



PROJECT MANAGEMENT PLAN

PUMA experimental program at the ISOLDE facility - Study, Integration and Implementation

ABSTRACT:

The current document describes the work packages and details organizational matters for the integration and installation of the PUMA experiment, the MR-ToF and adjacent new beam line 2022 and 2023.

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HISTORY OF CHANGES

REV. NO.	DATE	PAGES	DESCRIPTIONS OF THE CHANGES
0.1	2022-03-08	10	First draft version
0.2	2022-03-23	9	
0.3	2022-04-14	10	Definition of work packages
0.4	2022-06-01	11	Updates, schedule added

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1. INTRODUCTION

The PUMA collaboration has submitted a technical proposal [1] at the SPSC (Jan 2020) as well as a Letter of Intend to the INTC (Feb 2020) and has been approved by the RB in (March 2021). The experiment proposed includes a set-up at the AD to accumulate antiprotons in a superconducting magnetic trap after which the trap will be transported (under power) to the ISOLDE facility where it will be installed at a low energy radioactive ion beamline (RIB) for nuclear physics.

The space identified for the PUMA experiment in the ISOLDE hall 170 where it could receive Low Energy RIBs, is the position at the end of the RC6 line, where previously the NICOLE experiment was installed.

The present position of NICOLE would be replaced with a Paul trap and a multi-reflection time-of-flight mass separator (MR-ToF)[3]. The RC6 beam line will provide RIBs with the necessary beam requirements at the entrance of the PUMA experiment which will be located in the HIE ISOLDE part of the experimental hall, presently used for storage. CERN takes care of the infrastructure and beam line until the hand over point, the PUMA collaboration is responsible to deliver the beam elements and experimental set-up after this point.

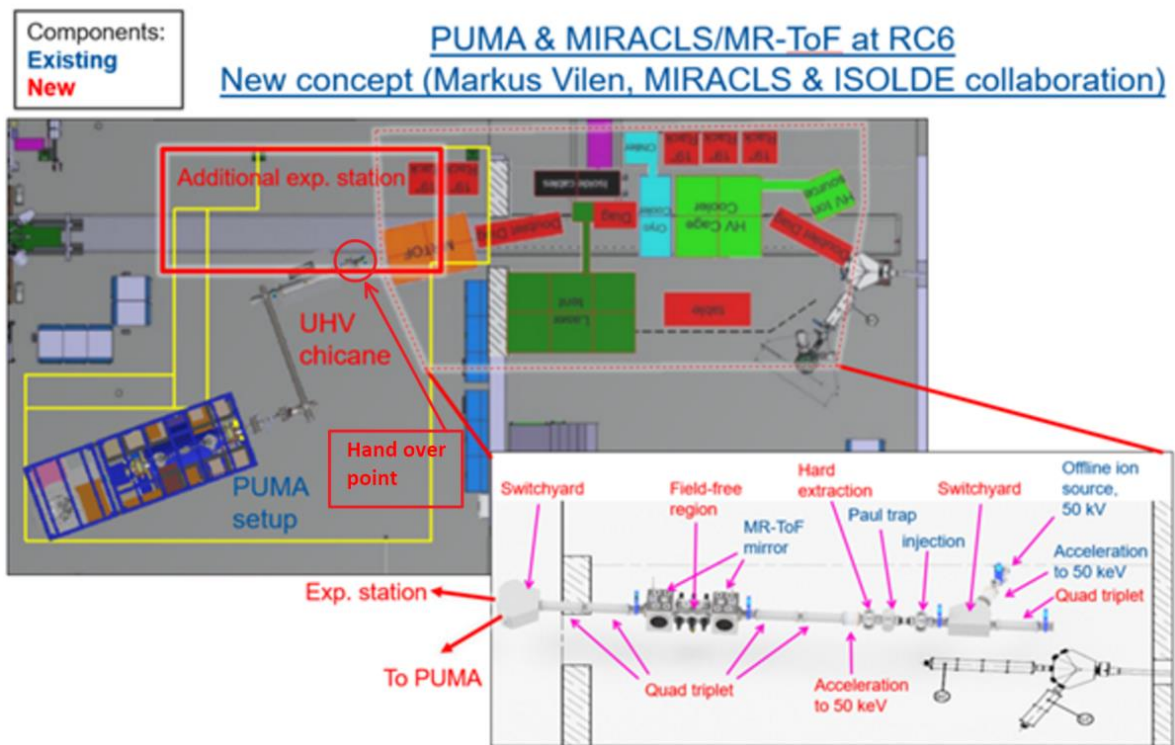


Figure 1: General view of the ISOLDE hall with the new beam line and the PUMA experimental area (Beam right to left).

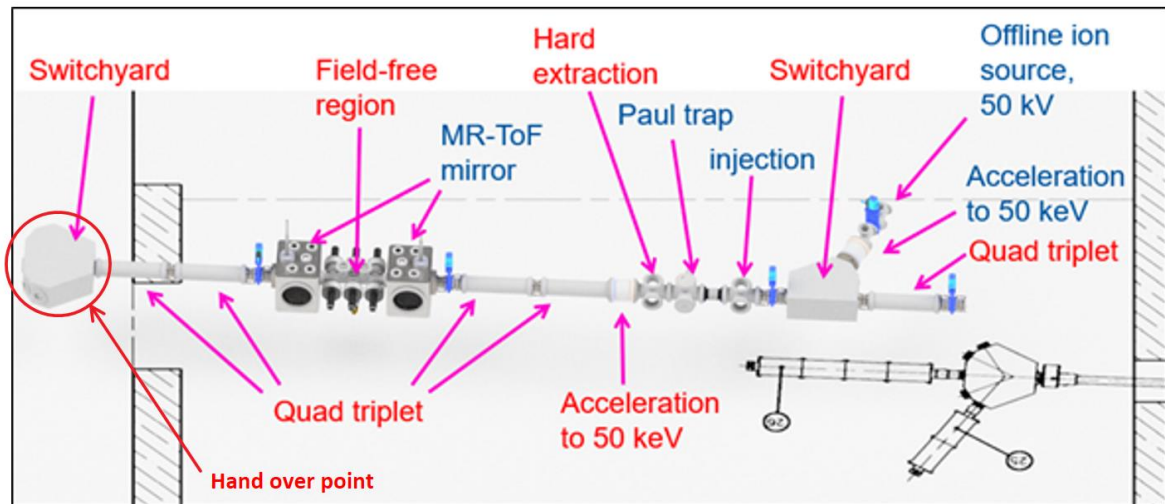


Figure 2: CERN part of the new beam line and the PUMA experimental area (Beam right to left).

2. ORGANISATION

The activity is coordinated by SY-STI, via a dedicated Project structure detailed in this section. The different WPs described in the current document are responsibility of the respective Group in charge of the activity and report to the Project Leader.

- **Project Leader – Oliver Aberle (SY-STI), Deputy Erwin Siesling (BE-OP)**
 - The role is to coordinate the execution of the works as well as to make sure that budget is available for the approved activities. He proposes scoping increase or decrease depending on the situation.
- **PUMA@ISOLDE Infrastructure Technical Coordinator (PAIITC)– Oliver Aberle, Deputy Erwin Siesling (EDMS 2708234)**
 - The technical coordinator is responsible for the follow-up of the planned activities and supervise the coordination of the entire activity. The Project Leader reports to the SY-STI management.
 - The mandate of the PAIITC is available at EDMS 2708234.
- **Project Engineer(s)** A. Obertelli (TUDa), W. Bartmann (SY/ABT), J. Ferreira Somoza (TE/VSC)
 - Support the execution of the tasks and objectives via the respective work packages and critical tasks.
- **Project Safety Officer (PSO) – R. Mouret (HSE-RP) tbc**
- **Planning Officer (PO) – S. Mataguez (BE-OP) tbc**
- **RSSOs –Sven de Man (SY-STI)**
- **RP Physicist: Fabio Pozzi (HSE-RP)**

- Provide expert advice to WP1 for the definition of the radiation protection measures applicable to both worksites (AD hall, ISOLDE hall) and the road transport on site.

- **RP Officer: A. Dorsival (HSE-RP)**

The proposed structure is supposed to remain in place until the completion of the project, currently foreseen for 2023.

3. WORK PACKAGES DESCRIPTION

The activity is divided into 4 work-packages dealing with various parts of the Projects.

- **WP1: Management and Coordination [O. Aberle, SY-STI, E. Siesling BE-OP]**
 - Coordinate the study and the implementation of the modification to the ISOLDE experimental hall and associated beamline required to install and operate the PUMA experiment at ISOLDE.
 - Compile an updated ECR for the planned modifications to the facility, including the resources required in terms of both workforce and budget.
 - Ensure that the proposed plans for all technical modifications associated with the facility documented in the ECR be approved or endorsed at the relevant committees (INTC, ITCM, IEF, ISCC, etc.);
 - Organize regular technical meetings dedicated to the implementation of the facility modifications with all relevant partners. These meetings should bring together the ISOLDE, PUMA and MIRACLS collaborations, and the various support/services groups implicated.
 - Follow-up on actions decided in this technical meeting.
 - Request and coordinate interventions from support groups for the modifications of the facility.
 - Liaise between the PUMA Collaboration, the other collaborations when required, the EP Safety Unit, the BE/OP/ISO section, the SY/ABT Group as well as HSE Unit experts to assess the technical feasibility and the safety aspects of the installation required for the PUMA physics program in the ISOLDE facility.
 - Manage the budget allocations dedicated to the implementation of the PUMA@ISOLDE, as documented in the ECR. Propose budget adjustments to Management in case of need via the SY-STI management.
 - Provide an integration layout of the new beam line RC6 and the PUMA experiment implementation in Catia.
- **WP2: The RC6 beam line [W. Bartmann, SY-ABT]**
 - The work package will be responsible for the optics modelling of the electrostatic devices and the design and construction of missing beam line elements.

- Prepare line design with optics and survey in MADX.
- Iterate specs for converters and electrostatic elements.
- Check schedule/budget of production/delivery for electrostatic HW, converters, interlocks and update preliminary planning/budget.
- **WP3: Vacuum [J. A. Ferreira Somoza, TE-VSC]**
 - Iterate specifications for vacuum, both on RC6 beam line and PUMA experiment side.
 - Check schedule/budget of production/delivery for chambers/pumps/valves and preparation for UHV (e.g. bake out, NEG coating and qualification tests), update preliminary planning/budget.
- **WP4: Beam instrumentation [W. Andreazzi, SY-BI]**
 - Provide beam instrumentation (HIE-ISOLDE diagnostic boxes, quantity 5? tbd), compatible with UHV (bakeable).
- **WP5: Handling and transport [R. Rinaldesi, EN-HE]**
 - The work package is tasked to define and provide existing tools and equipment to transport the experimental set-up from the AD hall to the test position in ISOLDE to the working area.
 - Responsibility for providing any new tools that may be needed during the entire sequence in agreement with WP2, WP3 and WP4.
 - Assures and verifies handling manipulations for the entire process and (building cranes, vehicles, etc.).
 - Follow-up of the crane modification
- **WP6: BEAM optics [A. Obertelli, (TUDa)]**
 - The beam optics is strongly dominated by the Paul trap and the MR-TOF. The overall ion optics simulation (simion) by PUMA includes also the RC6 part including these elements (trap and MR-TOF), optics models of the electrostatic elements provided by WP 2.

4. COORDINATION

4.1 Phasing and Schedule

The activities described in Section 3 are planned to be executed during 2022 and 2023. Both operational schedule of AD and ISOLDE have to be considered. Therefore, the planning ([EDMS 2744575](#)) will be adapted to comply with existing operational priorities.

The planning of the entire Project activities is kept under the overall responsibility of SY-STI, with regular feedback from BE-OP, EN-HE, SY-ABT and TE-VAC.

4.2 Safety Organization

The Project PSO shall be kept up to date of all matters associated to Safety aspects of the Project. The mandate of the PSO is based on [GSI-SO-7](#). The Visit d'Inspection Communes (VIC) will be responsibility of each WP holder group, and the Project PSO will participate and give advice if required. The Project PSO is also responsible for the safety associated with the following work packages (also indicating the WP holder).

The holders of the following work package are assumed to be fully responsible for the safety assessment of their work and related subcontractors, due to the specificities of the executed activities.

4.2.1 Safety Coordination and Category

In reference to the planning [EDMS 2744575](#), all the Project's WP are defined as Category 2 and shall be managed according to the GSI-WS-1 ([EDMS 1440245](#)).

The Work Package leaders shall manage their activities according to the type of the category of work, in compliance with the GSI-WS-1.

4.3 Meetings

The Project activities are discussed in detail during the regular Project meetings. All relevant Groups are expected to be represented there.

The following meetings are organized. The chair of the respective meeting is also mentioned. The holders of the different work packages are expected to participate.

- PUMA@ISOLDE, PAII

(chair: O. Aberle scientific secretary: Q. Demassieux)

- o INDICO link: <https://indico.cern.ch/category/15189/>
- o Steering of global activities related to the integration and installation of the PUMA experiment, the MR-ToF and adjacent new beam line and discussions of the different work packages associated with the Project.
- o Affected WP: **all**

- A dedicated e-group has been created: PUMA-ISOLDE-coordination@cern.ch

4.4 Reporting

The Project structure reports to the SY-STI Management. The activity interfaces with the SY-STI, BE-OP, BE-ATB and HSE-RP Management to avoid clashing of resources and planning.

The different WPs reports directly to PAII Project Leader.

4.5 Budget Codes

The Project is funded by...

Radiation Protection supervision, and personnel follow-up will be covered by HSE-RP budget.

Similarly, transport and heavy handling operational costs will be covered by EN-HE central budget (tbc). The work under work package 2, including vacuum related, will be covered by XXX. The part after the handover point is taken by the PUMA collaboration.

5. WP MANAGEMENT

5.1 Deliverables and Milestones

Key deliverables are available for the various parts of the project. Detailed planning and milestones definition is available in the planning document [EDMS xxxxxx](#).

- **June 2022** – Project kick-off
- **End of June 2022**
 - Release of the PMP for PUMA@ISOLDE (Responsibility: WP1 with contributions from all stakeholders)
 - Start technical meetings
- **July 2022**
 - **MS: Updated ECR**
 - Schedule and Budget revision
- **Q3 2022**
 - Emittance measurement of low-energy beam
 - Optics model and beam parameters at RC6 (Responsibility: WP 6)
- **Q4 2022**
 - Design HW (Responsibility: WP 2)
 - Produce integration drawings (Responsibility: WP 1)
 - **MS: Beam line review - Integration**
- **Q1 2023**
 - Procurement
 - Manufacturing of beam line elements
- **Q1 2023**
 - Procurement
 - Manufacturing of beam line elements
- **Q2 2023**
 - Produce HW (electrostatic elements and differential pumping stage)(Responsibility: WP 2)
 - Produce HW (power converters, interlocks)(Responsibility: WP 2)
 - Start beam line installation

- **Q4 2023**
 - Readiness for first beam
- **Q1 2024**
 - First beam to PUMA @ ISOLDE

5.2 Interfaces

Critical milestones are related to:

- Agreement between all stakeholders for the PMP (**June 2022**)
- ECR approved (**July 2022**)
- Optics model and beam parameters for RC6 (**October 2022**)
- Readiness of HW (**July 2023**)
- Ready for beam in ISOLDE (**October 2023**)

5.3 Schedule

The schedule is kept up to date at [EDMS 2744575](#) and a screenshot of linear schedule is reported in Figure 1. It shows the activity divided per areas in the Isolde hall, divided for the different work packages.

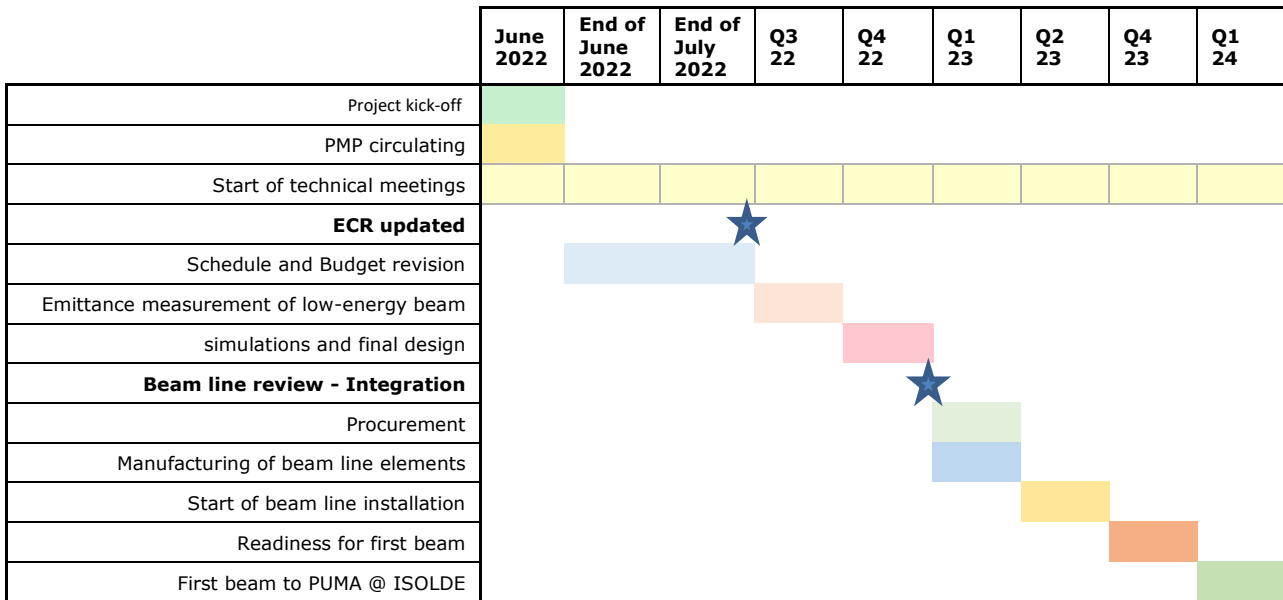


Figure 3 — Screen shot of linear planning

6. REFERENCES

- 1) Experimental Proposal for PUMA: antiprotons and radioactive nuclei, PUMA Collaboration, A. Obertelli et al.
- 2) General Safety Instruction GSI-SO-7 – Project Safety Officer (PSO)
(https://edms.cern.ch/ui/file/1410233/LAST_RELEASED/GSI-SO-7_E.pdf)
- 3)