Brief update on MTP planning: ISOLDE Improvement Program

J. A. Rodriguez, J. Vollaire, E. Siesling – ISCC – 06.11.2024

Main requests and status:

- **BTY line 2 GeV upgrade (long lead items approved):**
  - Consolidation of the beam dumps approved and compatible with 2 GeV operation.
  - Consolidation of power converters compatible with 2 GeV operation approved.
  - Replacement of the last focusing doublets compatible with 2 GeV operation approved.
  - Study group in place to design and prepare the reconfiguration of the beam line for 2 GeV.
- **Consolidation of REX RF amplifiers and LLRF and RF issues:**
  - Consolidation of the 101 MHz systems (RFQ, IHS, 7GP1, 7GP2, 7GP3) approved.
  - Consolidation of the 202 MHz systems (9GP) will be included in the request.
  - Path to address the issues with 9GP vacuum, IHS phase/power jumps and 7GP1 / 7GP3 instabilities in place.
- **Consolidation of SRF cavities and spare cryomodule:**
  - Request to consolidate CM1 during LS3 not yet decided but endorsed by RF group. Negotiations with other groups on-going. Early start of LS3 for ISOLDE (2026) beneficial.
  - Manufacturing of the spare cryomodule (CM5) only possible after LS3.
  - Consolidation of other cryomodules without impact on physics program only possible with CM5.
- Multiple other requests for improvement in the spare slides.

BTY line, targets, beam ionization and hall platforms:

System / Area		Issue / Request	Status
BTY line	Magnets	New focusing quadrupoles (x4) New steerers and new dipoles for 2.0 GeV	Design study launched (procurement approved) Specification ongoing
BTY line	2 GeV upgrade	Physical reconfiguration of the vertical bend in the PS Booster, new vacuum chambers, handling systems, new supports….	Will be included the MTP request. Excellent support from technical groups for the study.
RILIS	Extension of the laboratory	Study and design of an extension of the laboratory to increase the working area available and meet the growing demand for laser ionized beams.	Request to fund the study (feasibility) will be included in the request. Very preliminary budget estimate provided to CONS.
ISEG EPC racks	Equipment platform	Funding for a new equipment platform that will be used to host the new ISEG racks (i.e. electrostatic power converters). Addional floor space will be liberated.	Extension of the platform at the end of the hall (Build. 508 side). To be done at the end of the YETS 2024/25.
CRIS / COLLAPS / ISOLTRAP	Equipment platform	Funding forr a new equipment platform above the CRIS and COLLAPS to liberate floor space around the experimental stations.	Supported by EP. Study under way.

BTY line and ISOLDE separators / low-energy transfer lines:

System / Area		Issue / Request	Status
Separators	Beam gates system	Consolidation and integration of the beam gates system in the CERN control system.	Prototype system (proof of concept) in place. New system planned for LS3.
	Field probes	Consolidation of the field probes in the HRS dipole magnets.	Under discussion. Consolidation of power converters already approved.
Central line	Pulsing system	Develop a pulsing system to allow fast changes changes of configuration of the line (i.e. able to alternate between beam from GPS and HRS).	Pulsing hardware currently under development. Power converters in consolidation plan. Software by OP during LS3.
Cooler/buncher	Buffer gas supply system	Replace buffer gas supply system with one with additional instrumentation outside the HT cage.	Supported by SY-STI. Will be included in the request.
	Misalignenment at extraction	Understand the source the transverse kick the beam receives at the extraction and correct the situation.	Supported by SY-STI. Extraction triplet will be examined during the 2024/25 YETS.
	Pumping / storage tanks	Study the feability of releasing the pumped gas directly not using the temporary storage tanks.	Supported by VSC. Will be discussed with RP before deciding to include it in the request.
Instrumentation	Beam time structure	Additional instrumentation to be able to measure the beam time structure out of the cooler/buncher.	Prototype for PUMA under development. Additional unit(s) being considered.

The REX/HIE-ISOLDE post-accelerator:

System / Area		Issue / Request	Status
REXTRAP - cooler/bunchers		Address some of the issues with discharges in the REX/TRAP, improve performace of the cooler/buncher, work on the development of a new design.	Supported by ABP group. A fellow will be requested to work on the REXTRAP and cooler/bunchers desing/improvements.
REX RF	IHS	Find source and solve issue with the random phase and power jumps observed during the last couple of years.	Being investigated. Cables/connectors to be replaced during the 2024/25 YETS.
	7GP1 / 7GP3	Find the source and solve the issue with the RF instabilities for high RF peak powers (i.e. A/q>4.0).	Situation should improve after 101 MHz RF amplifiers + LLRF consolidation. To
	9GP RF structure	Repair of the vacuum leak in the RF structure.	Structure will be open during LS3. New seals will be produced and installed.
	9GP LLRF system	Consolidation of the LLRF systems. Replacement by a digital system (similar to the 101 MHz ones).	Supported by SY-RF. Will be included in the request.
	9GP RF amplifier	Consolidation of the 202 MHz RF amplifier. Replacement by solid-state technology (similar to the 101 MHz ones).	Supported by SY-RF. Will be included in the request.
	Support in case of issues	Upgrade support from day-time to best-effort/stand-by.	Not before LS3. Decision will be revisited at that time (new LLRF / solid state amplifiers).
REX magnets	Cooling of IHS inner triplet	Improvement of the cooling system of the inner triplet in the IHS structure (e.g. increase of the water flow).	Under discussion.
Instrumentation	Calibration slits	Recalibrate all the collimators and slits in the linac.	Under discussion.

The REX/HIE-ISOLDE post-accelerator:

System / Area		Issue / Request	Status
REX vacuum	Additional pumping units	Additional pumping to improve vacuum in the vicinity of CM1 to avoid degradation of the SRF cavities.	Supported by VSC group. Will be included in the request.
HIE-ISOLDE SRF	CM1	Consolidation of SRF cavities in CM1 to recover the degrading gradients.	Endorsed by RF group. Negotiation with other groups on-going. Will be included in the request for LS3.
	CM5	Building of a spare cryomodule to replace other cryomodules in the machine while consolidated.	Only possible after LS3. Supported by SY-RF-SRF. Not yet approved by management. Will be included in the request.
	CM2, CM3, CM4	Consolidation of the SRF cavities in other CMs.	No impact on physics only if CM5 is available.
HIE-ISOLDE cryogenics	LN2 cooling system	Study, design and implementation of a LN2 cooling system that can be used to maintain CMs at ~90K during the YETS.	Converged to LN2 / GHe heat exchanger. Study and design will be included in the request. Possible implementation at a later stage.
	2kL LHe dewar	Integration and commissioning of the LHe dewar to minimize the impact on the SRF cavities in case of non-scheduled interruption of the cryoplant.	Endorsed by TE-CRG. Will be included in the request. Most likely available after LS3.
HIE-ISOLDE vacuum	Active pumping	Maintain the pumping of the cryomodules during YETS and LS.	In place since 2024. Stops of the pumping system will be minimized in the future.