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Search for Neutrino Oscillation at CERN-SPS

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It is proposed to investigate in BEBC, filled with Neon, the $\nu_{\mu} \leftrightarrow \nu_e$ oscillation, which is expected if $m_{\nu_{\mu}}$ and/or m_{ν_e} are different from zero, and transitions $\nu_{\mu} \leftrightarrow \nu_e$ can occur.

The oscillation length " ℓ " is a function of the momentum p of the neutrino and of Δ , which is the $m_1 - m_2$ mass difference (m_1 and m_2 are respectively the ν_1 and ν_2 masses). A typical value of " ℓ " is 2.5 km for $p = 1$ GeV and $\Delta = 1$ eV².

It has been evaluated that about 150 ν events are expected in BEBC in 100.000 pictures per 10^{13} protons per pulse, considering the length of the ν beam at the CERN-SPS (~ 1 km), the protons extracted from the SPS at an energy close to that of injection (~ 10 GeV), and properly scaling the Argonne ν -spectrum.

With this number of events an upper limit $\Delta < 0.1$ eV² will be set with 90% confidence level.

Should the effect be there, the knowledge of the energy of each individual event will allow the determination of both Δ and θ , the mixing angle of $\nu_1 - \nu_2$.