ENUBET: decay tunnel instrumentation for neutrino beams

**Physics programme**
- Improve by one order of magnitude the $\nu_e$ and $\nu_\mu$ cross sections
- Highly beneficial to future long baseline $\nu_e \rightarrow \nu_\mu$ programs
- First step towards a time tagged neutrino beam: direct $\nu$ production/detection correlation

**Enhanced NeUtrino BEams from kaon Tagging**
- New concept to measure the neutrino flux by monitoring positron from $K^+ \rightarrow \nu_\mu e^+ \pi^0$ decays on an event by event basis
- **Calorimeter system** to instrument the decay tunnel of a narrow band neutrino beam

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ENUBET @ SPS, 400 GeV, 500 ton detector

Photon Veto
- Below the UCM 3x3 cm$^2$ plastic scintillator doublets with WLS fibers readout by SiPM
- Tag positron from $K^+$ decays and rejects $e^+e^-$ pairs produced in $\gamma$ conversion from $\pi^0$

**Photon Veto characterization**
- Single MIP response: 24 photo-electrons
- Light collection efficiency > 95%

results of test beam @ CERN-PS:
- Timing resolution of 400 ps

**1 m.i.p/2 m.i.p. separation studies**
- Tuning of a composite model using test beam data (CERN-PS) of 1 single tile MC simulations $\rightarrow$ pdf sum of 2 or 3 tiles
- Results:
  - using a cut on the sum of 3 tiles signal integrals that maximize the significance
  - Purity > 80 % for $N_e/N_\mu = 1 \%$
  - Purity > 90 % for $N_e/N_\mu = 1 \%$

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**REFERENCES**