
SX simulations

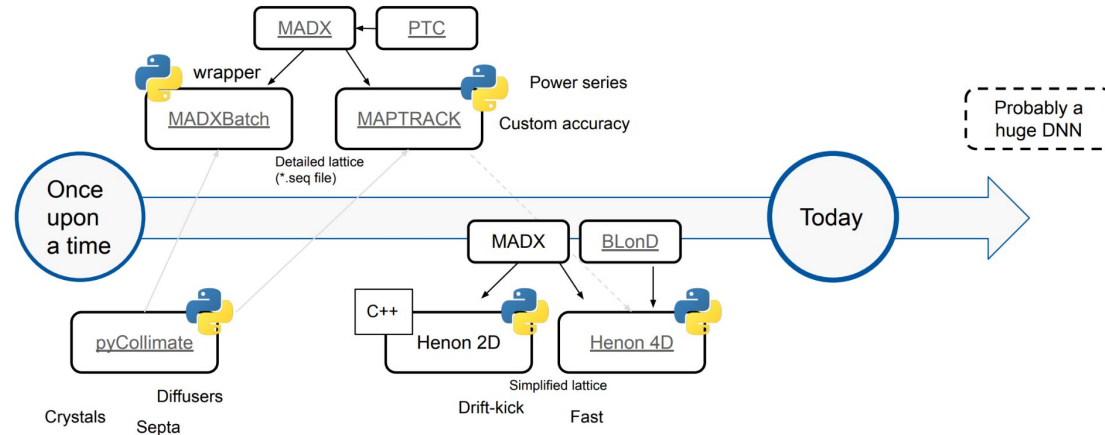
IFAST-REX WP5.3

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Introduction

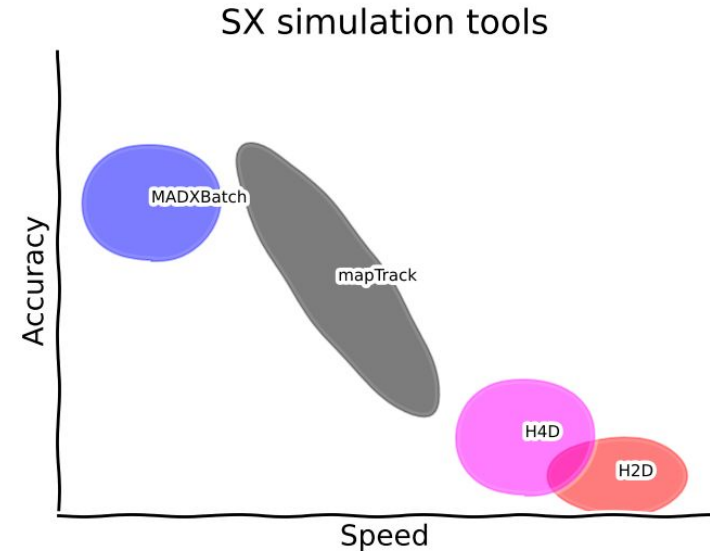
- Very nice overview from Pablo at the last IFAST-REX collaboration meeting
- Classify the usage of these different tools depending on application
- Starting point for the WP3 for SX simulation in the IFAST-REX context

A (very rough) timeline of our codes



Classification

- Depending on the usage needed for, different tools should be used
- Very accurate phase-space description:
 - ◆ MADX thin track or PTC tracking (e.g. batched on cluster)
 - ◆ MapTrack at high order
- Loss estimation:
 - ◆ Tracking code coupled with matter tracking (FLUKA, GEANT4)
 - ◆ Simple aperture cut (MADX or any aperture checks)
 - ◆ Tracking of primary protons (MapTrack or MADX + pyCollimate, SixTrack for collimation)
- Spill quality:
 - ◆ Henon map tracking (2D or 4D)



Moving forward (see first talk of today)

- Accurate simulations: [Xsuite](#) => single particle dynamics tracking tool in python which can be used on GPUs
 - ◆ Developed by BE/ABP at CERN
 - ◆ Well documented and it seems the shining new star
 - ◆ Very well integrated with MADX and cpmad
 - ◆ It can also be extended to treat collective effects (e.g. space charge), collimators...and any “exotic” element
- **Extendible** => For example, it can integrate pyCollimate easily (also for crystal treatment using probability density function from data)
 - ◆ pyCollimate not GPU ready...it should come soon
 - ◆ As very scriptable, it may be interfaced with other scattering routines? First examples where GEANT4 has been interfaced with Xsuite already available
- **Testing ongoing...it looks very promising!**

Goals for the WG

- Create a community for SX simulations
- Share tools, collaborate on [new] ideas, improve the existing methods:
 - ◆ Do we have already available all the tools we needed for the different type of simulations?
 - ◆ What are the new tools coming up?
 - ◆ Is there any possibility to exploit ML to speed up/improve our simulations/tools?
 - For example, see R. Russel work on differential tracking and phase space tomography
- It will be a series of informal discussions
 - ◆ Ideally we should always share the git projects of what was presented
 - ◆ Go into technical details
- Idea to meet every few months (or more if needed)
 - ◆ Please come forward with topics that you would like to be discussed