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The ENUBET project: a monitored neutrino beam

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The ENUBET project intends to reduce the flux related systematics in an accelerator neutrino beam to the 1% level by monitoring associated charged leptons produced in a narrow band meson beam. Large angle leptons from kaon decays are measured in an instrumented decay tunnel, while low angle muons from pions can be monitored after the hadron dump.
A general overwiev of the ENUBET physics program will be presented with particular focus on the beamline design.

A key element of the project is the design of a meson transfer line with conventional magnets that maximizes the yield of K+ and π+, while minimizing the total length to reduce meson decays in the not instrumented region. In order to limit particle rates on the tunnel instrumentation, a high level of beam collimation is needed, thus allowing undecayed mesons to reach the end of the tunnel. At the same time a fine tuning of the shielding and the collimators is required to minimize any beam induced background in the decay region.

The transfer line is optimized with TRANSPORT and G4beamline simulations for 8.5 GeV/c mesons with a momentum bite of 10%, considering various proton drivers and target designs. Doses are estimated with a full FLUKA model. The current envisaged beamline is based on conventional quadrupoles and dipoles and provides a large bending angle that can ensure a reduced background from the untagged neutrino component at the neutrino detector. This contribution will report details on the up-to-date design in terms of particle yields at the decay tunnel and expected neutrino fluxes at the far detector.

Doses at the second dipole do not prevent the use of a superconducting magnet, that, increasing the bending angle, could improve the background suppression and the separation of the monitored neutrino component from other neutrinos: glimpses of such a design will be also shown.

In addition, studies on an alternative secondary site-dependent beamline with a broad momentum range (4, 6, 8.5 GeV/c), that could enhance the physics reach of the facility, will be discussed.

Working group

WG3

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