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Status of the ENUBET monitored neutrino beam

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The ENUBET experiment, included in the CERN Neutrino Platform effort as NP06/ENUBET, is developing a new neutrino beam based on conventional techniques in which the flux and the flavor composition are known with unprecedented precision ($\mathcal{O}(1\%)$). Such a goal is accomplished by monitoring the associated charged leptons produced in the decay region of the ENUBET facility. Positrons and muons from kaon decays are measured by a segmented calorimeter instrumenting the walls of the decay tunnel, while muon stations after the hadron dump can be used to monitor the neutrino component from pion decays. Furthermore, the narrow momentum width ($<10\%$) of the beam provides a precise measurement ($\mathcal{O}(10\%)$) of the neutrino energy on an event by event basis, thanks to its correlation with the radial position of the interaction at the neutrino detector. ENUBET is therefore an ideal facility for a high precision neutrino cross-section measurement at the GeV Scale, that could enhance the discovery potential of the next generation of long-baseline experiments, and for the study of non-standard neutrino models.

We report here a new improved design of the proton target and of the meson transfer line, that ensures a larger neutrino flux while preserving a purity in the lepton monitoring similar to the one previously achieved. The final design of the ENUBET demonstrator for the instrumented decay tunnel, which is due by the end of 2021, will be also discussed. It has been determined on the basis of the results of the 2016-2018 testbeams and will prove the scalability and performance of the selected detector technology. Progress on the full simulation of the ENUBET facility and of the lepton reconstruction, towards the full assessment of neutrino flux systematics, will be also reported.

Collaboration name

NP06/ENUBET

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