



Contribution ID: 143

Type: Parallel Flash talk

## Long-baseline tagged neutrino experiments with megaton scale water Cerenkov detectors

Friday, 26 February 2021 12:10 (5 minutes)

Long-baseline neutrino experiments using megaton scale water Cerenkov far detectors can accumulate very large neutrino samples -  $\mathcal{O}(10^3)\nu_e/\text{year}$  - even with moderate beam intensity -  $\mathcal{O}(100)\text{kW}$ . The presentation will show that at these intensities it is possible to instrument the beam with charged particle silicon pixel trackers to reconstruct precisely the energy, direction, initial flavour and chirality of the neutrino produced in each  $\pi^\pm \rightarrow \mu^\pm \nu$  decay.

With proper synchronisation between these trackers and the far detector, the interacting neutrinos can be associated with the one reconstructed from the  $\pi^\pm \rightarrow \mu^\pm \nu$  decay kinematics. The far detector is then only left with the identification of the oscillated neutrino flavour. This task is greatly simplified by the prior knowledge of the other neutrino properties.

In such a tagged long-baseline neutrino experiment, the individual tracking of each neutrino of the beam from production to detection greatly reduces systematic uncertainties. Added to that, the sub-percent energy resolution and the large neutrino sample size will allow to reach unprecedented precision on neutrino oscillation parameters. For instance the  $\delta_{\text{CP}}$  phase could be determined with a few degree precision across the whole  $\delta_{\text{CP}}$  range with 10 years of data of a long-baseline tagged neutrino experiment from U70 in Protvino, Russia, to a KM3NeT-ORCA like detector offshore Toulon, France.

More detailed studies will be performed with refined beam characteristics and detector layout.

### Collaboration name

**Primary author:** PERRIN-TERRIN, Mathieu (Aix Marseille Univ, CNRS/IN2P3, CPPM, Marseille, France)

**Presenter:** PERRIN-TERRIN, Mathieu (Aix Marseille Univ, CNRS/IN2P3, CPPM, Marseille, France)

**Session Classification:** New Facilities