# Hybrid Monte Carlo in MICE

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**Abstract**

Proposal for the implementation of hybrid Monte Carlo to be used mainly for systematic studied in MICE data analysis.

## 1 Introduction

The MICE Monte Carlo is usually constituted of two parts. A G4BL simulation up to the second bending dipole D2 of particles generated at the target position and a full MAUS Monte Carlo up to the EMR detector. The simulation in fully automated to be executed on the GRID. A full Monte Carlo generation can be quite CPU consuming and unnecessary in case of systematic studies that might involve only changes at the cooling channel geometry level.

Specifications of the implementation of the hybrid MC on the GRID need to be agreed between users in order to make it usable for several type or analysis (scattering, emittance studies, etc.).

## 2 Proposal

Several hybrid versions of the official MICE Monte Carlo have been independently generated for different analysis by different users, generally without using the GRID infrastructure, running in Universities' clusters or on SCARF.

Different user cases can be covered with a single hybrid Monte Carlo infrastructure running on the GRID.

The general idea is:

- Generate a full MICE Monte Carlo dataset for a specific run (defined by the beam line settings, cooling channel currents, absorber material and geometry)
- Run the users' analysis in order to apply on the full simulation the desired set of preliminary cuts and produce a beam output file (e.g.

json) at the Tracker Station 5 position containing a defined list of variables

- Utilise a smearing procedure on the single beam file in order to generate as many different samples as necessary at the Tracker Station 5 position in order to produce enough statistics for the purpose of the study
- Run the MAUS simulation on each single sampled beam using the geometry defined by the user

The first step is already implemented on the GRID, while the second step can be produced by the user; the beam have to be copied over in the GRID job submission server together with the user-defined geometry or datacards, while the second two items have necessary to run on the GRID.

A possible list of variables that could be included in the beam file for each particle are:

- position and momentum at Tracker Station 5
- TOF0 position
- TOF1 position
- ???