM

Target #3 cooling and moderator station

- Visit ASN/OFSP 10th December
- Major efforts from CV to develop the technology to match the specifications and RP requests (EDMS 2068336)

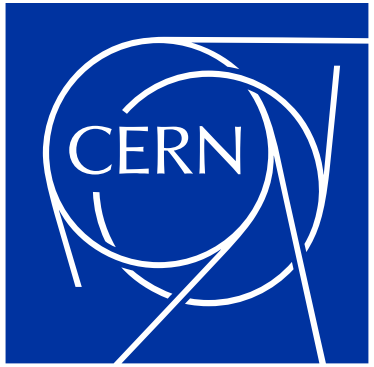
F. Dragoni

Visit ASN/OFSP 10th December

- Implementation of the ASN-OFSP safety recommendations in EAR2
- New safety file includes modifications implemented during LS2
  EMDS 2604713 - n_TOF Target Facility Safety Overview
- Visit of the target area and the cooling station
- Recommendations given, details to come
- Safety file for EAR1 to be produced 2022
- Consolidation of the gas system in EAR2 - completed
- Consolidation of the alignment system – ongoing
- Upgrade of the n_TOF electronics laboratory - completed
- DAQ upgrade
- Consolidation and R&D program for detectors - ongoing

Conclusions

- Target performance as expected!
- Cooling and moderator stations up and running - ASN-OFSP comments
- New permanent magnet and second collimator work well
- NEAR has started activity, projecting for next years
- New Ge detector installed
- Ready for beam after YETS 2021/22
- FTN line needs still tuning – modifications implemented



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