



Update on Improvements Programme

98th ISOLDE Collaboration Committee meeting – 17th of November 2023

Joachim Vollaire

Outline

- **Motivation and context of Consolidation and Improvement Program**
- **List of different activities / proposals**
- **Status report for some activities**
- **“Cost, Schedule and Scope Review” in December**
- **Conclusions**

Why consolidation

Accelerator Consolidation Day 2023

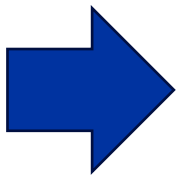
📅 Friday 20 Oct 2023, 08:30 → 17:30 Europe/Zurich

📍 774/R-013 (CERN)

Description The 2023 ACC-CONS Consolidation Day aims to gather the latest information from the equipment groups on their Consolidation activities and their related budget spending profile. For the currently approved activities, the updated budget profile is to be presented according to the current status and future spending plans. New or high priority pending requests may be presented, which also includes a possible shortfall on critical spares.

The equipment can no longer be used with sufficient reliability

- The equipment has been exposed to levels of radiation that compromise its functionality
- Commercially available spare parts are lacking, obsolescence
- Technical support is no longer available for components or software
- The systems no longer meet safety regulations and standards (including their evolution in time)



Groups put forward their requests for ISOLDE hardware.

M. Lamont presentation

ISOLDE Consolidation and Improvements Programme

Objectives of the program

- Integrate the different consolidation activities led by the equipment owners and identify opportunities to enhance the capacities and capabilities of the facility
- Address safety concerns as well as limitations of the infrastructure or beam line systems inherent to an aging facility

Capacities and capabilities enhancement: opportunities identified during the two EPIC workshops (2019 and 2022) as well as during the Mini-Workshop on ISOLDE Consolidation and Improvement

Mini-workshop on ISOLDE consolidation and improvement

Wednesday 19 Oct 2022, 09:00 → 17:30 Europe/Zurich

6/2-024 - BE Auditorium Meyrin (CERN)

Description The ISOLDE facility is one of the world leading facilities for the production, study and research using Radioactive Ion Beams. In June this year, the facility has celebrated its 30th years of operation using the protons from the Proton Synchrotron Booster (since 1967 ISOLDE had operated with the 600-MeV protons from the Synchrocyclotron). In order to ensure that the facility will remain at the forefront and continue to serve its growing users community for the next decades, we are organizing a workshop on the ISOLDE consolidation and improvement program.

The purpose of the workshop is to identify critical aspects of the system or equipment that could jeopardize the facility availability and reliability and to review the planned and required consolidation plans. In addition, the users, operation and technical teams are asked to review any improvements to the facility that could further increase the physics outputs.

<https://indico.cern.ch/event/1208149/>

Components of the program

1. Upgrade of the BTY line to deliver protons of 1.4 GeV or 2.0 GeV from the PS Booster to the two ISOLDE target stations. The proposal should also include a review of the beam line reliability and spares management.
2. Replacement the two ISOLDE beam dumps for the GPS and HRS target stations with actively cooled and instrumented systems. Consolidate the shielding (or reserve the space) to ensure safe operation with an increased beam power in the future. Construct a technical building on top of the target area to access the dumps and the surrounding shielding and host targets and beam dumps related subsystems.
3. Modernization of the primary areas ventilation to address the recommendations from the FIRIA review exercise. The recommendations include the implementation of fire dampers and charcoal filters for the target area ventilation.
4. Definition of a plan to ensure the availability of the REXTRAP and REXEBIS and enhance the performance and reliability of the systems according to the needs of the HIE ISOLDE users. The defined plan includes improvements of the existing setup that will be implemented before Run4. In parallel, the need to define a spare strategy for the REXEBIS and REXTRAP solenoid magnets has been identified. EDMS 2975844
5. Definition of a plan to ensure the availability and reliability of the normal conducting section of the REX-LINAC and its related systems.
6. Definition of a plan to ensure the long-term availability and performances of the SC part of the HIE ISOLDE Linac. The solutions identified during the Mini-Consolidation workshop include the production of a spare cryo-module as well as the implementation of a liquid nitrogen supply to keep the cryo-module shields cold during the entire year.
7. Review and consolidation of the ISOLDE target systems and low energy beam lines equipment (including timing and ISCOOL RFQ cooler buncher). Upgrade of the power supplies for the electrostatics elements to allow for beam switching of the central beam line elements for simultaneous beams delivery from GPS and HRS.
8. Review of the infrastructure status and space allocation. Proposal to rationalize use of space.

BTY line: vertical dogleg and powering



SY
Accelerator Systems

REFERENCE
PSB-RP-ES-0002

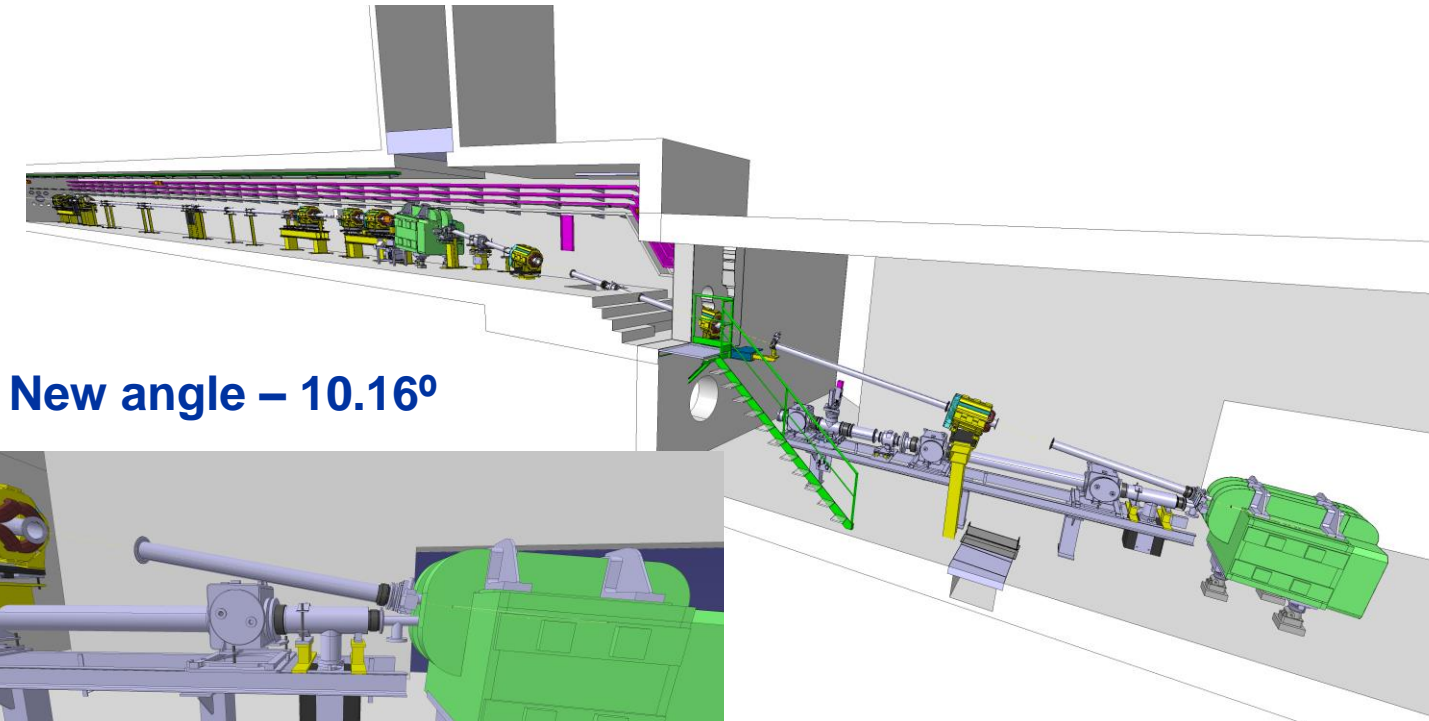
Date: 2023-07-05

FUNCTIONAL SPECIFICATION

Sirius S and 2P Power Converters for Magnets of the PSB-BTY Transfer Line in the Framework of the Accelerator Consolidation Project

ABSTRACT:

This document covers the functional specifications of SIRIUS converters for the replacement of old power supplies in the framework of the accelerator consolidation program for the PSB-BTY Transfer line.



New angle – 10.16°

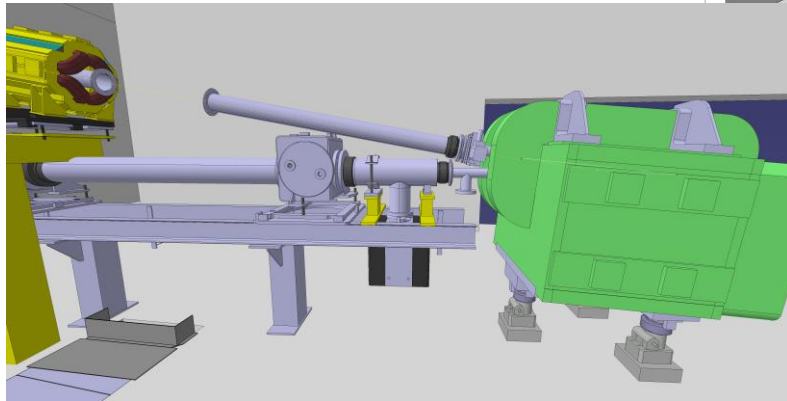


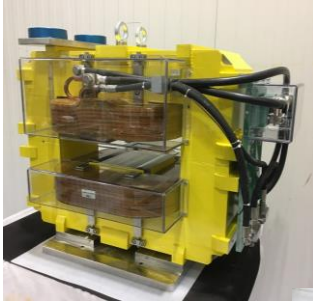
Figure 7 — Building 197/1-401: possible integration of SIRIUS converters.

Identification of equipment to move
Interferences

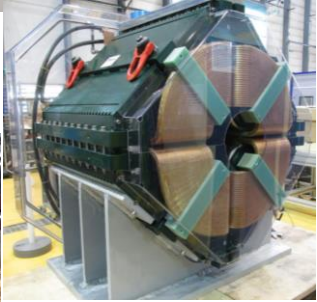
Support to modify. Vacuum chambers to produce...

Small civil engineering work (hole in non-load bearing wall validated)

BTY line: magnets



- Manufacturing of 3 new CR200 dipoles (2 magnets installed + 1 spare). Estimated cost 100 kCHF
- Manufacturing of 4 new type 4 AF correctors. Estimated cost 50 kCHF



- Four magnets installed: BTY – QDE209, QFO210, QDE321, QFO322
- Not compatible with 2 GeV operation with the new power converters (Isolde consolidation)

- 3 solutions identified:

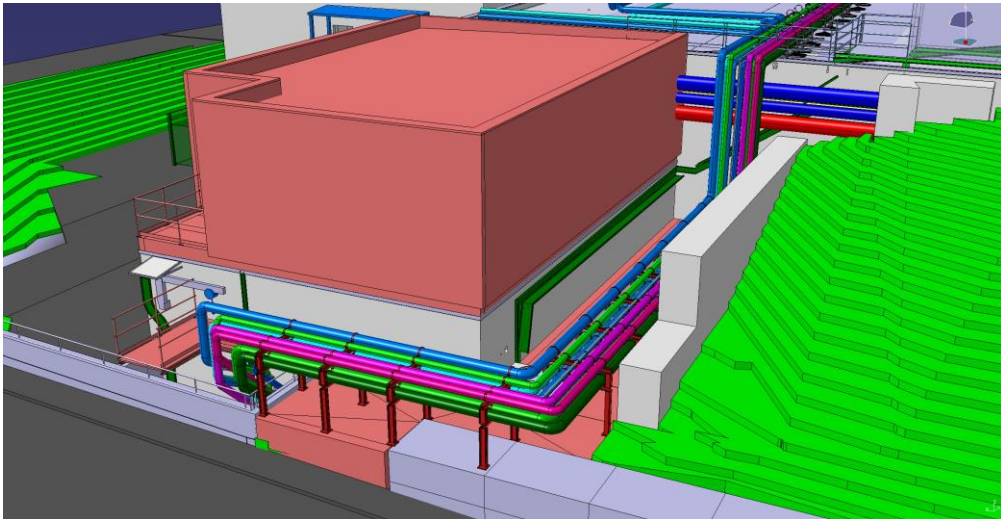
- SOLUTION 1: Replace the Q100 quadrupoles by the laminated version Q100L. The Q100L is a bit over-sized for the integrated gradient we need in the BTY.
- SOLUTION 2: Propose a new quadrupole design. An option could be to modify an existing design to meet the requirements.
- SOLUTION 3: If the quadrupole aperture can be reduced from 200 mm to 150 mm, the BT-BTP quadrupole design could be used.



- The estimated cost for magnets upgrade to fit Isolde 2 GeV requirements range from **500 to 900 kCHF** depending on the retained solution to replace the Q100 quadrupoles. Include spare.
- Infrastructure modifications to be taken into consideration (support, cabling, hydraulics...)
- Time scale for design, tendering and manufacturing of all the new magnets is 2.5 to 3 years from the date of approval of the project. Decision needed early 2024.

Update on FIRIA recommendations follow-up

- Building 197 extension to include new ventilation hardware (fire dampers, charcoal filters...)
- Review of fire safety in the separator zones
- Anticipate construction and installation of equipment during Run3 (final connection during LS3 “only”)
- Work for relocation of services started a few weeks ago (careful planning with physics)



Melania Averna Project Leader



HSE
Occupational Health & Safety
and Environmental Protection Unit


EDMS No:2640950

MEMORANDUM

Date : **5 October 2021**

To : Ana-Paula BERNARDES (SY/STI), Serge DELEVAL (EN/CV), Simone GILARDONI (SY/STI), Joachim VOLLAIRE (SY/STI)

Cc : Elodie AUBERT (HSE/RP), Alexandre DORSIVAL (HSE/RP), Yves LOERTSCHER (HSE/OHS), Fabrice MALACRIDA (HSE/RP), Saverio LA MENDOLA (HSE/OHS), Fabio POZZI (HSE/RP), Stefan ROESLER (HSE/RP), Ingo RUEHL (EN/CV), Pavol VOJTYLA (HSE/RP)

From : Benoit DELILLE (HSE) 

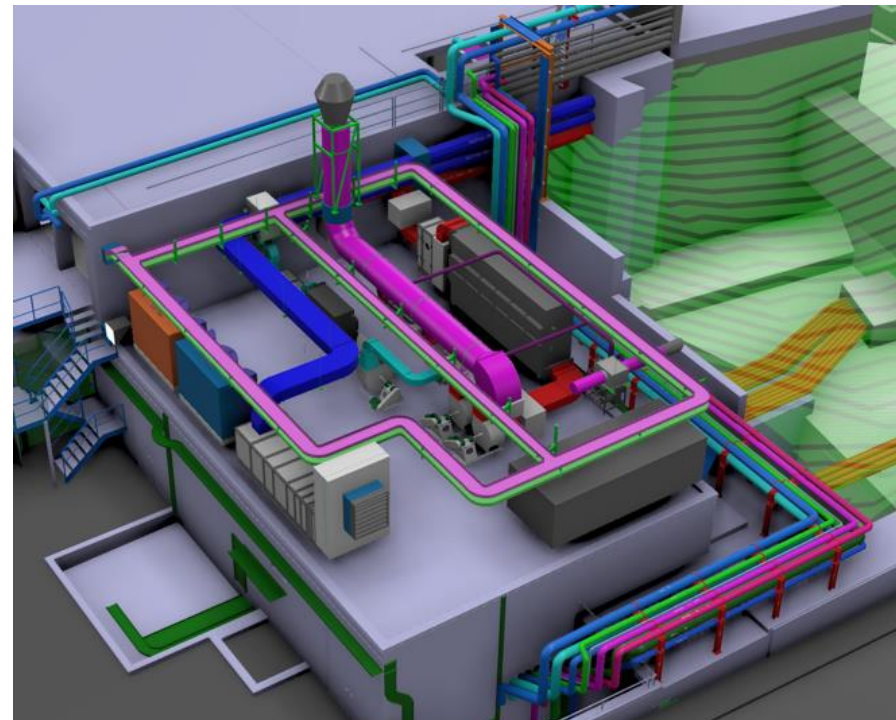
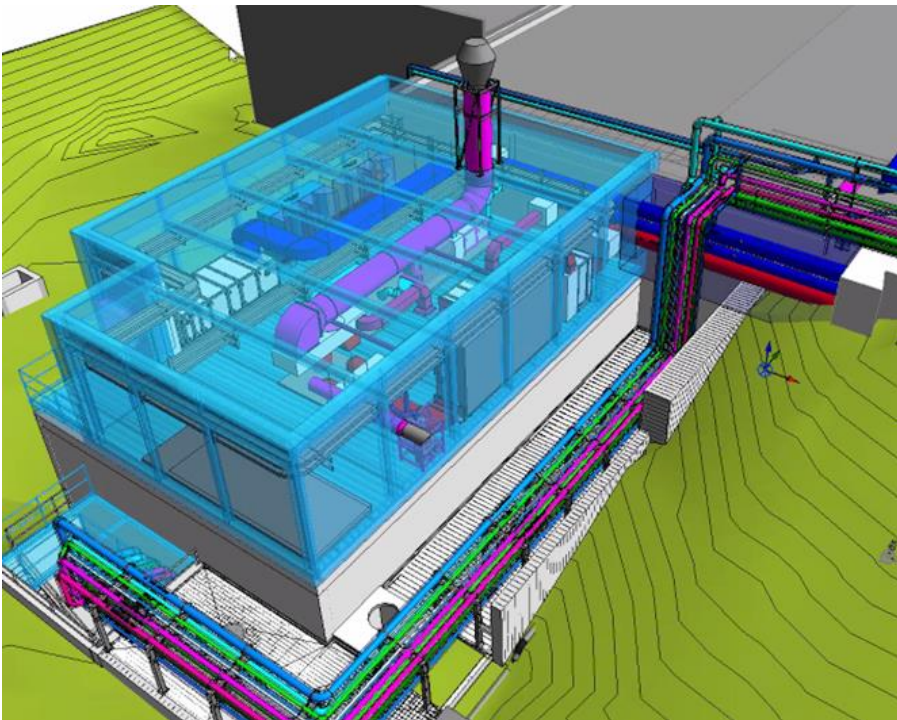
Subject : HSE recommendations following FIRIA assessment of the ISOLDE target area

In the context of the FIRIA project (Fire-Induced Radiological Integrated Assessment), the HSE unit assessed the radiological impact induced by fire accidents in the ISOLDE target area (b. 838) as well as by accidents involving the loss of integrity of actinide targets.

The conclusions of the FIRIA study along with experience from ISOLDE operation have led to

FIRIA worksite

- Detailed integration of EN-CV equipment ongoing
- Next step will be the detailed design of the building (interfaces with ISOLDE Beam Dumps Replacement Project for space and service passage reservations)
- Construction to start in 2024 (in parallel to operation)
- **Side activities during the current YETS:** fan coil unit installation in the HRS separator area. Fire detection installation in GPS and HRS separator zones.



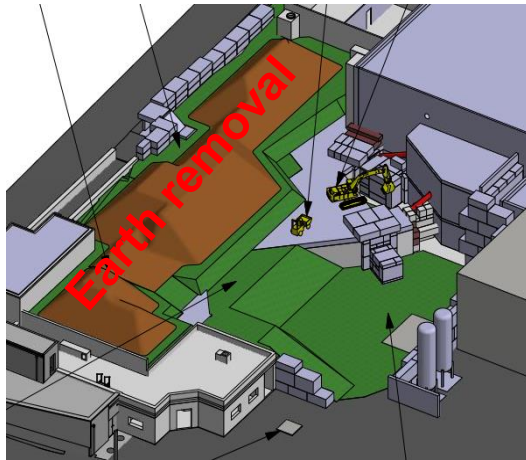
FIRIA worksite during the coming YETS

Pictures from the last couples of weeks

Before construction work

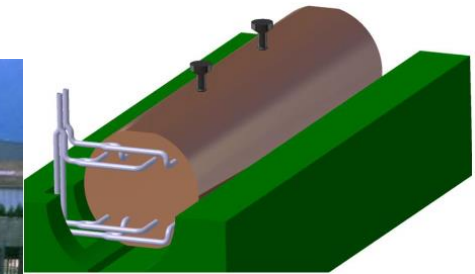


Beam Dumps Replacement Study



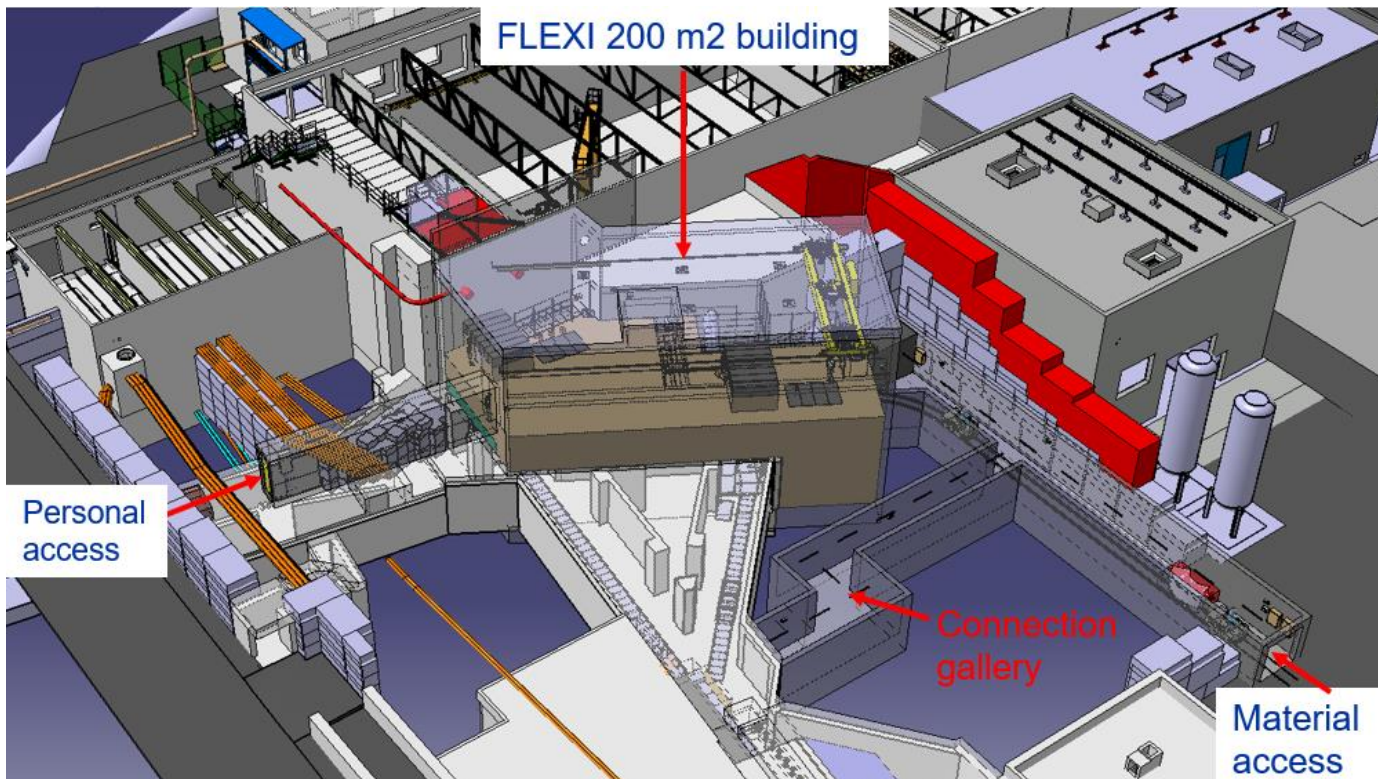
- Detailed study ongoing for beam dumps removal (optimization of costs)
- Decision needed on activity to have commitment of support groups
- Activity only considered during a LS
- Major worksite (reason to anticipate B. 197 work)
- New beam dumps able to cope safely with increased beam power

Water cooled dumps



Ana-Paula Bernardes Project Leader

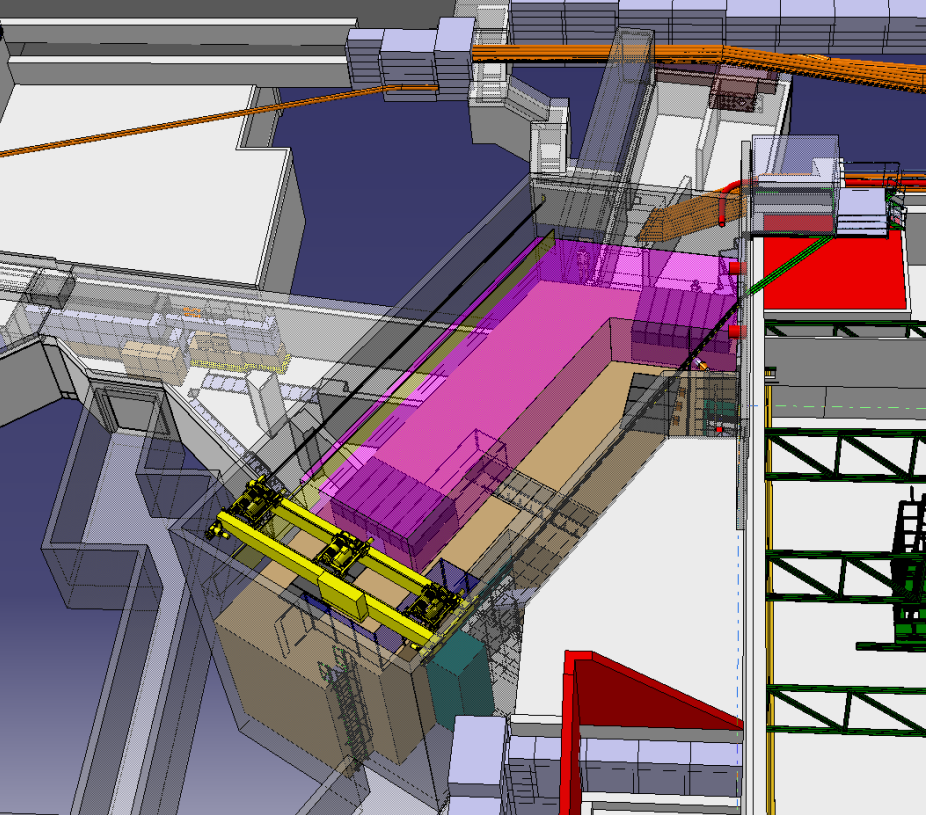
FLEXI Building on top of target area



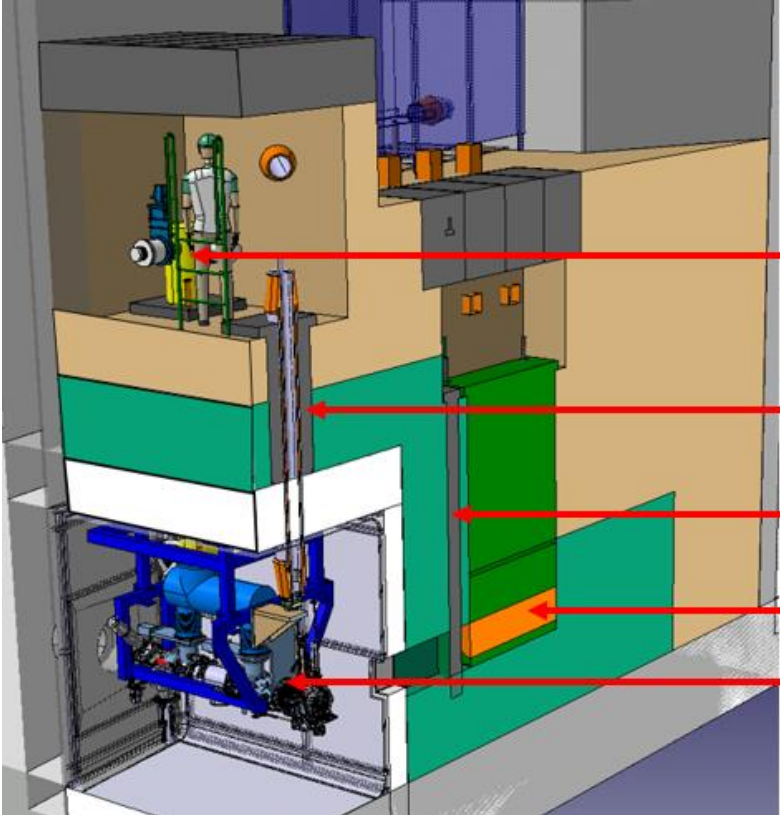
- New building allowing for handling of shielding and dumps
- New access possibility to HRS separator area
- New access to target area
- Space and reservation for Frontends (target stations) evolution

New target station (post LS3) concept

Future nuclear ventilated room in FLEXI building



Frontend concept



- Vacuum pumping module
- Boris Tube module
- Guillotine shielding
- Dump module
- New Frontend design

Proposal from S. Marzari

Cost, Schedule and Scope Review: ISOLDE Consolidation and Improvements Programme

09:00	→ 09:30	Context and objectives of ISOLDE Consolidation and Improvement Program	🕒 30m	✎ ▼
09:40	→ 10:05	Status of the BTY Line Upgrade at 2 GeV	🕒 25m	✎ ▼
10:10	→ 10:40	Status of ISOLDE Beam Dumps Replacement Study	🕒 30m	✎ ▼
10:45	→ 11:10	Status of the FIRIA recommendation Implementation (ventilation modernization and safety upgrade)	🕒 25m	✎ ▼
11:20	→ 11:40	Other consolidation and upgrade plans. ISOLDE Infrastructure status.	🕒 20m	✎ ▼
14:10	→ 14:35	Improvement and Consolidation Plan for REXTRAP and REXEBIS	🕒 25m	✎ ▼
14:35	→ 14:55	SY-RF consolidation and upgrade plans for the HIE-ISOLDE Linac (NC and SC)	🕒 20m	✎ ▼

https://edms.cern.ch/ui/file/2975844/1/Scope_ISOLDE_Program_Draft_docx_cpdf.pdf

Cost, Schedule and Scope Review: ISOLDE Consolidation and Improvements Programme

The committee is asked to review the status of the different activities and plans presented by the activity/project leaders or technical coordinators. The review committee should address the following questions:

1. Is the scope of work for the different activities well defined and in line with the consolidation and improvement program objectives?
2. Are the project risks well identified and properly mitigated?
3. Are the interfaces between different activities managed in a coherent way?
4. Are key decision dates for implementation of the different solutions well identified?
5. Is the expected workforce available and adequate for the proposed schedule?
6. Is the program properly structured to ensure successful implementation?

Conclusions and perspectives

- Different proposals put forward following the Mini-Workshop on ISOLDE consolidation and improvements.
- Report of the workshop outcome in different meetings (IEFC/JAPW) helped equipment group to have declared ISOLDE ACC-CONS requests **accepted** (BTY line power converter, PS for electrostatic elements, HV platform and target/line heating, solid state amplifiers for REX, spare CM production....).
- Additional budget made available to cover additional cost related to Performance Improving Consolidation (Ex. BTY PC: 1.4 MCHF ACC-CONS justified by obsolescence + 400 kCHF for 2 GeV compatibility)
- In addition, 3.5 MCHF already allocated for urgent orders and studies as well as Building 197 extension (Fire Safety improvement with Building 197 extension, REXEBIS improvements).
- Studies ongoing to define possibilities, scope of works and refine budget requirements:
 - Recent MD tests to assess the possibility to use the RFQ cooler-buncher as an accumulation, cooling and bunching stage instead of REXTRAP (solenoid failure).
 - Circulation of cold GHe at 85K in the cryo-module shields during the HIE ISOLDE Linac warm-up earlier this week
- Review schedules on the 12/12/2023 to clarify the scope of work until LS3 and beyond, collect budget requirements for MTP204 preparation as well as to confirm availability of resources (support group, infrastructure....)



Picture from Matthieu Deschamps

Some terminology

- **CONSOLIDATION**: Partial or complete replacement of a system to be performed to maintain the present level of performance/availability
- **UPGRADE**: Replacement or addition of a system to improve the performance, which would otherwise
- **PERFORMANCE IMPROVING CONSOLIDATION (PIC)**: Replacement or upgrade of a system justified by consolidation but with the additional goal of improving performance

Slide from S. Gilardoni



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