General information

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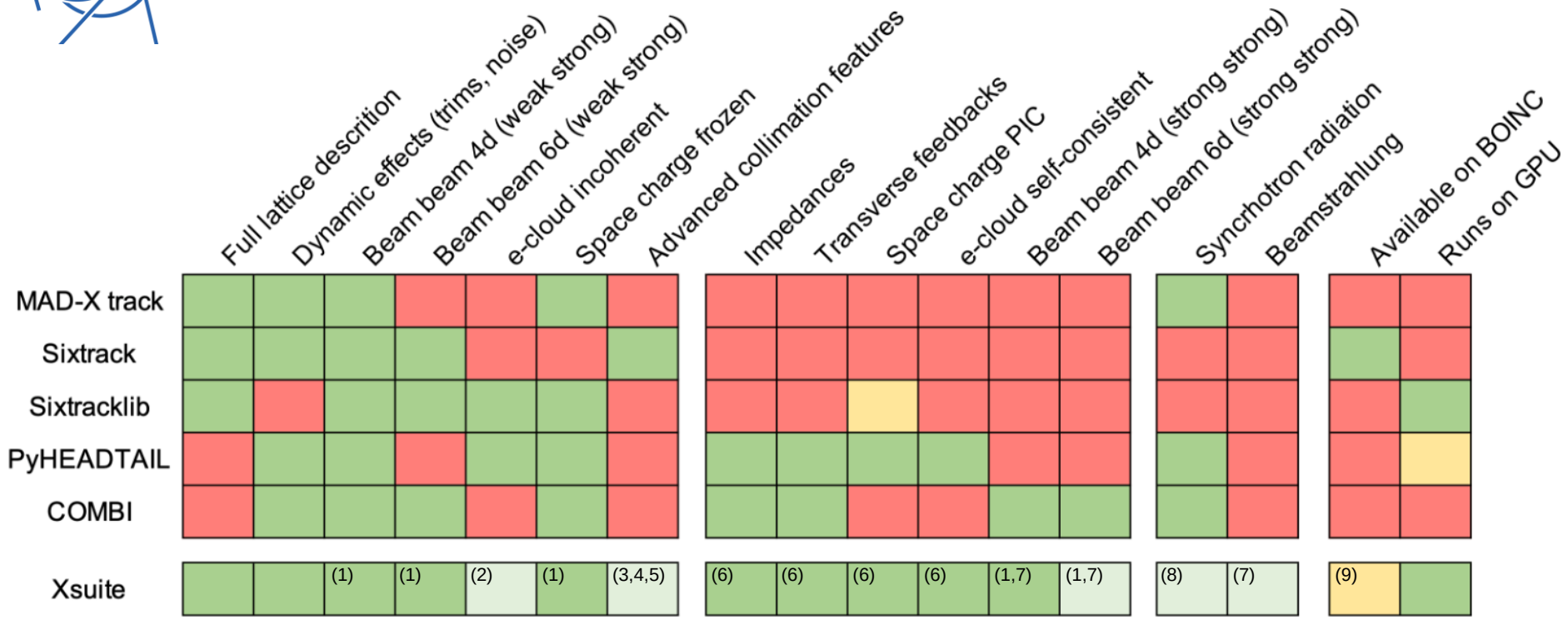
General information

- News on IT services in the last **IT User Meeting** (ITUM)
  - https://indico.cern.ch/event/1056274/
  - Interesting topics:
    - Reana (Reproducible Analysis Platform)
    - CERN Linux support and long term strategy (separate presentation)
    - Windows 10 (and 11) upgrades (and dates)
    - **DFS to CERNBox migration**
    - **Migration of openshift+mkdocs websites**

- **News from HPC cluster**
  - New partitions with brand/new nodes and fast connection (Photon)
  - Older nodes ("batch partition") to be retired soon
  - Info here: https://batchdocs.web.cern.ch/linuxhpc/resources.html

Software development - Xsuite



(1) Uses optimized implementation of Faddeeva function providing x10 speedup on GPU (M.Schwinzerl)
(2) To be ported from Sixrtacklib (straightforward)
(3) Electron lens implemented (P. Hermes)
(4) Geant4 interface working (A. Abramov)
(5) Porting K2 scattering and Fluka coupling is under development (F. Van Der Veken, P. Hermes)

(6) Through PyHEADTAIL interface (X. Buffat) Only CPU for now
(7) Under development (P. Kicsiny, X. Buffat)
(8) Under development (A. Latina)
(9) Under study

See presentation at CEI, INC, LNO, NDC meetings: https://indico.cern.ch/event/1066779
Interest from FCC and Gamma Factory communities.

Software development - Xsuite

- **Ongoing development:**
  - Introduced **backtracking** capabilities and **loss-location refinement** (for collimation studies)
    - Preparing first test using saved scattered particles from sixtrack (F. Van Der Veken)
  - **Interface with Geant4** → working on integration with loss location refinement
  - **Lattice management and import – xsequence** (F. Carlier - EPFL, R. De Maria)
  - **Deferred expressions** – xdeps (R. De Maria)
  - **Synchrotron radiation** from multipoles (A. Latina)
  - **Strong-strong beam-beam** (P. Kicsiny, X Buffat)
    - First **large studies on CENR HPC cluster**
    - **6D bb** being developed
  - **Tracking with beam-beam** (S. Kostoglou, G. Sterbini)
    - **Large scale DA** simulations (10k jobs) **successfully benchmarked against Sixtrack**
    - Now **working on FMAs**
    - Investigated **numerical portability across processors**

Numerical portability of python workflows

- Basic **python libraries (numpy, scipy)** favour performance over numerical portability
  - **Observation:** determinant calculation of LHC 1-turn map differs at the level 1e-20 across CPUs
  - Affects transformation of particles from normalized to geometric coordinates→ in the presence of chaotic motion can change significantly the behavior of the particle

- Numerical reproducibility **not perceived as an issue by most of the scientific community**
  - Such an **issue is not even addressed in the library documentation**
  - **Statistically relevant physical observables** are reproducible independently of the CPU

- After some painful trial and error, we managed to **define a recipe to build a numerically reproducible python installation**
  - scipy and numpy expected to be significantly slower
  - To be used only if your workflow really requires numerical portability
  - Not guaranteed to work on all CPUs and with future versions of python libraries

→ **My opinion:** It would wise to **become independent from numerical reproducibility** in our workflows in the future, or **be prepared to invest significant resources** as there is no or little support outside community on this front

More info at: https://xsuite.readthedocs.io/en/latest/numericalreproducibility.html

Thanks for your attention!