

High precision neutrino cross section measurements with ENUBET: assessment of systematics in monitored neutrino beams

Friday, 21 June 2024 17:30 (2 hours)

The ENUBET project recently concluded the R&D for a site independent design of a monitored neutrino beam for high precision cross section measurements, in which the neutrino flux is inferred from the measurement of charged leptons in an instrumented decay tunnel. In this phase three fundamental results were obtained and will be discussed in this talk: 1) a beamline not requiring a horn and relying on static focusing elements allows to perform a ν_e cross section measurement in the DUNE energy range with 1% statistical uncertainty employing 10^{20} 400 GeV protons on target (pot) and a moderate mass neutrino detector of the size of proto-DUNE; 2) the instrumentation of the decay tunnel, based on a cost effective sampling calorimeter solution, has been tested with a large scale prototype achieving the performance required to identify positrons and muons from kaon decays with high signal-to-noise ratio; 3) the systematics budget on the neutrino flux is constrained at the 1% level by fitting the charged leptons observables measured in the decay tunnel.

Based on these successful results ENUBET is now pursuing a study for a site dependent implementation at CERN in the framework of Physics Beyond Colliders. In this context a new beamline, able to enrich the neutrino flux at the energy of HK and to reduce by more than a factor 2 the needed pot, has been designed and is being optimized. The civil engineering and radioprotection studies for the siting of ENUBET in the North Area towards the two protoDUNEs are also in the scope of this work, with the goal of proposing a neutrino cross section experiment in 2026. The combined use of both the neutrino detectors and of the improved beamline would allow to perform cross section measurements with unprecedented precision in about 5 years with a proton request ($<0.5 \times 10^{18}$ pot/year) compatible with the needs of other users after CERN Long Shutdown 3. An update on the status of these studies and future plans will be presented.

Poster prize

Yes

Given name

Filippo

Surname

Bramati

First affiliation

University and INFN of Milano-Bicocca

Second affiliation

Institutional email

filippo.bramati@mib.infn.it

Gender

Male

Collaboration (if any)

On behalf of NP06/ENUBET Collaboration

Primary author: BRAMATI, Filippo (Istituto Nazionale di Fisica Nucleare)

Presenter: BRAMATI, Filippo (Istituto Nazionale di Fisica Nucleare)

Session Classification: Poster session and reception 2

Track Classification: Accelerator neutrinos