**ENUBET Hadronic Transferline**

- A short (~20m) transferline followed by 40m long decay tunnel
  - Primary proton interactions in the Target simulated with FLUKA. Various proton drivers considered: 400 GeV, 120 GeV, 30 GeV protons
  - Optics optimized with TRANSPO - results implemented in G4Beamline for full transport and interaction simulation
  - Reference momentums: 8.2 GeV ± 1.0% → Best configuration achieved:
    - *quadrupole triplet* → *bending dipole* → *quadrupole triplet*
  - Magnet apertures 15 cm, dipole length 1.8 T → 7.4° bending, quad fields in the range 5-11 KG
  - Optimization performed with regards to:
    - Number of K* and π* at tunnel entrance in the momentum range of interest
    - Total Length of the Transfer Line → minimized to reduce kaon decay losses
    - Beam Size → non decaying particles should exit the decay tunnel without hitting the tunnel walls.
    - Magnet Field and Apertures → use of normal conducting, conventional magnets
    - Level of Background transported to the tunnel → affects S/N of identified e^-
    - Constrain on sources of systematics provided by distribution of particles in the decay tunnel, their energy and polar angle → no info is needed from particle production in the target

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**Static Transferline**

- Performance significantly better than proposal estimates [1] → K decay 4 times higher than result of optic optimization
- Several advantages: cost, technical implementation and performance of particle ID. First step towards tagged beams.
- ~50% of K* decay in the 40m long instrumented decay tunnel

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**ENUBET (Enhanced NeUtrino BEams from kaon Tagging)**

- A novel *ν source* from K→e^+ π^- ν_e decays by tagging the e^+ in an instrumented decay tunnel
- Reduce systematic on neutrino flux to O(1%) level by monitoring the positrons produced at large angle in the decay tunnel of conventional neutrino beams
  → Improve by ~1 order of magnitude precision on ν_μ & ν_e cross sections
- New generation of neutrino cross section experiments with unprecedented control on the flux
- First step towards time-tagged ν-beam; the ν at the detector is correlated with the lepton in the tunnel
- Highly beneficial to long baseline ν_e → ν_x programs

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**Horn-based Transferline**

- A narrow band transfer-line based on ENUBET slow proton extraction (few ms) + horn pulsed for 2-10 ms
- On-going studies at CERN to implement the synchronization of a slow-extracted spill with a pulsed strong focusing system → enhance output of neutrino flux keeping a reasonable pile-up threshold
- Recent test results @ CERN confirmed the proof-of-concept of feed-forward burst spill optimization: Autospill-Burst leads to a burst length optimization from 200 → 10-16 ms
- From this benchmark more degrees of freedom to explore full simulation and address remaining issues towards full operability

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**References**

[2] CERN-SPSC-2016-056 / SPSC-043/14 Enabling proton measurement of flux in undetected neutrino source: the ENUBET project ENUBET Collaboration
[3] INFN A-2016-0111A A compact 480 MeV proton beam line with longitudinally segmented double collimators. A. Bertini et al

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**CERN-BE-OP-SPS**