nuSIM: parameters for first simulation of neutrino spectra

P. Kyberd and K. Long

Simulation of nuSTORM production straight

A rudimentary simulation of nuSTORM has been created in python. The simulation is based on the design presented in [1]. To initiate consideration of detector systems and sensitivities the following parameters have been adopted for the storage ring, the production straight and the muon-beam optics:

- Total ircumference: 616 m
- Length of production straight: 180 m
- Stored muon momentum (p_μ) range: $1 \leq p_\mu \leq 6$ GeV
- Momentum acceptance: $\pm 15\%$
  - Simulate a parabolic momentum distribution with limits $\pm 15\%$
- Transverse acceptance: $1 \, \pi$ mm rad
- Transverse beta function (in both transverse coordinates: 25000 mm

The transverse beta function is taken as "representative" of the production straight. It is assumed that $\alpha = 0$, and that the emittance, ϵ, (acceptance) and beta are momentum independent. The width of the transverse phase space is obtained using:

$$
\begin{aligned}
x_i &= \sqrt{\epsilon\beta} \quad ; \quad \text{and} \\
x_i' &= \sqrt{\frac{\epsilon}{\beta}} \quad ;
\end{aligned}
$$

where x_i refers to both transverse coordinates (x and y).

Neutrino flux interface specification

To be drafted.

References

[1] C. C. Ahdida *et al.*, "nuSTORM at CERN: Feasibility Study,".