VMC based T2K Beamline simulation Studies

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Introduction

T2K simulation based on FLUKA (target) + GEANT3 (beamline)

- FLUKA problematic for various reasons (licence, old versions...)

- GEANT3 also not very convenient (old FORTRAN code, 32-bit compilation...)

⟹ **At some point, one should migrate all to GEANT4**

- For transition process, extensive comparisons between FLUKA and GEANT4 (target) and between GEANT3 and GEANT4 (beamline) should be made

- Tool needed for easy comparisons between MCs

⟹ **TNuBeam Virtual Monte Carlo**

TNuBeam Virtual Monte Carlo

- VMC (Virtual Monte Carlo) is a Root-based C++ framework developed first for ALICE, providing a common interface to different MCs.

- Aimed to run in the same framework FLUKA, GEANT3 and GEANT4, but FLUKA interface not working at the moment

- User is supposed to provide some Classes for detector description, beam definition, output variables, then VMC manages event generation in the same way for GEANT3 and GEANT4.

- TNuBeam is a software developed at LPNHE by A. Robert, B. Popov and L. Zambelli in the VMC framework.

- It provides T2K (target and/or beamline) simulation based on GEANT3 and GEANT4, as well as simulation of various NA61 configurations (Thin Target, Replica Target, ...) and of HARP experiment for comparison with hadron measurements

- It can take FLUKA simulation as input for comparison with T2K (JNUBEAM) simulation

First comparison between TNuBeam and JNUBEAM
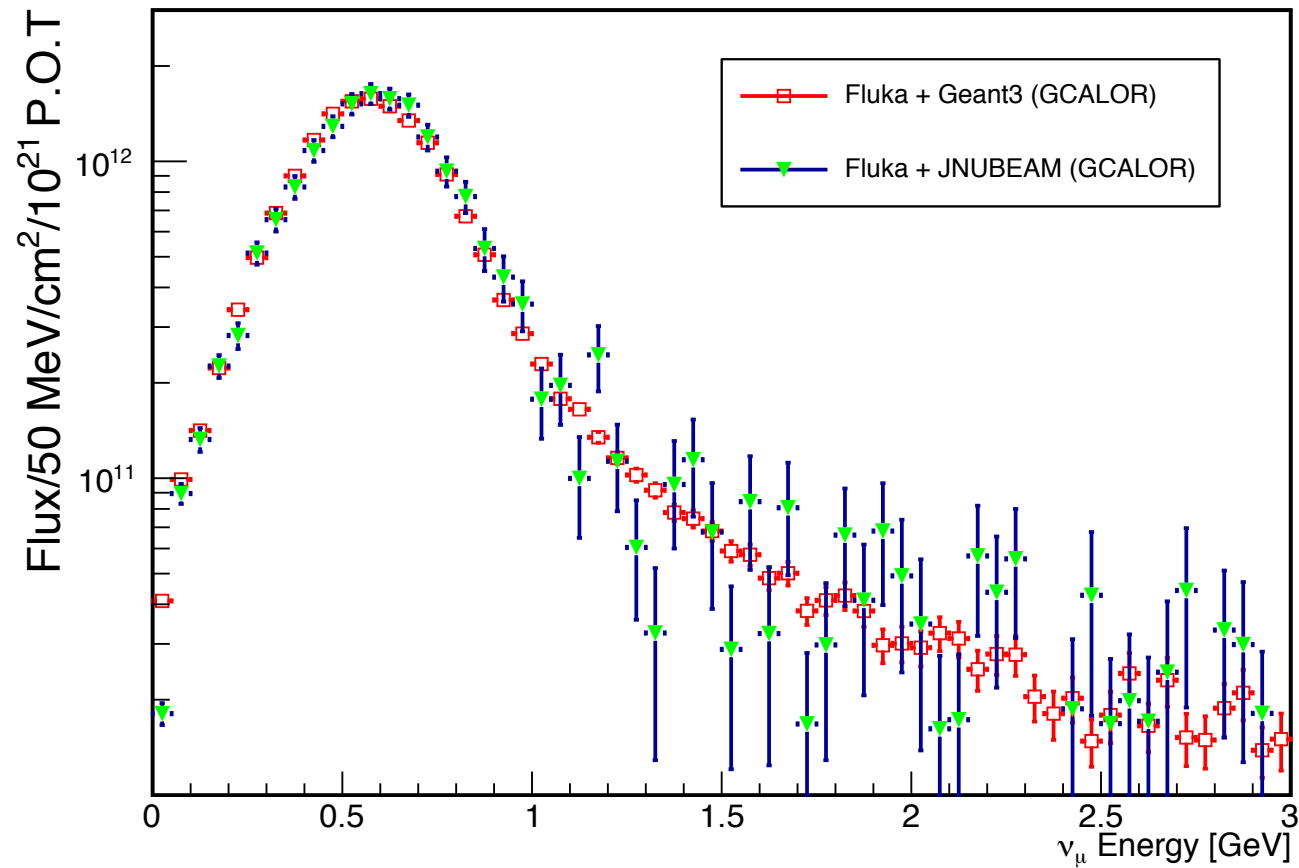
- **Target simulation based on FLUKA for both simulations**

- **Muon Neutrino Flux in ND280 detector**

TBC

Very preliminary study!

- **More plots!**

- **Cross-checks: flux calculation, timing, etc...**

- **Improvement of TNuBeam structure and user interface still under development.**

- **At some point, code development managed by gitlab (with Mathieu's help, thanks!)**