Fellowship Summary

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CERN BE-ABP-HSI

Nov 28th, 2018

Contents

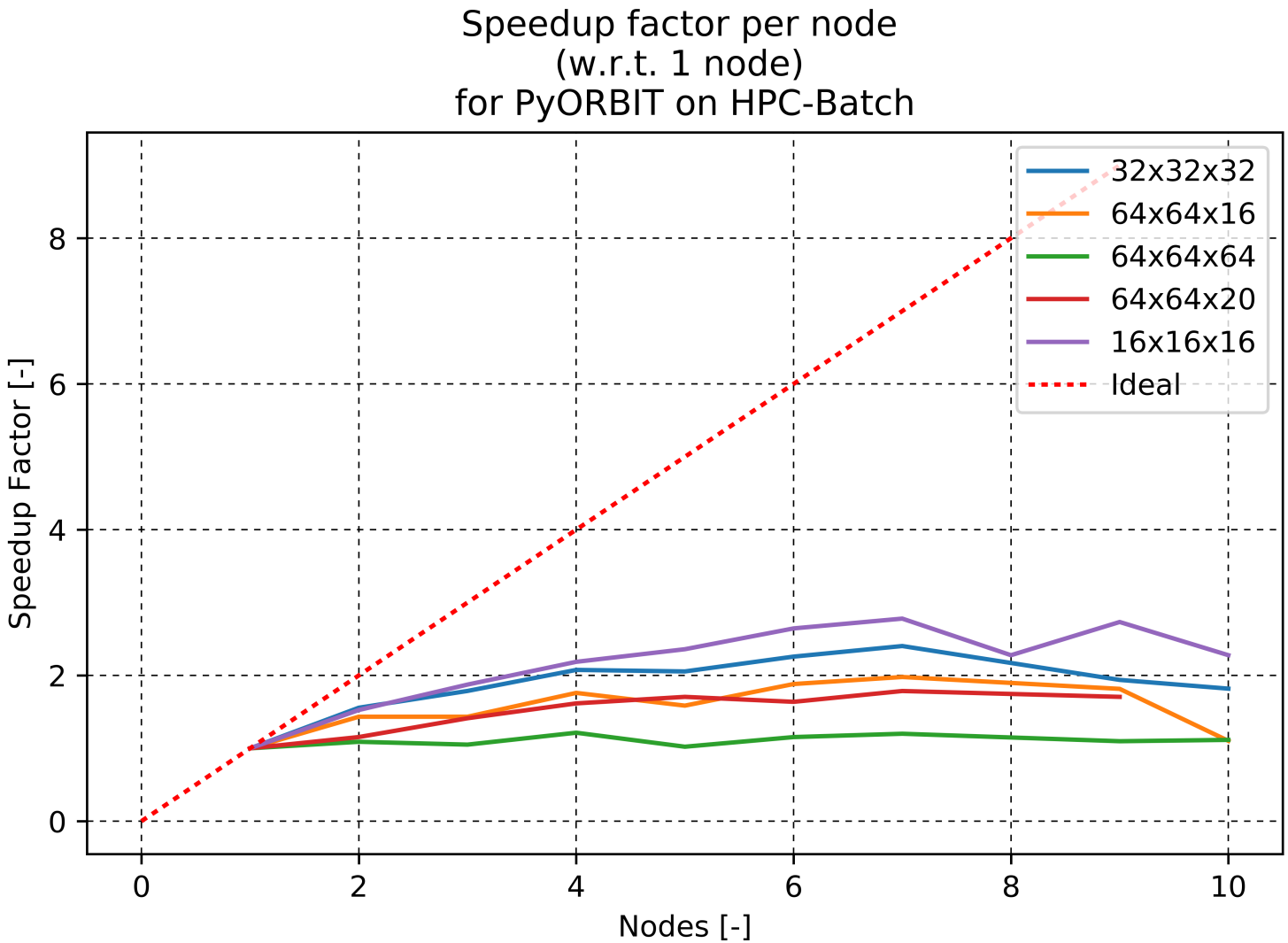
PTC-PyORBIT on HPC-Batch

- **Motivation:** Provide platform for larger and faster SC simulations.
- **End: Have optimised simulations running on HPC-Batch**
- **Documentation:** PTC-PyORBIT installation note (DONE), possible note on lessons learned from optimisation.
- **Current Status:** Overcame lack of AFS connection and various environment variable issues using local installation.
  Installation required debugging.
  PTC-PyORBIT operational on HPC-Batch.
  Speedup/scaling unexpectedly poor.
  Simulations not yet optimised. On pause since MDs started.

PTC-PyORBIT on HPC-Batch

- **Areas of Interest:** Profiling not really an option. Launch different parts of the simulations to identify bottlenecks.

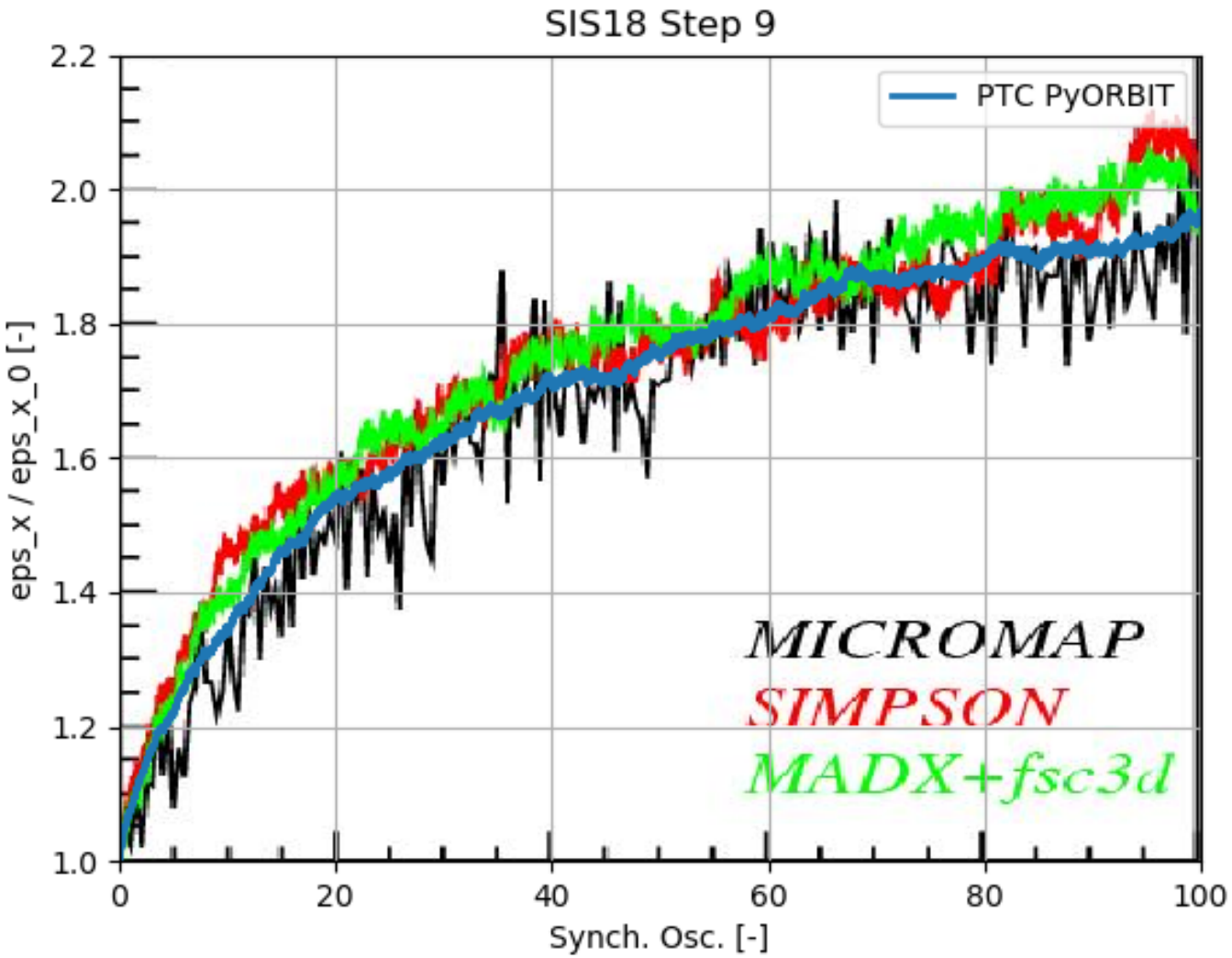
Speedup Issues



SIS18 Benchmark

- **Motivation:** Perform the SIS18 benchmark to compare codes and learn how to use PTC-PyORBIT.
- **End:** Benchmark agreement.
- **Documentation:** Github and talk done. What format would be most useful? What should it include? Style? Etc
- **Current Status:** Assumptions, parameter confusion, lack of code documentation in some areas lead to this taking more time than anticipated. Benchmark now complete and available on Github. Inform Giuliano Franchetti.
- **Areas of Interest:** Expanding the benchmark?

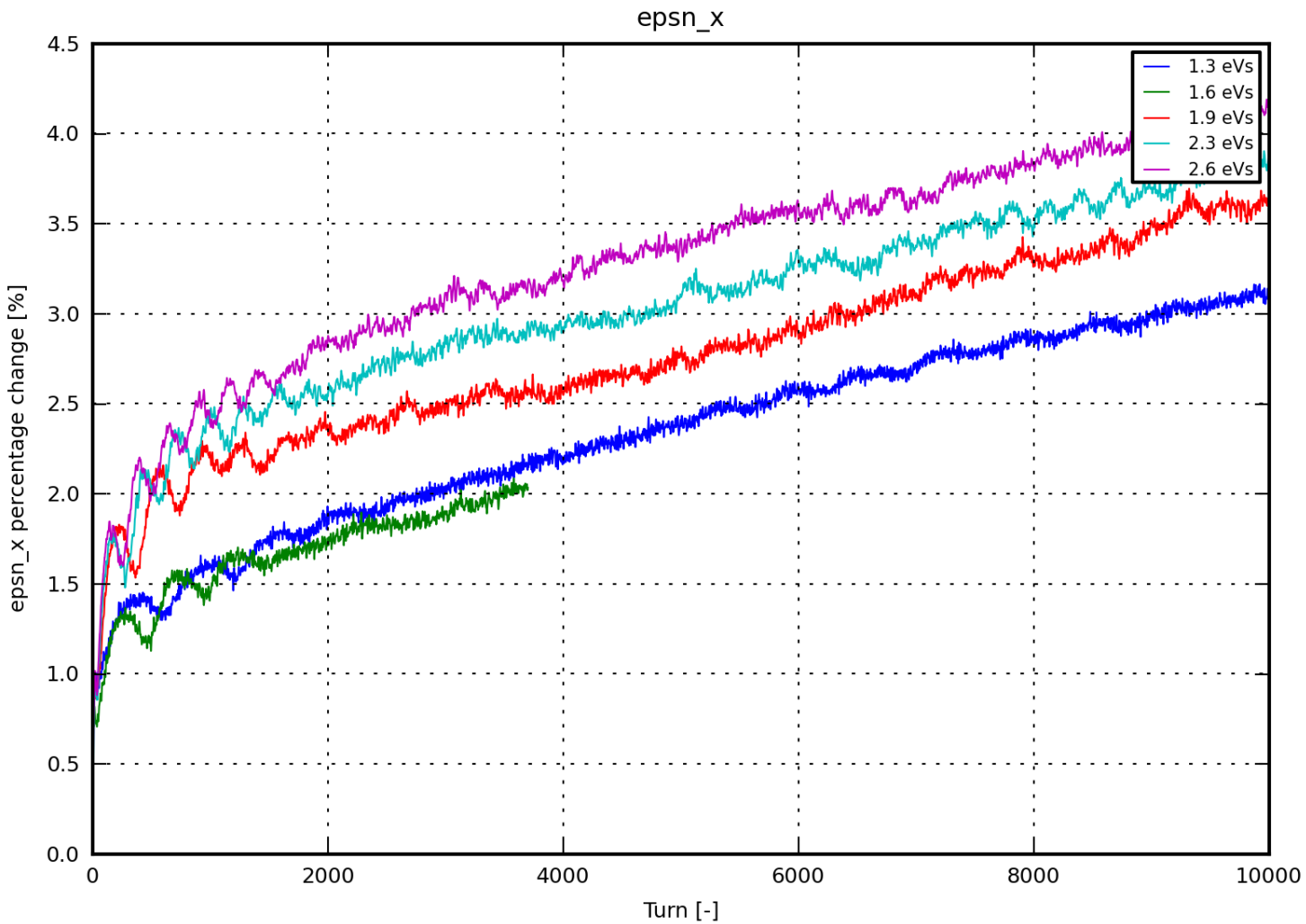
SIS18 Step 9


SIS18 Step 9
PTC PyORBIT
MICROMAP
SIMPSON
MADX+fsc3d
eps_x / eps_x_0 [-]
Synch. Osc. [-]
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0
20
40
60
80
100

PS Injection Simulations (Adrian & Simon MD)

- **Motivation:** Reproduce observations of the MD: Find optimal longitudinal ϵ_z to minimise transverse $\epsilon_{x,y}$
- **End:** Agreement between MD and simulations? Understanding of reasons for differences? Further insight?
- **Documentation:** Note? Talk?
- **Current Status:** Strange longitudinal bunch behaviour - developed 'distribution from tomo' functionality in PyORBIT. Parameters checked and longitudinal motion now stable. Simulations working, but lack direction.
- **Areas of Interest:** Dispersion mismatch from transfer line?

PS Injection



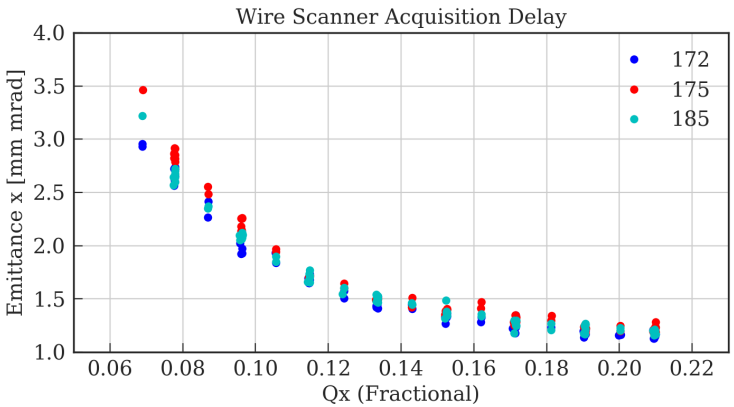
MD4224

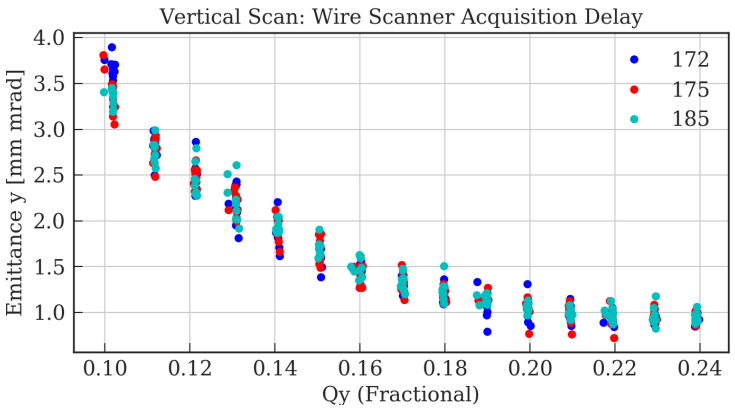
- **Motivation:** Approach the integer (static scan) in the PS and observe emittance and loss behaviour.
- **End:** Reproduce this in simulations as a benchmark to gain understanding of behaviour.
- **Documentation:** Swan notebook. Talk? Note? Paper?

MD4224

- **Current Status:** MDs complete. High brightness scans - only have WS data in single plane, same for low brightness & natural chroma. Low brightness & low chroma the only case with WS in both planes simultaneously. Some analysis complete but low brightness analysis requires more effort. Introduction of quadrupolar pickup is very interesting - analysis required. Need to reproduce chromaticity in MADX lattice for PTC flat file. How is this measured (2nd order polynomial)?
- **Areas of Interest:** Quadrupolar pickup. Width of resonance. Understanding behaviour (loss + emittance 'decrease'?).

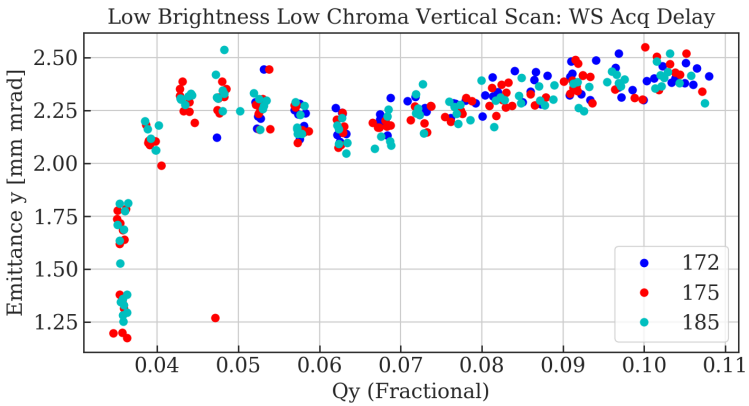
High Brightness

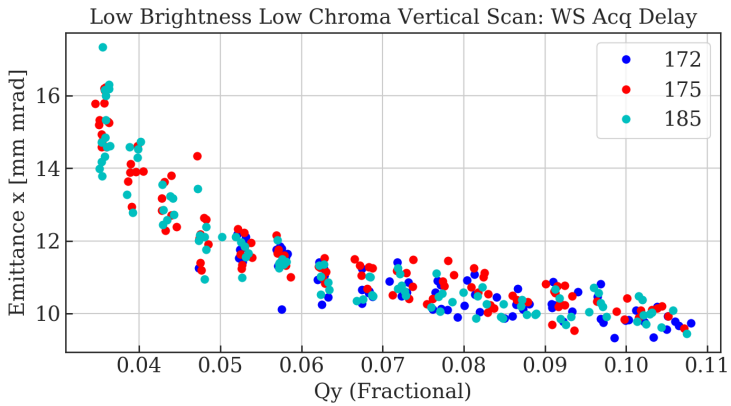




- Status: Analysis complete, now have to repeat in simulations.

Low Brightness





- Issues: Horizontal emittance unreasonable – have to check.
- Issues: How to reproduce correct lattice (using PFW to reduce chromaticity).
- Status: When analysis is complete, have to repeat in simulations.

Simulations

- Issues: Are we assuming that the the emittance blowup is in the first 2 ms after injection?
- Plan: Use tomo distribution with 'ideal' emittance (chosen at nominal WP). Static scan of simulations for each WP. 15 ms simulation time (≈7000 turns). For low brightness need to see how we can play with pole face windings in MADX lattice.

MD4443 (PSB)

- **Motivation:** Cross the .33 and .5 resonances and observe emittance and loss behaviour.
- **End:** Reproduce this in simulations as a benchmark to gain understanding of behaviour.
- **Documentation:** Talk? Note?
- **Current Status:** Analysis not complete. Simulations will be done after analysis.
- **Areas of Interest:** ??

PSB Sims with Ramp

- **Motivation:** Post-LIU PSB will inject during the ramp?
- **End:** Working simulations.
- **Documentation:** Note? Talk?
- **Current Status:** Not started.
- **Areas of Interest:** ??

PTC-PyORBIT

- **Motivation:** Merge CERN efforts into a single repository / EOS space etc. Provide proper documentation for code with examples.
- **End:** Make PTC-PyORBIT easy to use and understand.
- **Documentation:**
- **Current Status:** Not sure what other people have done. EOS project space available and used for HPC-Batch installation scripts and instruction document. Started on code examples for user additions (distributions, outputs etc). Eventually put a central CERN PTC-PyORBIT version with documentation and examples etc here.
- **Areas of Interest:**