First comparison of ORBIT and ACCSIM

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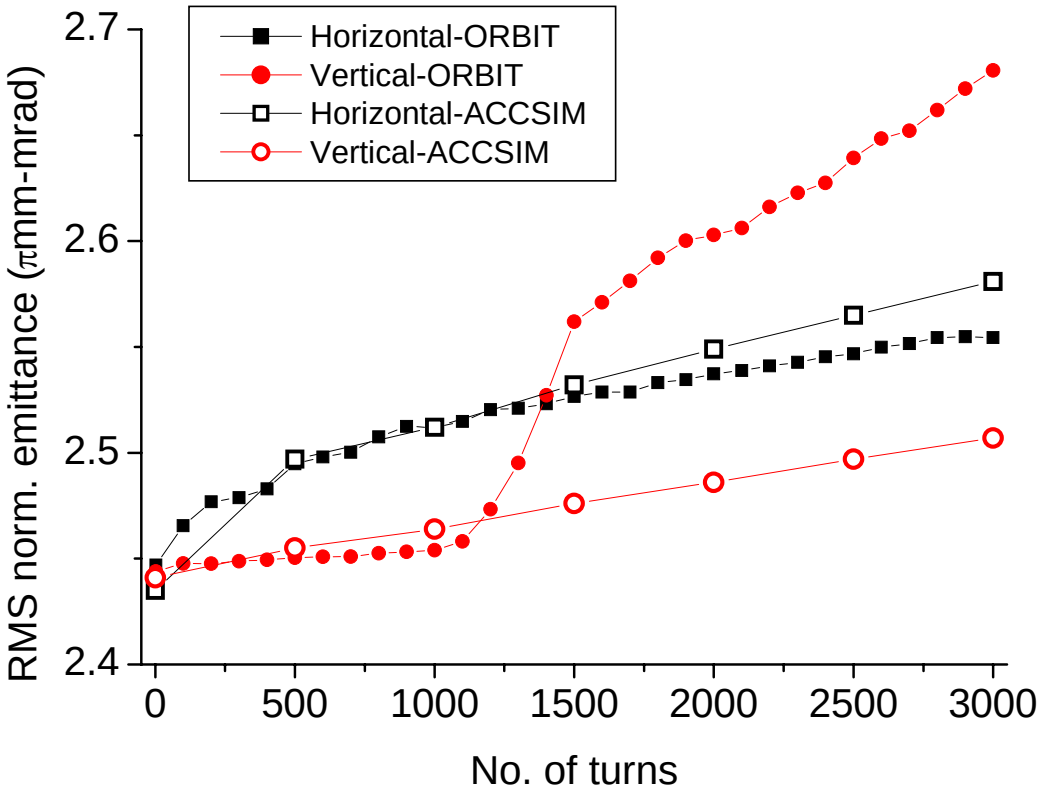
Simulation input

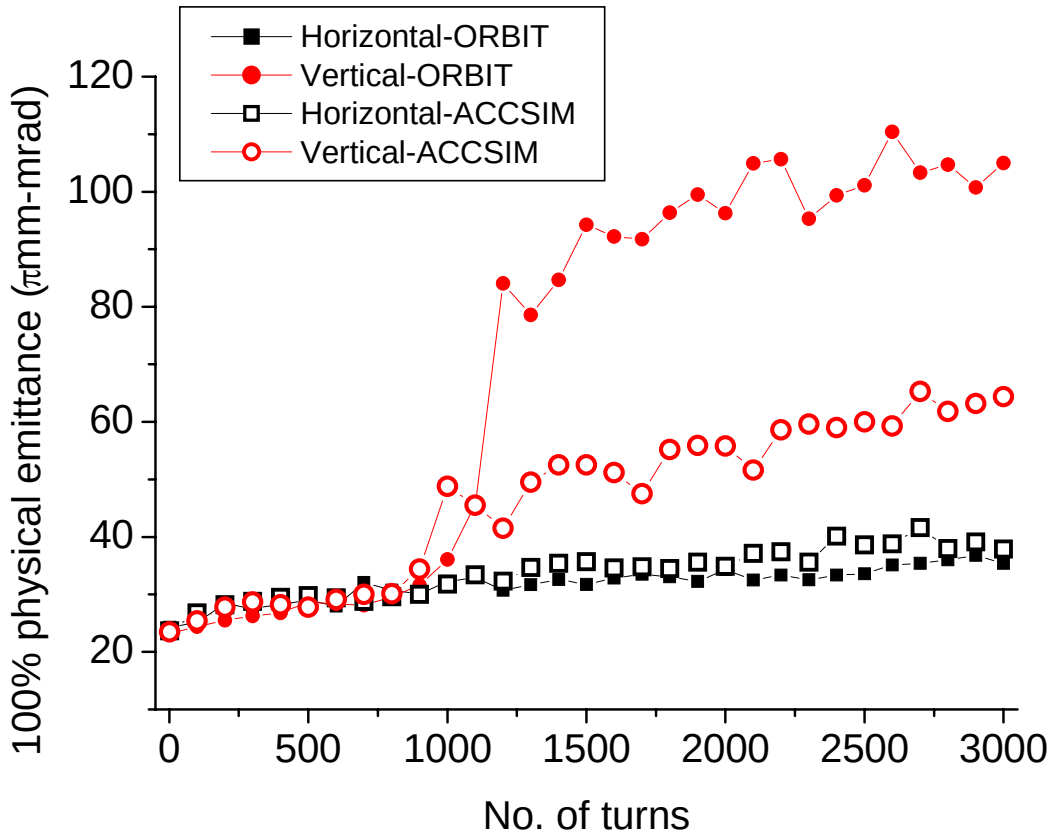
- Simplified PSB lattice
  - 16 identical cells without injection bump and foil
    (The total beam is injected on the first turn onto an 8kV rf bucket)
  - Working point: Nx=4.28, Ny=5.47
- LHC nominal beam
  - 160MeV, 3.25x10^12 protons
  - 99999macro particles
    - The particle distribution is provided by ACCSIM.
    - Initial transverse emittance: 2.45μm
    - Transverse distributions are matched to linear lattice parameter
    - Matched longitudinal distribution is found in ACCSIM
      (1.026MeV x100.21deg)

Emittance evolution (RMS)



Horzontal: slow blow-up in ORBIT and ACCSIM
Vertical: sudden blow-up after 1000turn in ORBIT
slow bow-up in ACCSIM

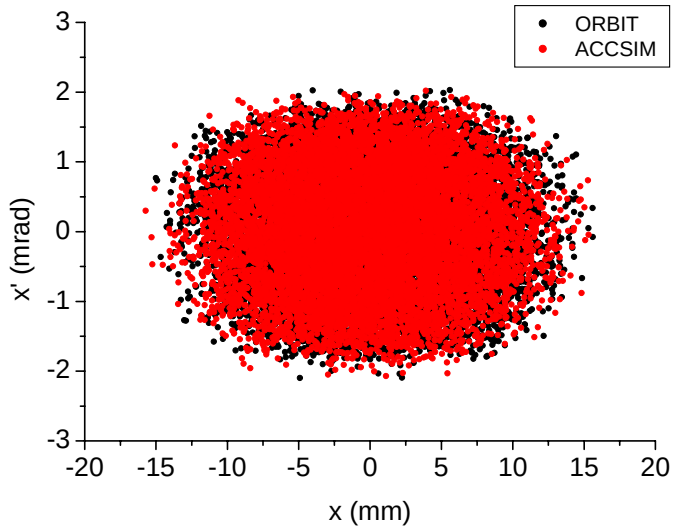
Emittance evolution (100%)

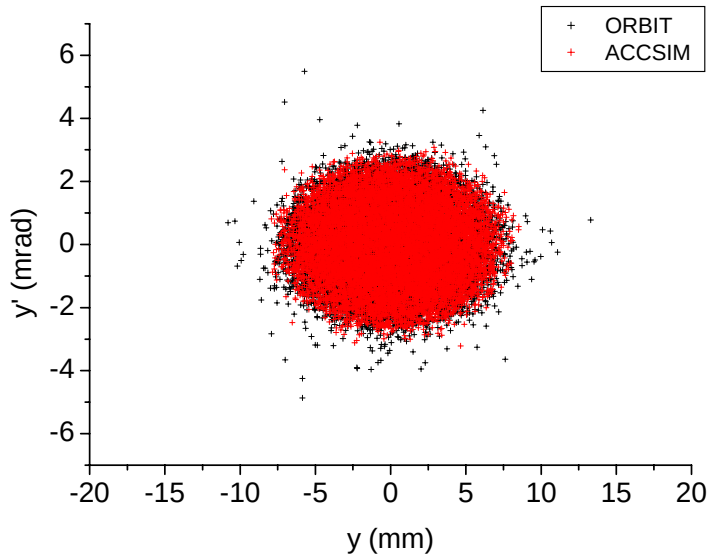


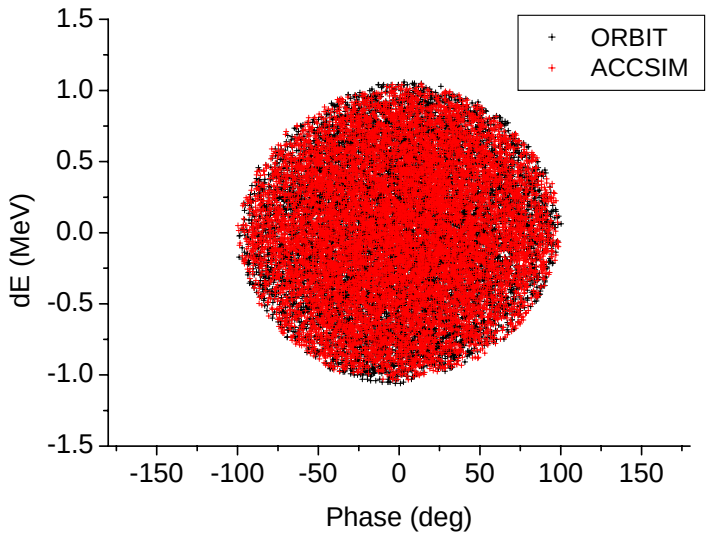
Horzontal: slow blow-up in ORBIT and ACCSIM

Vertical: sudden blow up around 1000turn in ORBIT and ACCSIM
but different magnitudes are seen

Phase spaces at 1500turn

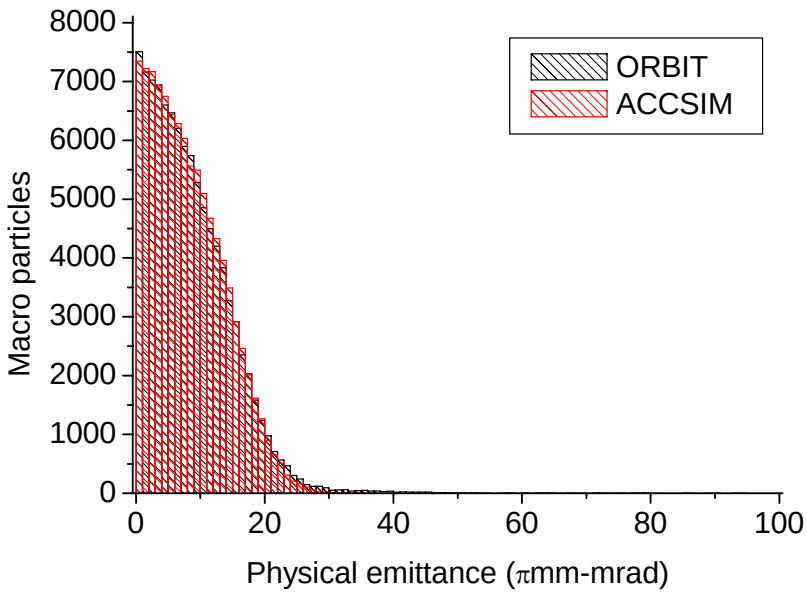


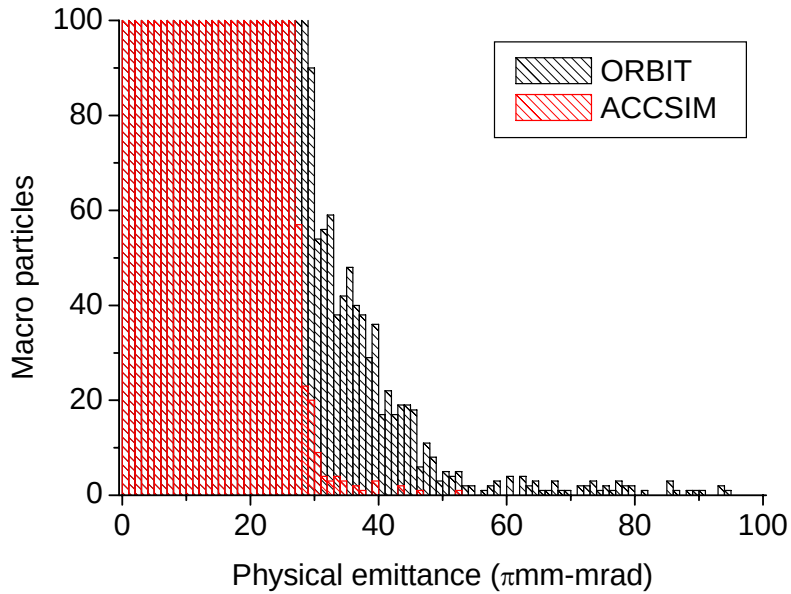




Horzontal: agreed
Vertical: Larger number of halo particles in ORBIT
Longitudinal: agreed

Vertical emittance histogram at 1500 turn





Remarks

- LHC nominal beam is simulated with ORBIT and compared to ACCSIM
  - Horizontal and longitudinal motion show agreement
  - For vertical motion, larger number of halo particles are seen in ORBIT result
- Tracking model
  - ACCSIM: Linear tracking

    ORBIT: Linear or nonlinear ? To be confirmed
- Simulation time: ~5x10^6 part.-turn/h/CPU
  - Ex. 10^5macro particles are tracked 50 turns in 1hour with 1CPU