The ENUBET experiment

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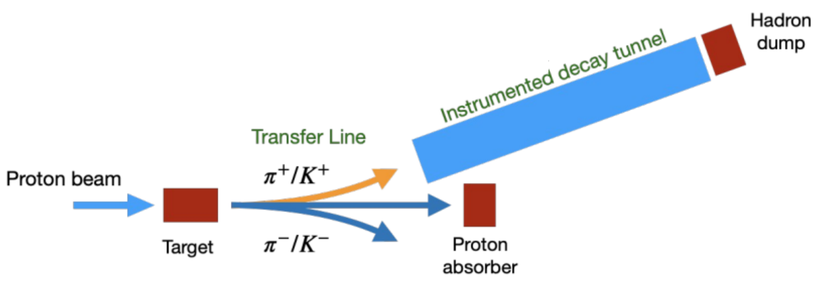
Abstract A part of the challenge in any neutrino experiment is the uncertainty in a priori knowledge of both neutrino interaction cross section and flux at the source. By monitoring the charged lepton production at the decay tunnel, these uncertainties can be reduced by one order of magnitude. Enhanced NeUtrino BEams from kaon Tagging (ENUBET) and its monitored neutrino beam is one of such proposals. This poster aims to present ENUBET project and its position in the landscape of CP violation measurement efforts.

Introduction

ENUBET (**E**nhanced **Ne****U**trino **BE**ams from kaon **T**agging): a **monitored beam** experiment aiming to reduce neutrino interaction cross section uncertainty



Monitored beam is a beam where the production of neutrinos is monitored in a direct manner measuring the rate of leptons produced in the decay tunnel.

$$K^+ \rightarrow e^+ + \nu_e + \pi^0 \qquad \pi^+ \rightarrow \mu^+ + \nu_\mu$$

Monitoring of positrons and muons from Kaon and Pion decays

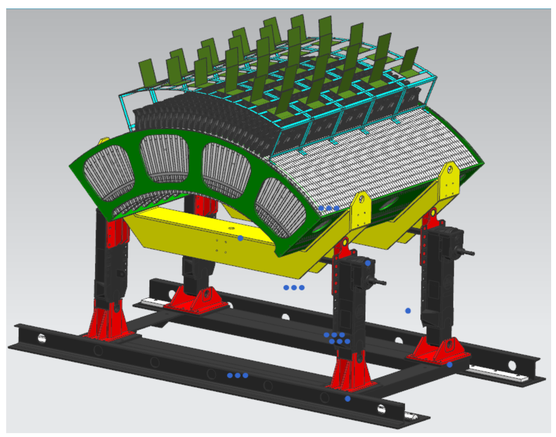
Monitoring

Possibility of a particle-by-particle association between the leptons in the decay tunnel and the ν CC interaction in the neutrino detector

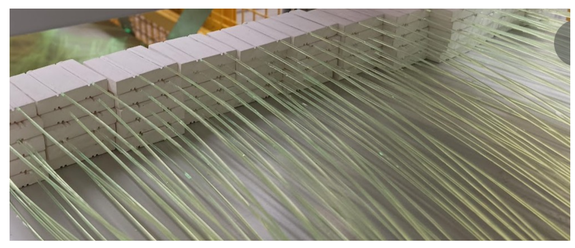
Reducing flux uncertainty to < 1%

The tagger demonstrator

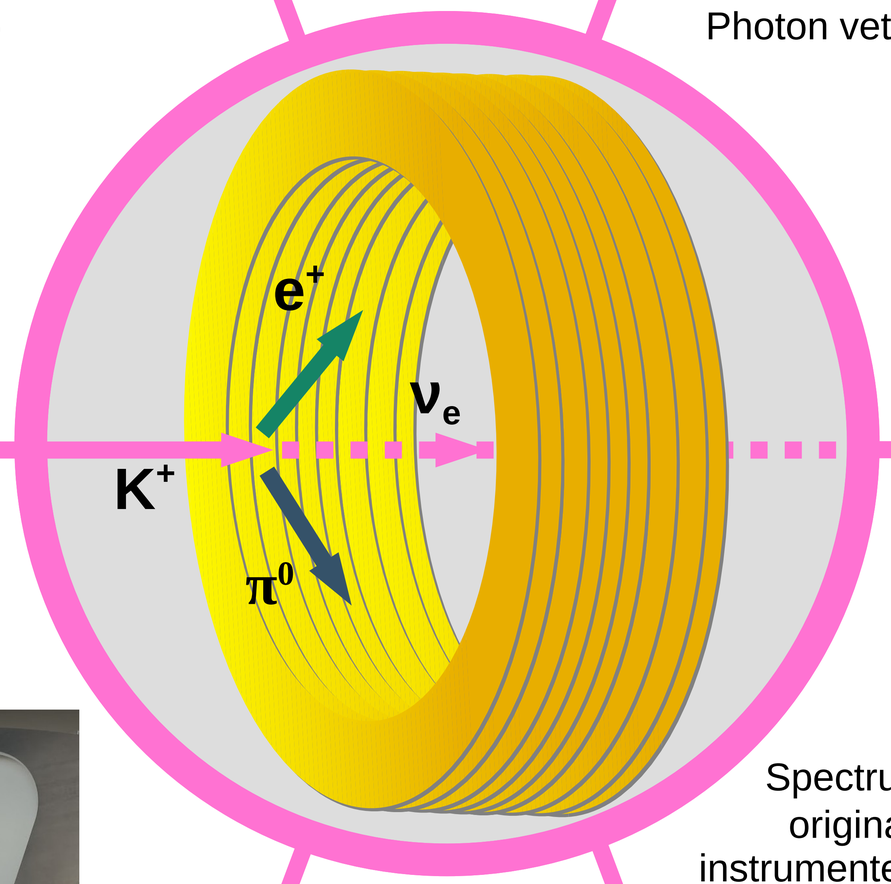
Calorimeter with longitudinal segmentation - Plastic scintillator (0.7 cm) + iron absorbers (1.5 cm)



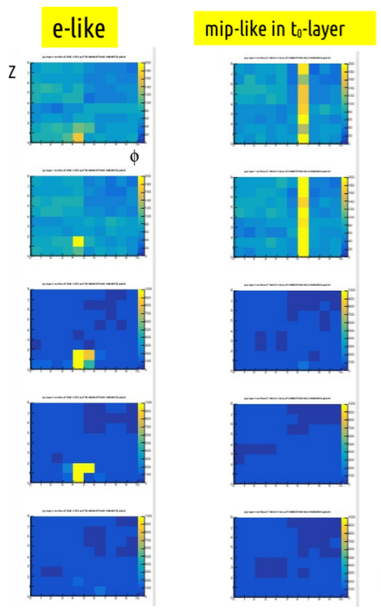
Photon veto (π^0 rejection) using plastic scintillator rings



Light collection and readout with WLS fibers and SiPM



Testbeam 2022 @ CERN



2 week testbeam in October 2022 at CERN-PS-T9

Complete analysis still ongoing!

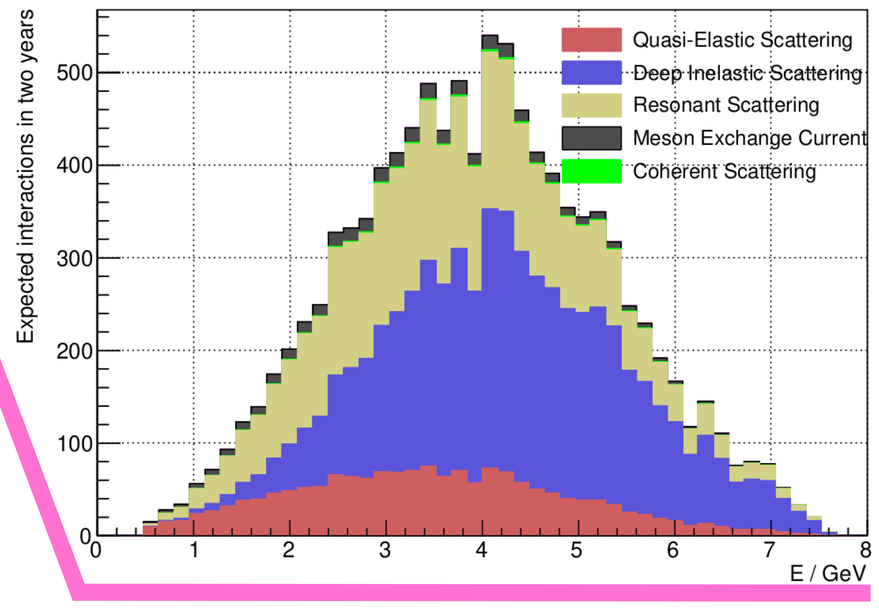
Neutrino interactions

500 t liquid argon detector
50 m from the decay tunnel end

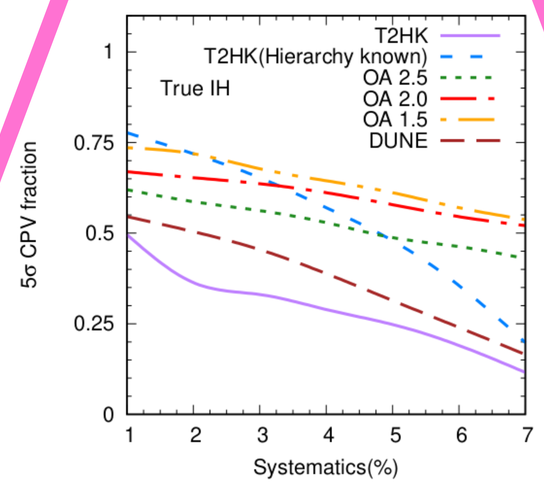
Spectrum of ν_e that originated in the instrumented decay tunnel

GENIE simulation using the flux provided by Geant4 simulation of the beamline

~10 000 ν_e interactions in 2 years



CPV



References & Acknowledgments

1) M. Ghosh, O. Yasuda, *Effect of systematics in the T2HK, T2HKK, and DUNE experiments*, Phys.Rev.D 96 (2017) 1, 013001
2) F. Acerbi et al., CERN_SPSC_2021-013, SPSC-SR-290, Geneva, 2021
3) A. Longhin, ENUBET: monitored neutrino beam for high precision cross section measurements, talk at NuInt2022

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Testbeam @ CERN Oct 2022