# ISOLDE Technical Report

Joachim Vollaire on behalf of the Technical Teams

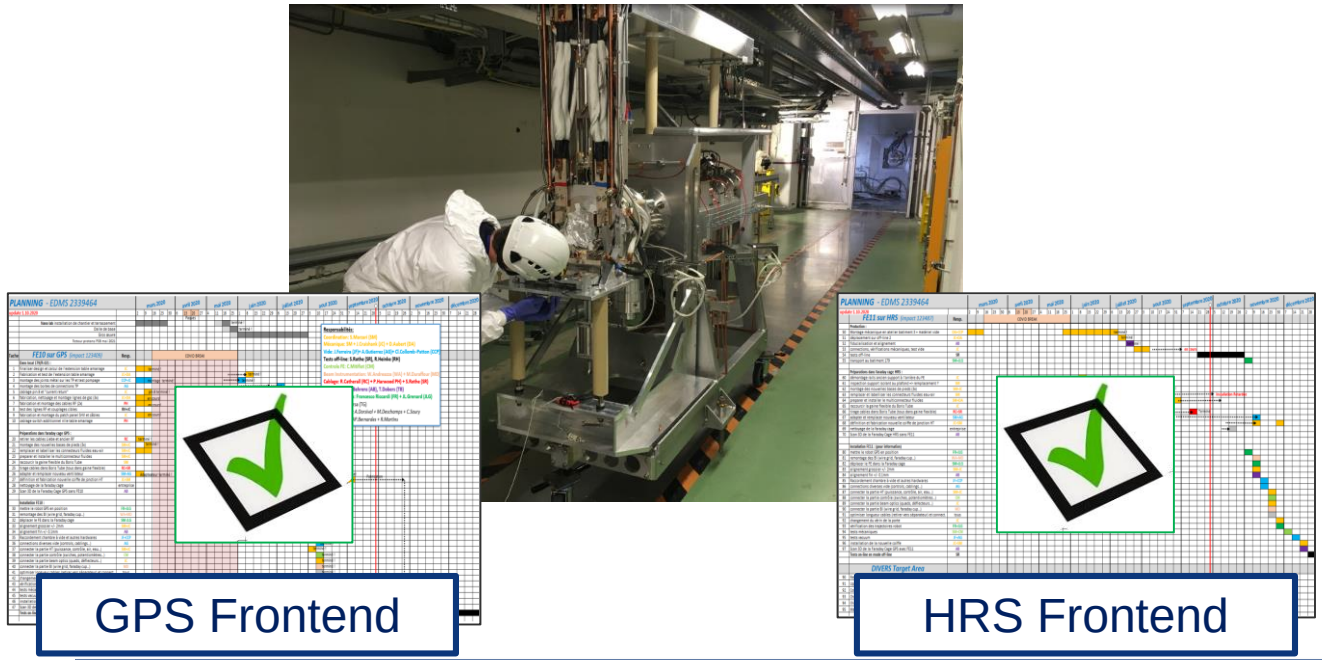
(Special acknowledgement to S. Rothe and E. Siesling)

# Outline

- Finalization of LS2 activities
  - Frontends
  - Gas System
  - Tape Station
- Update on the nano-Lab construction (Building 179 extension)
- Update on HIE ISOLDE
- REX/HIE ISOLDE hardware commissioning and activities
- Summary

# Target Stations (Frontends) replacement

- **GPS Target Station (FE10) Commissioning completed September 2020 (full recommissioning of the low energy lines, RILIS Laser systems for GPS and REX/ HIE ISOLDE)**
- **HRS Target Station (FE11) Commissioning completed in May 2021 (ISCOOL RFQ RILIS and RILIS laser systems for HRS)**

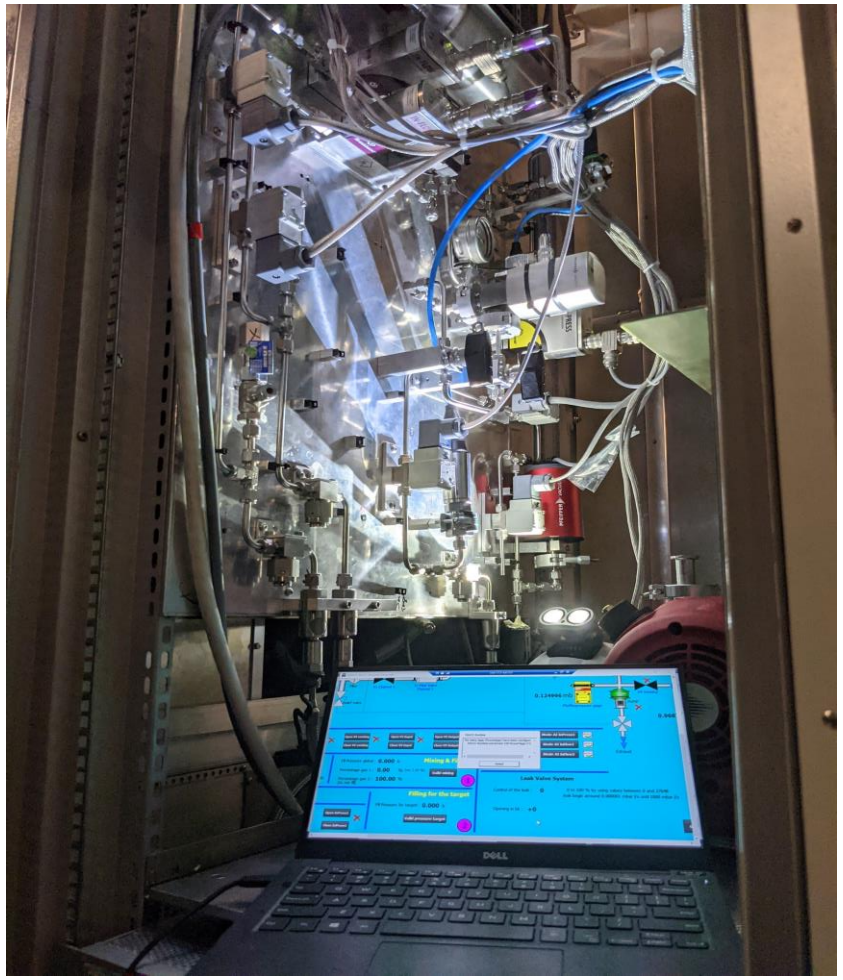


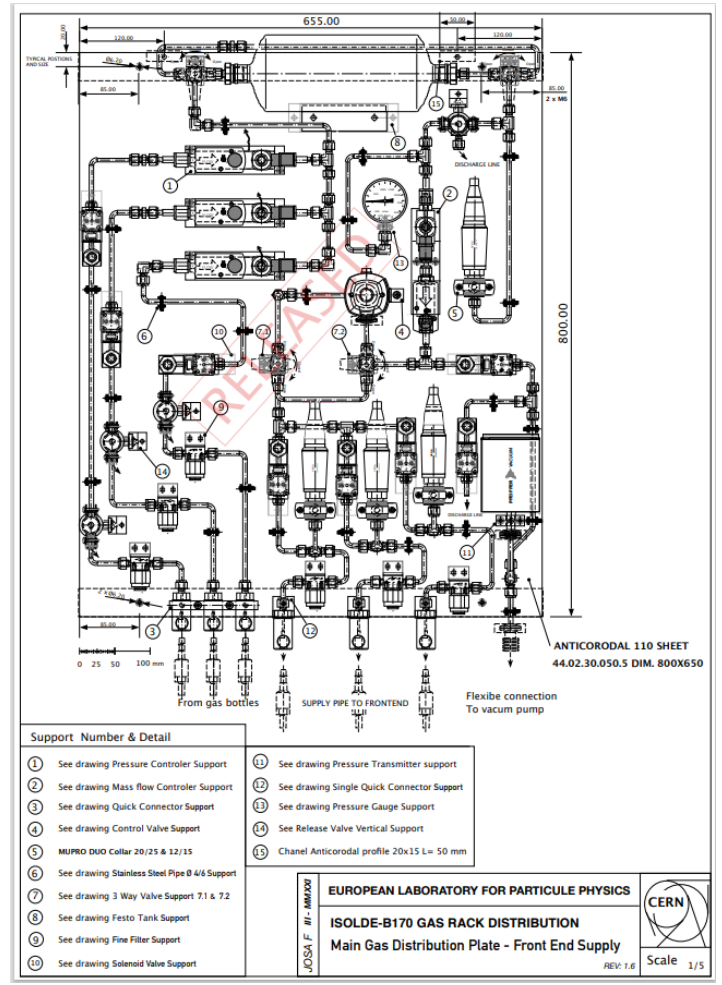
GPS Frontend



HRS Frontend

# New gas systems (HV room racks)

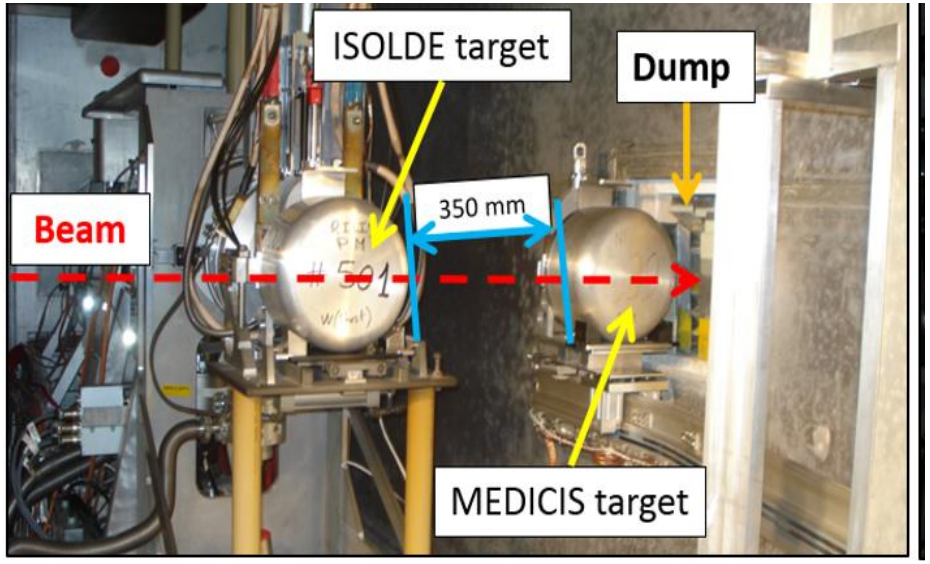


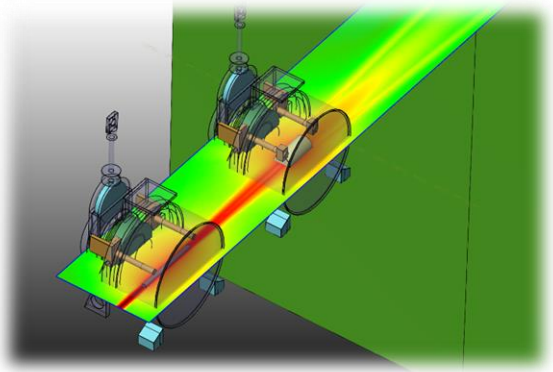



- **Hardware installed and tested, expert CTRL ready.**

# Parallel irradiations - new for GPS (1)

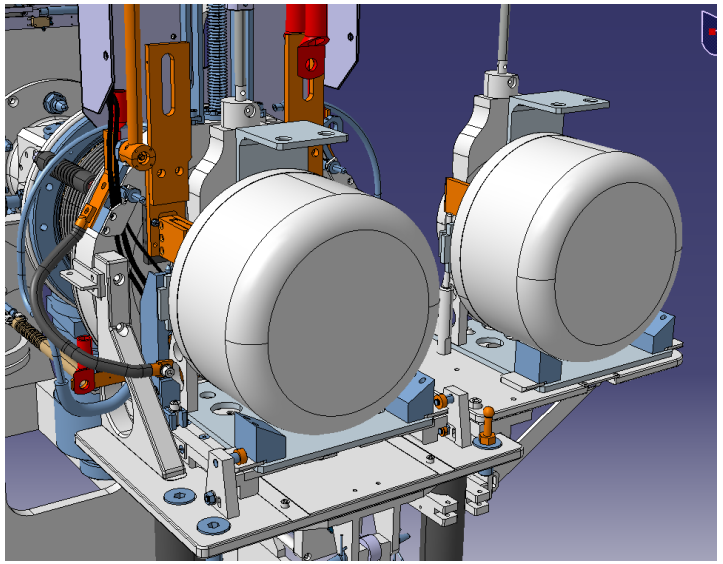
- Possibility to irradiate targets or material on HRS (extensively exploited for MEDICIS operation)
- Irradiation outside the Faraday cage with dedicated handling system (Rail Conveyor System)

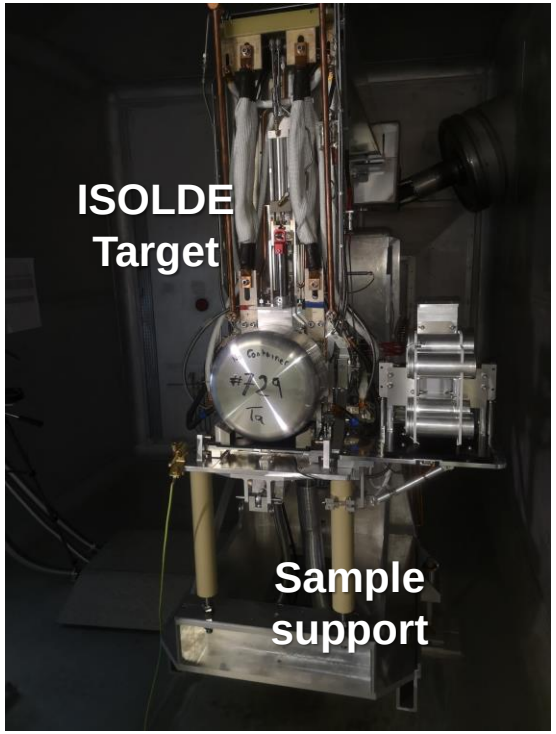


# Parallel irradiations - new for GPS (2)

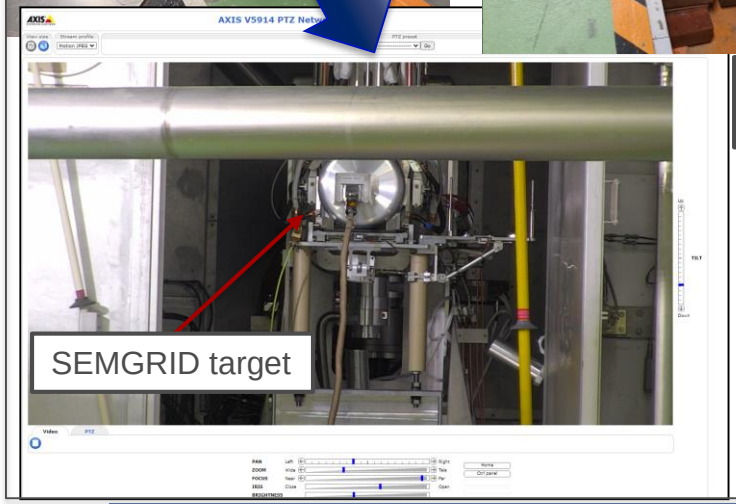
- Possibility to irradiate targets or samples expended to GPS (removable support added to FE10)
- Considered for material or target irradiations (MEDICIS operation of winter physics with long half life isotopes)
- Support is inside the Faraday cage (“floating” at HV)
- Handling done with the ISOLDE robot system



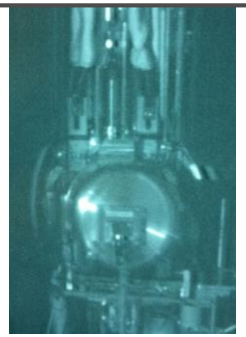


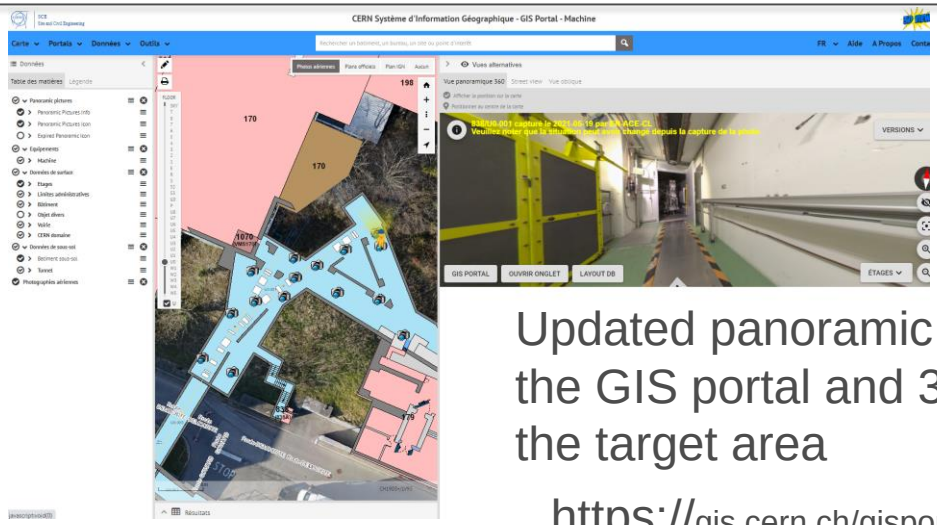

# Other target area upgrades and activities

## Re-enforcement of the shielding for the (high resolution) telescopic camera


**Rad. Hard camera (unshielded)**

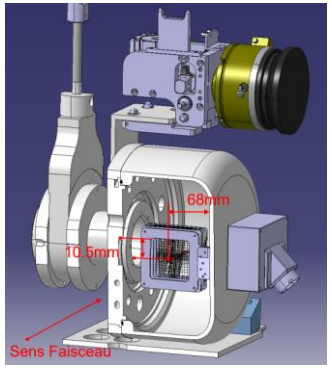




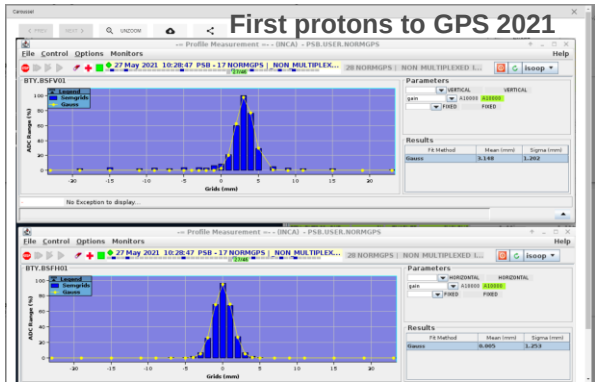

Updated panoramic pictures on the GIS portal and 3D scan of the target area

https://gis.cern.ch/gisportal/Machine.htm

## New SEMGRID Target(s) for the proton beam lines tuning

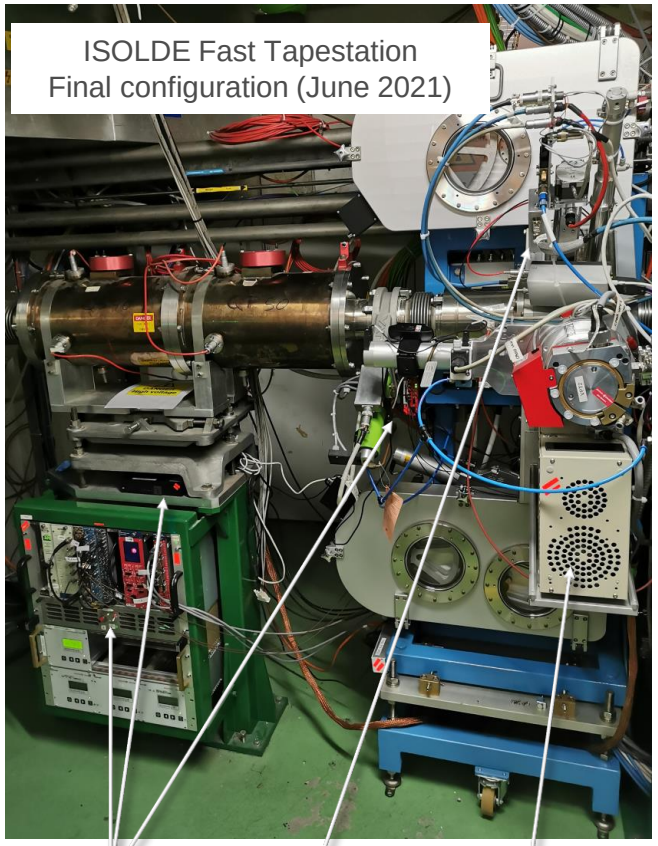




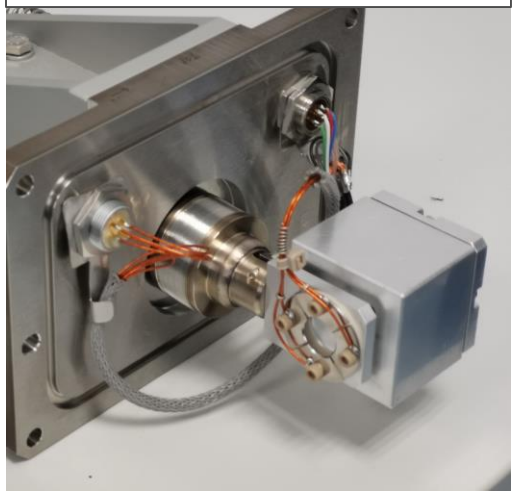


# The Tapestation

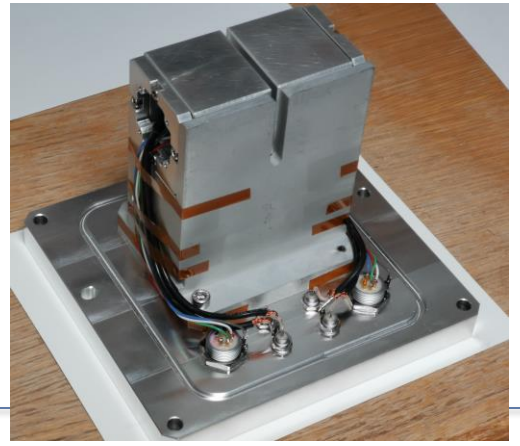
- **First measurements after LS2 (Target #638, 10.06.2021)**



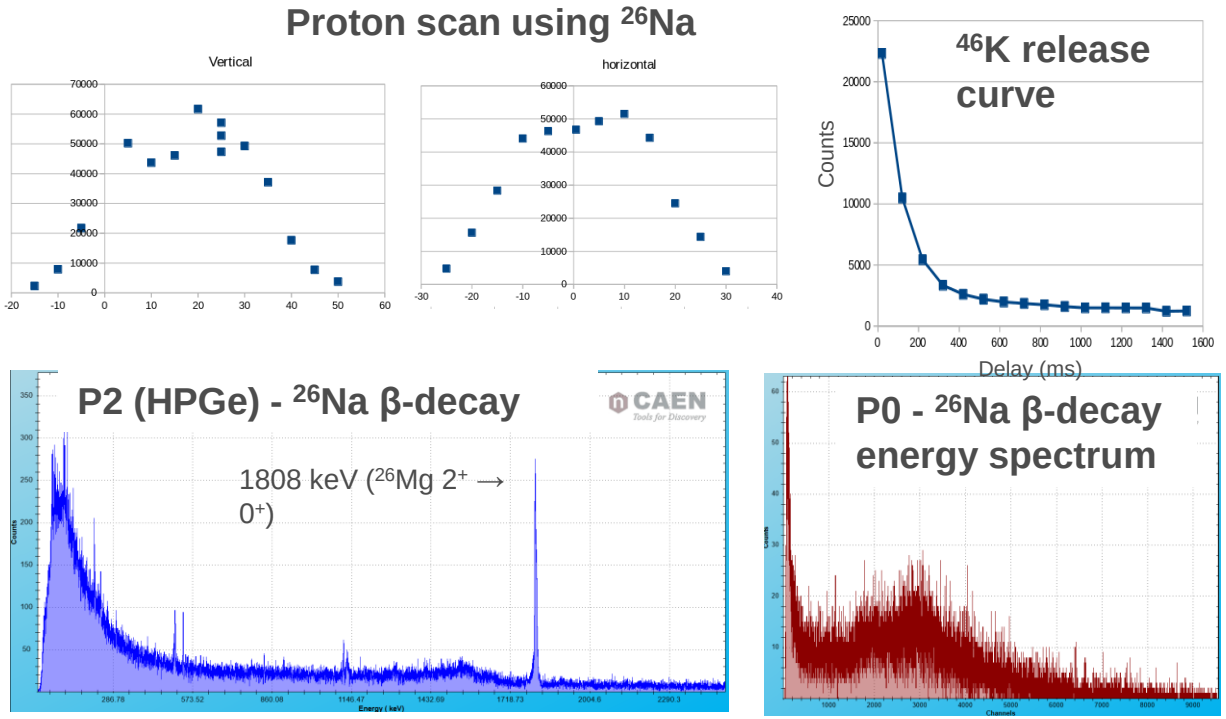

P0 position: 2π β detector and collimator



P1 position: 4π β detector



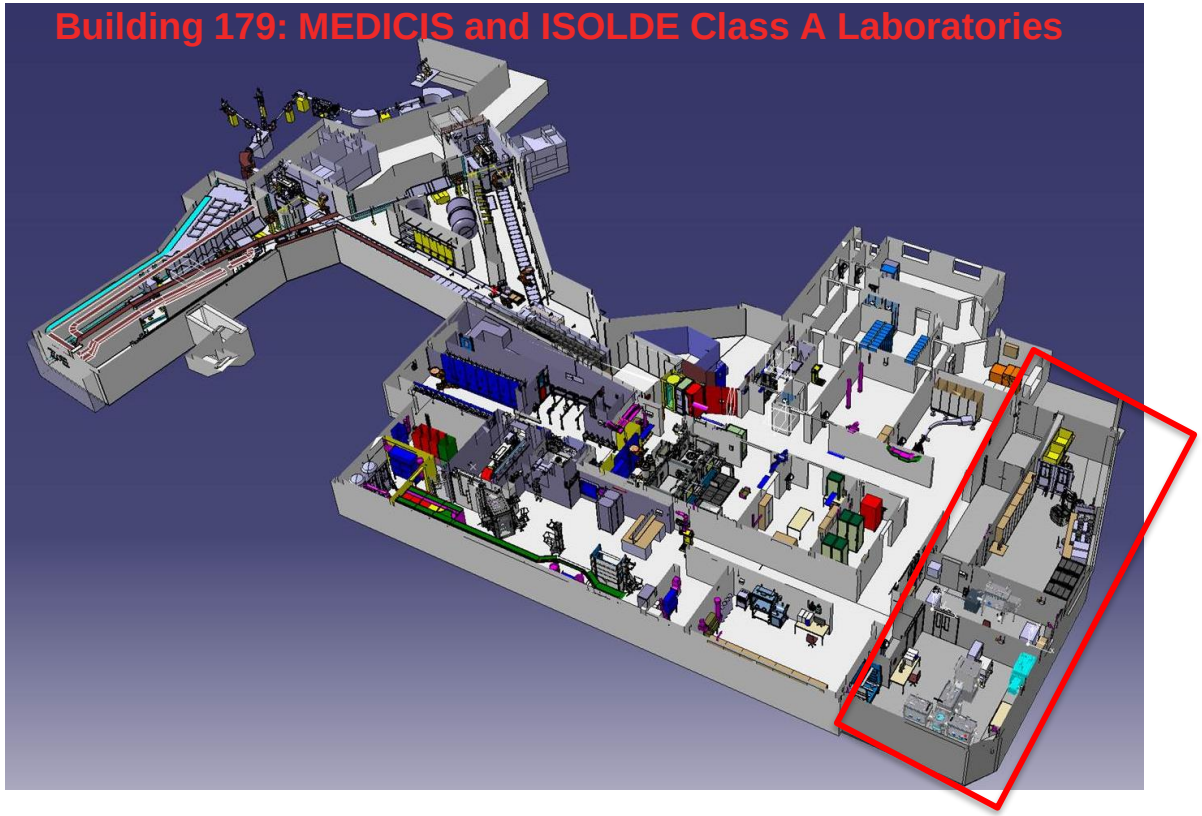
Special Thanks to **R. Lica** !

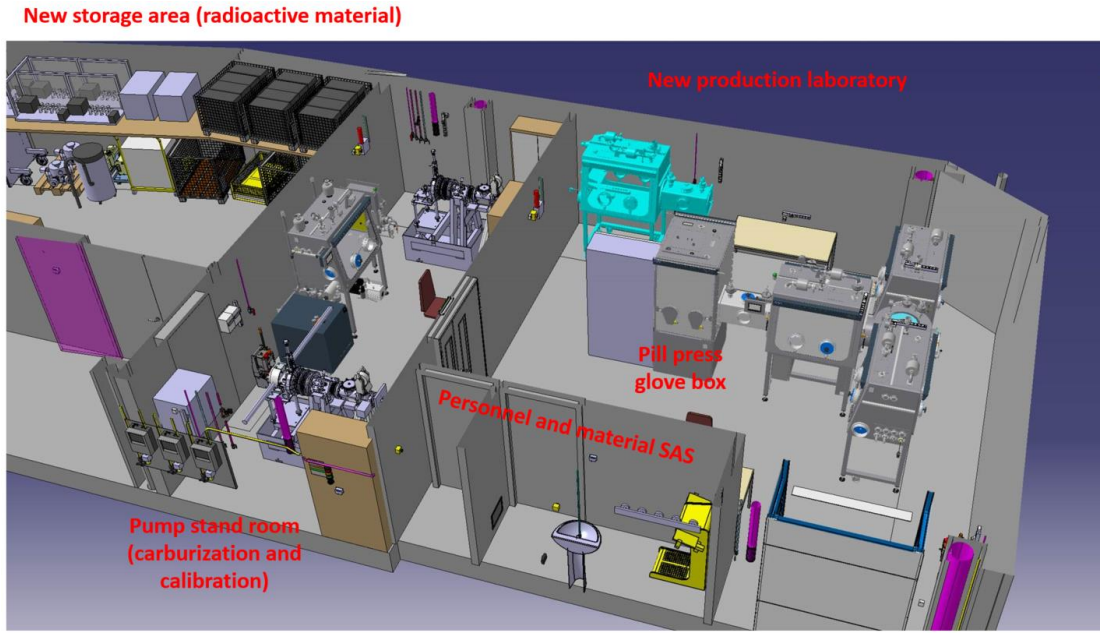



- **Future plans:**
  - automate the DAQ and analysis software (LabVIEW)
  - install the P2 beta detector (design finalized) ->beta / gamma
  - design the P3 position for alpha spectroscopy
  - commission the second tapestation at GLM , (seed funding requested)

# Building 179 extension: The nano lab

- **New laboratory for actinide targets production**
- **New storage area for radioactive material**



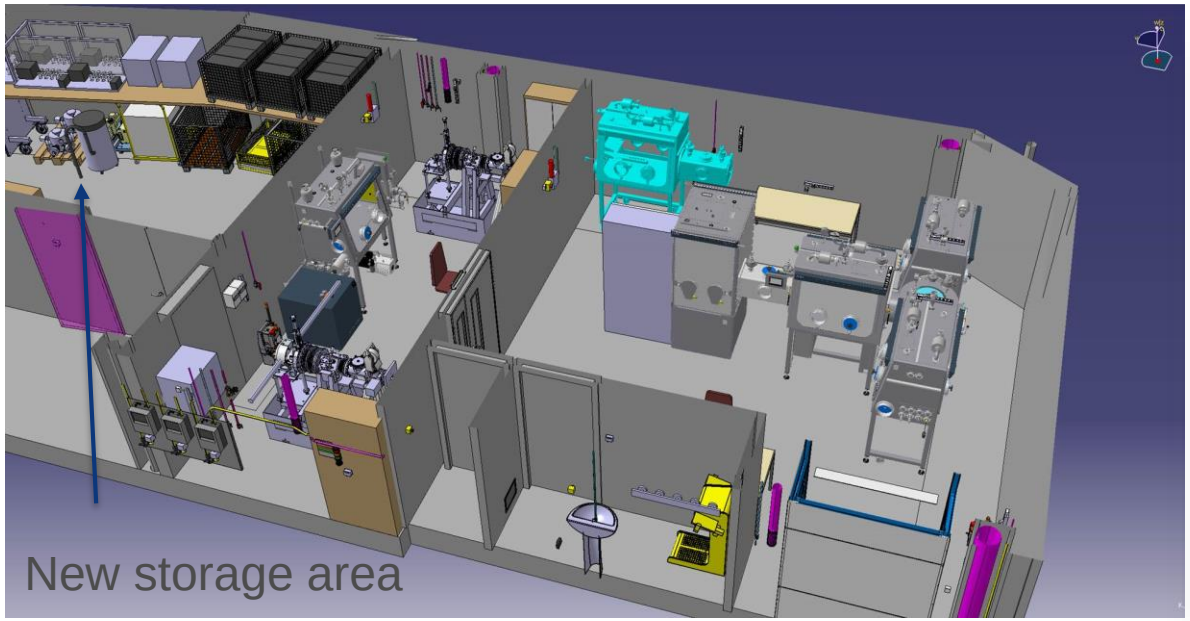
# Nano Lab update

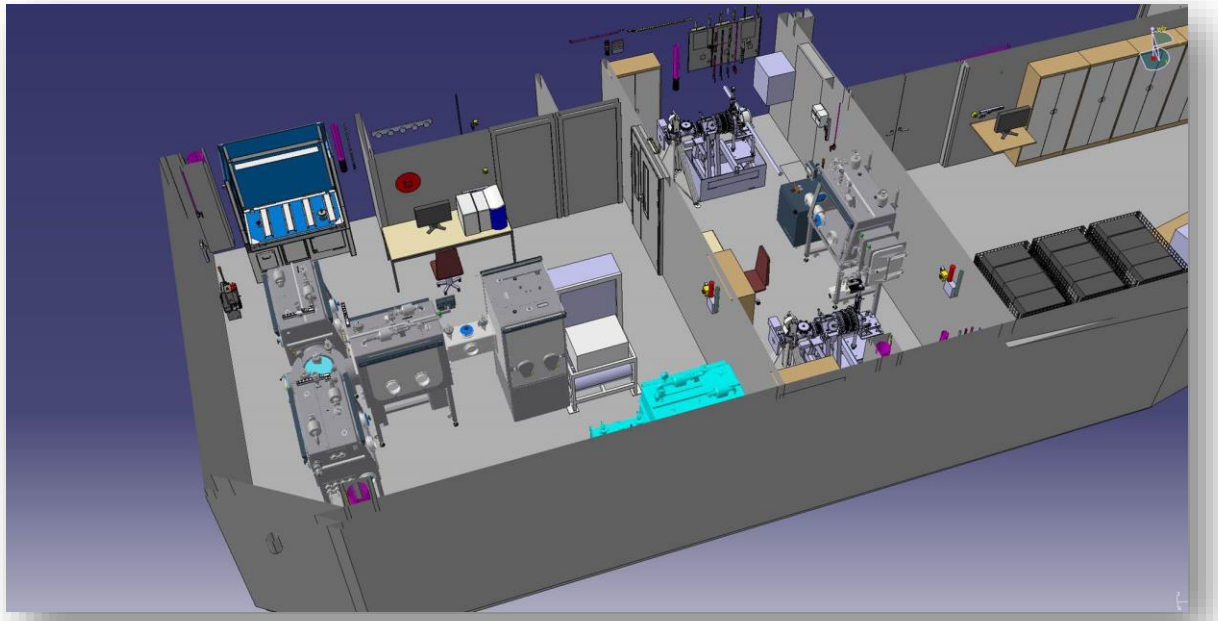
- Civil engineering started beginning of March 2020
- Completion expected in 1 week, end of June 2021



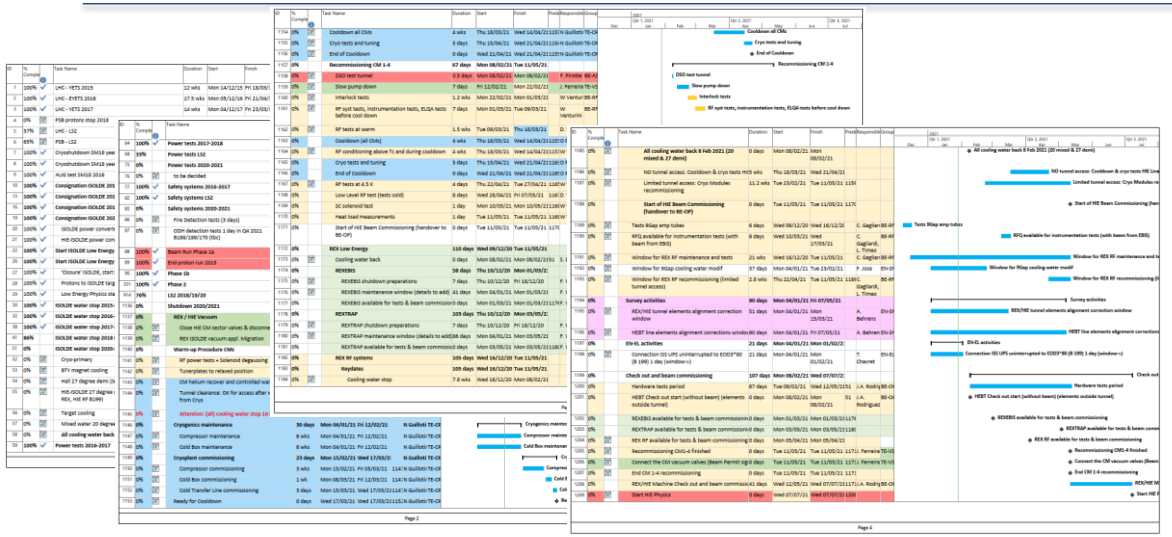
# Nano Lab: Unique facility for the safe handling of actinide powders in the nano range

- **Nuclear ventilation recommissioning** ongoing and will finalize the end of the construction phase and allow other activities to restart in Build. 179 (MEDICIS operation)
- **Commissioning of fumehood** beginning of July 2021
- Five custom **gloveboxes currently in manufacturing** stage – installation and commissioning fall 2021
- Transfer of the carburization and calibration stands being prepared (dedicated area with “inert” atm glove box and new transfer system)
- In the process of **retrieving authorization to start the development of non-radioactive nano-materials**



# Update on HIE ISOLDE

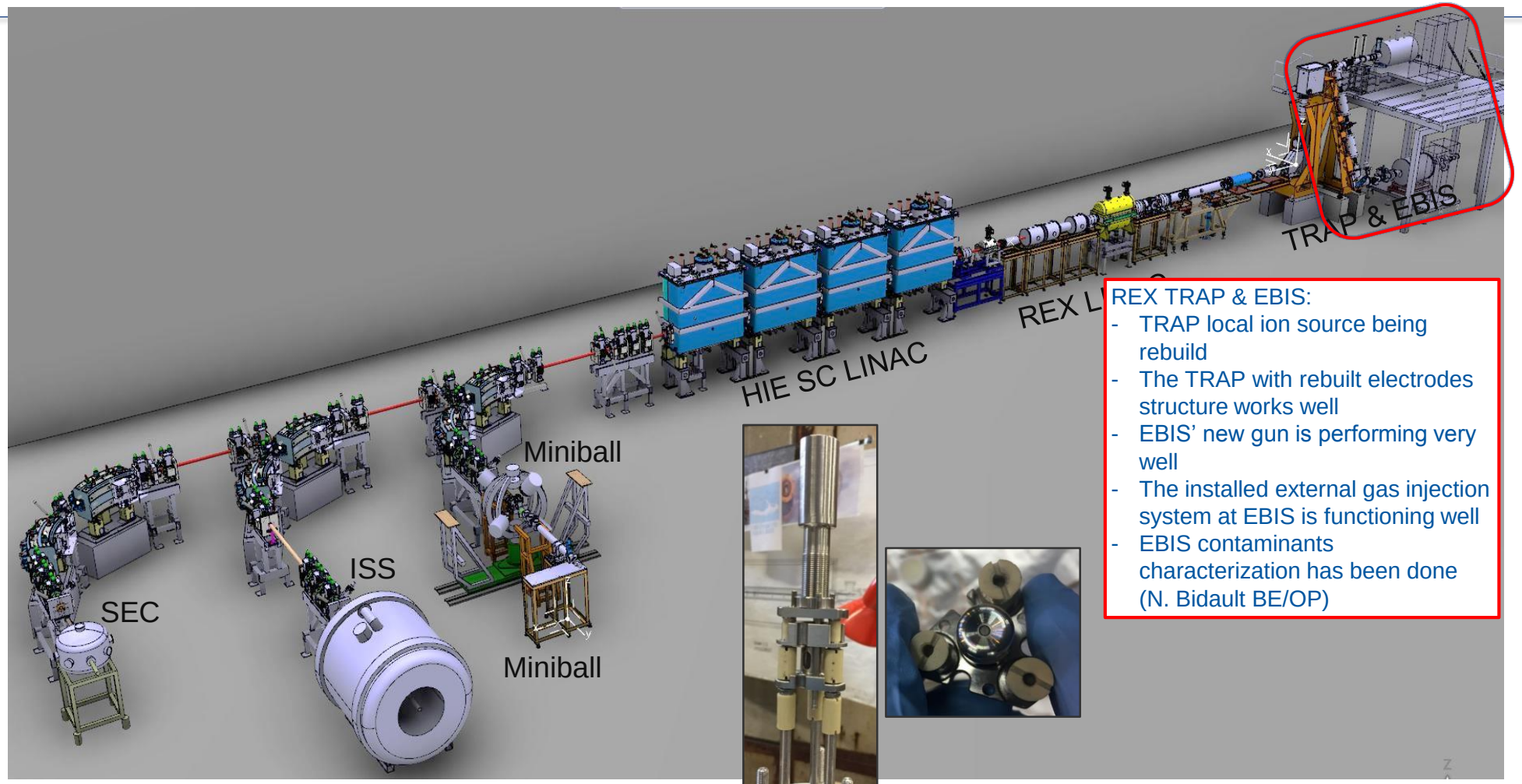


HIE ISOLDE Cryo plant

Key-dates and planning drivers:

- Warm-up of the SC linac started on the 3rd Dec and over the annual closure
- Stop of all cooling water and lock-out as of the 16th Dec
- Cryo primary water back 25th Jan, all other as of 8th Feb -> Unlocking power supplies and start of Hardware Test period
- Cryo maintenance until 12th Feb followed by recommissioning of the plant.
  Cooldown of the Cryo Modules 18th March – 21st April -> Recommissioning of CM1-4 with RF at cold (4.5K)
- Start of machine check-out and (stable) beam commissioning as of 12th May
- So far all milestones have been kept, despite several critical Cryo interruptions
- Stable beam available to the HIE experimental stations as of 7th July
- HIE ISOLDE (RIB) Physics start as of end-July

# REX/HIE ISOLDE hardware commissioning and activities:




REX TRAP & EBIS:
- TRAP local ion source being rebuild
- The TRAP with rebuilt electrodes structure works well
- EBIS' new gun is performing very well
- The installed external gas injection system at EBIS is functioning well
- EBIS contaminants characterization has been done (N. Bidault BE/OP)





Installation new E-gun at REX EBIS
(courtesy G. Kathri, F. Wenander, S. Mataguez)

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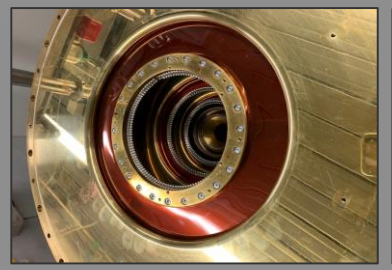

REX Linac 9Gap anodic capacitor repair (courtesy C. Gagliardi)






Burned 7GAP3 controller card at amplifier start-up. Capacitors replaced on all amplifiers (C. Gagliardi SY/RF)

REX NC LINAC:
- All REX RF systems were successfully recommissioned in time including the repaired 9GAP amplifier (anodic capacitor)
- A water leak on the IH structure occurred and was repaired
- The 7Gap3 amplifier controller board caught fire due to aging and wrong type of capacitors. Replaced on all amplifiers
- 7Gap3 preamplifier failed. Broken components replaced (C. Gagliardi SY/RF). No spare.
- Excellent support from RF (C. Gagliardi SY/RF)
- All beam instrumentation in REX & HIE recommissioned

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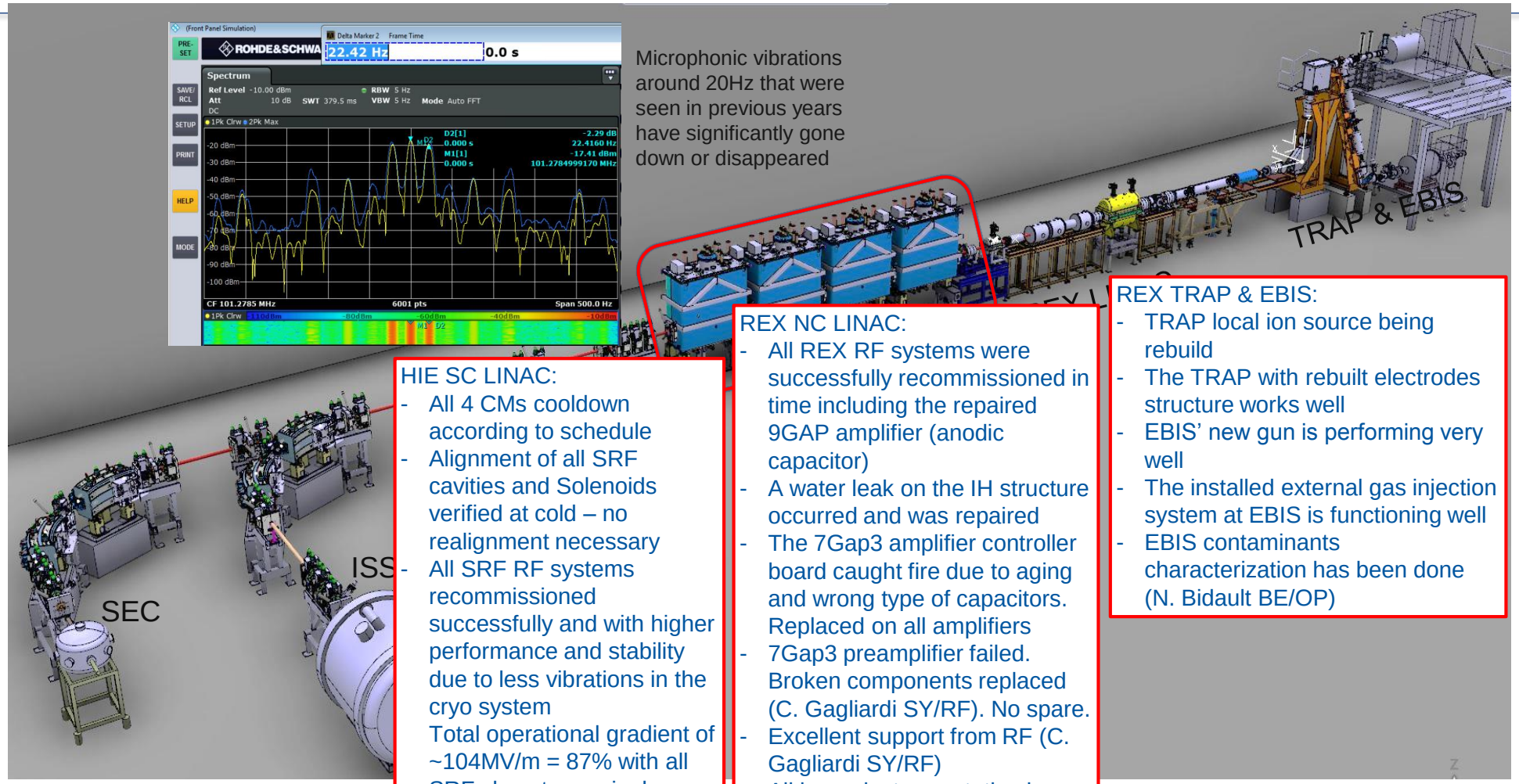


HIE SC LINAC:
- All 4 CMs cooldown according to schedule
- Alignment of all SRF cavities and Solenoids verified at cold – no realignment necessary
- All SRF RF systems recommissioned successfully and with higher performance and stability due to less vibrations in the cryo system
  Total operational gradient of ~104MV/m = 87% with all SRF close to nominal 6MV/m
- Excellent work by RF and Cryo (D. Valuch SY/RF, N. Guillotin TE/CRG)

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Energy of 10.24 MeV/u for a $^{40}Ar^{12+}$ (working now on stability)

# REX/HIE ISOLDE hardware commissioning and activities:

HEBT Dboxes equipped with Si detectors and stripping foils
(courtesy: W. Andreazza, BI team)




HEBT:
- Dboxes in all three lines equipped with Si detectors
- Stripping foils ready for installation when required (Aug) for all three lines as well as at two positions in the straight section (redundancy)
- Optimization of the overall alignment of the HEBT elements has been carried out by Survey (A. Behrens, A. Beynel BE/GM)
- Instrumentation tested except for some in the XT02/03 lines

Experiments:
- ISS uninterrupted power connected (chiller and compressor)
- No MINIBALL this 2021 run..

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# Summary and perspectives

- Facility  (Frontends and related systems) were ready for commissioning with protons end of May
- Nano-laboratory construction phase terminated and the nuclear ventilation for Building 179 is being recommissioned (expended for the nano-lab connection) to allow operation in the building to restart (MEDICIS operation in particular with first irradiation planned next week)
- REX/HIE ISOLDE recommissioning on track with the schedule (stable beam to HIE experimental stations early July and physics a few weeks later)
- Upgraded facility and systems will highly benefit Target and Ion Source Development activities (material development in the nano-lab, new Tape Station, new gas systems, new irradiation station, laser ionization capabilities at offline2….)
- LS2 is over and Run 3 is starting, but plans for future consolidations and/or upgrades are being studied (ISOLDE Beam Dump Replacement study, consolidation plan to be initiated…)

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