Contribution ID: **30** Type: **Oral**

Experimental proof of principle of the Neutrino Tagging technique at NA62

Friday 25 August 2023 08:30 (24 minutes)

The neutrino tagging technique proposes to instrument a neutrino beam line with silicon trackers to kinematically reconstruct properties of individual beam neutrinos produced in $\pi \to \mu\nu_\mu$, $K \to \mu\nu_\mu$ decays. As a result, the initial neutrino flux is precisely determined and the individual neutrino energy can be reconstructed with a resolution better than 1%. Moreover, based on time and angular coincidence, the neutrinos kinematically reconstructed by the trackers can be individually associated to the neutrinos interacting in the neutrino detector, such that the precise measurement of their properties can be used for physics analyses (e.g. oscillations, cross-section). A proof of principle of the method has been performed using the NA62 experiment at CERN as a miniature neutrino experiment: its intense kaon beam copiously produces neutrinos when decaying as $K \to \mu\nu_\mu$, its spectrometers act as tagger for the charged particles, and its electromagnetic calorimeter serves as neutrino detector. A trigger line was deployed in 2022 to collect events in which a neutrino interacted in the calorimeter. This contribution presents the analysis of the data collected in 2022. To avoid potential bias, the analysis was optimized in a phase space region free of neutrino interactions. In the complementary signal region, a fraction of an event is expected. This contribution will reveal the actual content of this signal region.

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Session Classification: parallel (room#101)

Track Classification: WG3: Accelerator Physics