Personnel Protection of the CERN SPS North Hall in Fixed Target Primary Ion Mode

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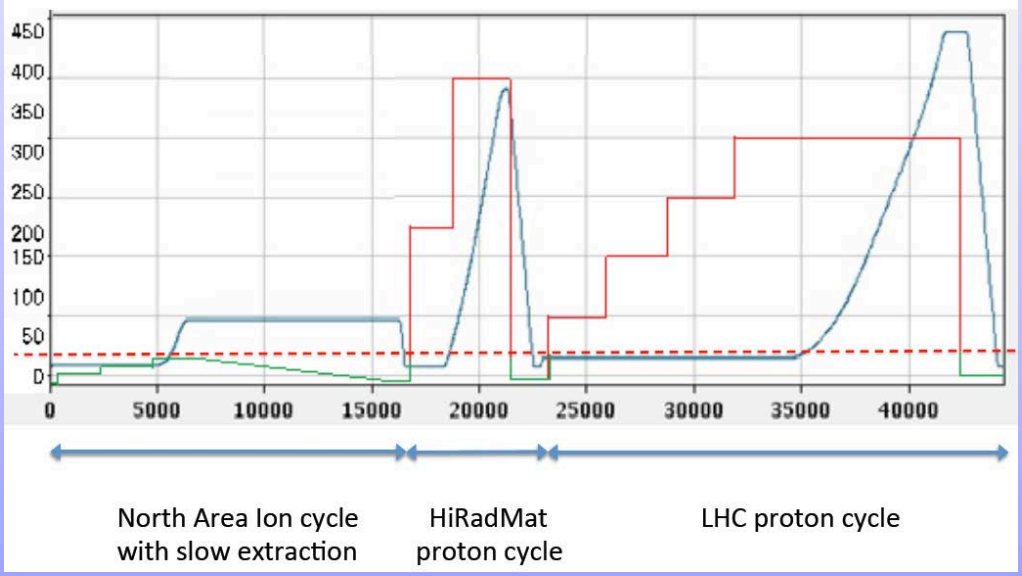
Motivation – Why a New Interlock?

- SPS beam can be extracted into the North Area experimental hall in two modes: as secondary protons or primary ions.
- **In the past**, switching from proton to ion mode has required an injector configuration change, which has prevented accidental mixing of the two modes.
- **In the future**, both proton and ion cycles can be present in the same super-cycle ➔ it might be theoretically possible to extract a wrong type of beam.
- **High intensity primary proton beam extracted without collimation into the experimental areas would expose personnel to a radiation hazard.**



How to Mitigate – Technical Solution

- A **special-purpose interlock** to prevent extraction of a high intensity proton beam from the SPS when running with a mixed ion-proton super-cycle.
- Two Beam Current Transformers (BCT) at SPS point 5 **measure the beam current** (intensity) signaling any intensity higher than threshold.
- Interlock **inhibits pulsing of the extraction elements** at SPS point 2.
- Safety system based on a **diversely redundant design** respecting IEC 61511.
- Two interlock chains with **total back-to-back response time < 100 ms**.
  - PLC chain: SIEMENS S7 CPU and remote I/O with fiber optic cabling.
  - Wired chain: HIMA Planar 4 modular safety-certified wired logic.