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The ENUBET Demonstrator: beamtest characterization across the years

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The goal of ENUBET is to develop the first monitored neutrino beam for high precision cross section measurements, in which the neutrino flux in the Hyper-Kamiokande and DUNE energy range is inferred from the measurement of charged leptons in an instrumented decay tunnel. The systematic uncertainties that usually afflict the estimate of the neutrino flux are suppressed by measuring in an instrumental decay tunnel the associated charged leptons produced in the decay of the K .

The collaboration has recently completed the beamline design and tested the tunnel instrumentation technology with a large-scale prototype.

This talk will describe the Demonstrator, a large scale prototype of the instrumented decay tunnel (3 m long and 90° in the radial direction), consisting of a sampling calorimeter with longitudinal, azimuthal and radial segmentation and composed of iron and plastic scintillators, whose light is collected by WLS fibers and read-out by SiPMs.

The first implementation, with 400 channels, has been tested at the T9 CERN-PS beamline in 2022. An upgraded prototype with 1200 readout channels has been successfully tested on the same beamline in 2023 and 2024. The results in terms of linearity and energy resolution will be described, together with the study of possible crosstalk effects, its PID capability and comparison with the MC simulations.

During the beamtests of 2023 and 2024 the Demonstrator has been tilted, in order to simulate the impinging of the charged leptons produced in the decay of the K and the results on the energy resolution will be presented.

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