Nonlinear Beam Optics Run Settings

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Objectives and Routines

Induce mismatch and compare RMS emittance with Kernel-based phase-space density.

- RMS emittance → obtained using the ecalc9f routine.
- Kernel-based density → obtained using scipy package routine in python. In this analysis, the idea is to:

  – Isolate the constant density contour line that corresponds to 1 sigma of the beam ellipse – in 4D this refers to the region containing 15% of muons [Introduction to Accelerator Physics, S.Y. Lee] but this applies to upright ellipses so here I only present the max contour level density.

  – Track this max density in the MICE channel and compare it with RMS emittance at the locations of the tracker reference planes.

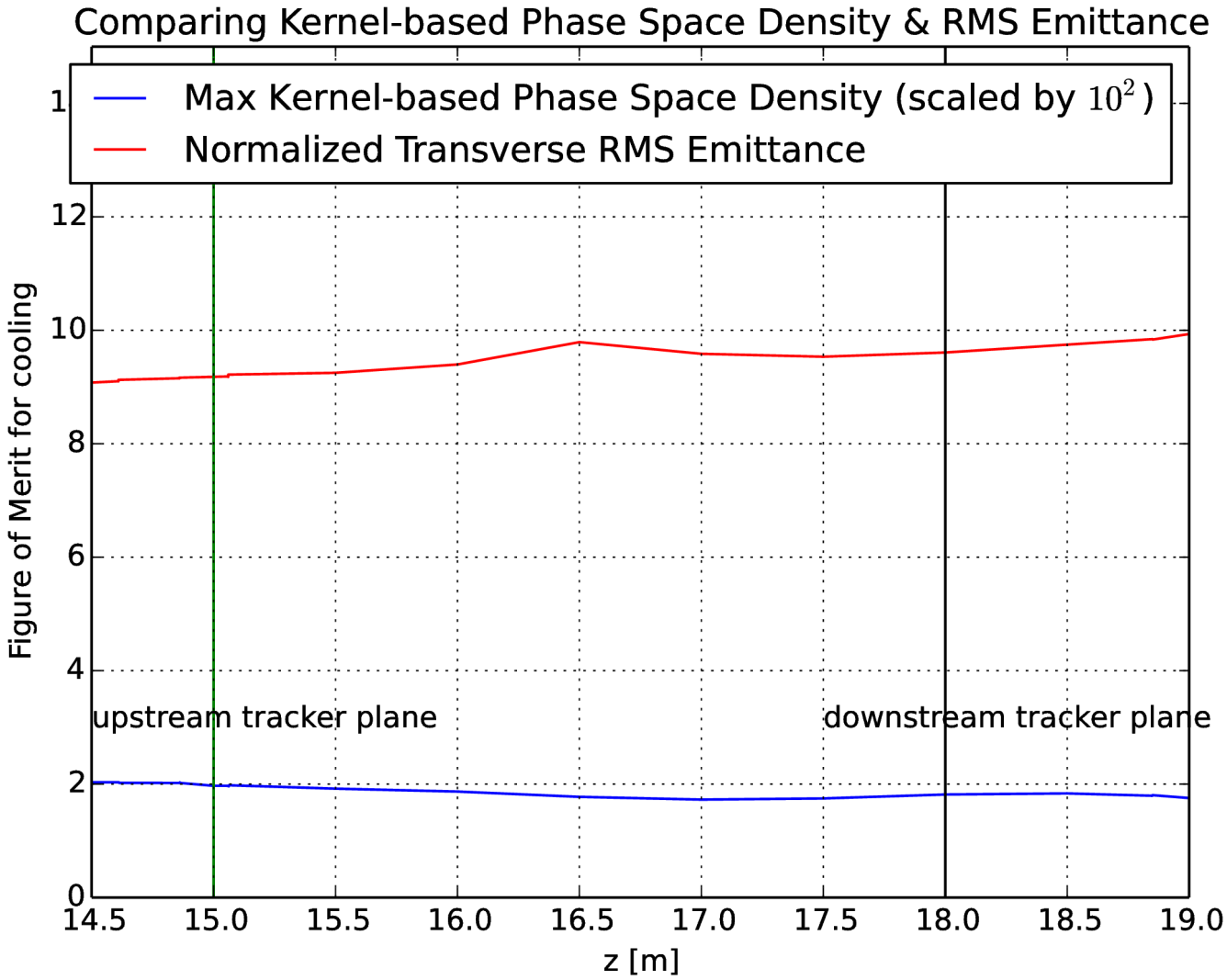
- MAUS-G4BL simulation settings: (3 π mm rad, 200 MeV/c), SSD in ECE configuration, SSU and SSD at 3T + (6 π mm rad, 200 MeV/c), SSD in ECE configuration, SSU and SSD at 3T

G4beamline – MAUS Integration

- Two step process,
  - G4beamline → Beam generation from target to 1 m downstream of D2.
  - Geant4 → Beam generation from 1 m downstream of D2 to EMR.
- G4beamline routine,
  - Simulation script calls MapPyBeamlineSimulation mapper.
  - Mapper uses g4bl formatted geometry input files.
  - Inputter generates spills and fills them by primaries.
  - MICE primaries written to an output.
- Geant4 routine,
  - Different simulation script and different mapper is called.
  - Inputter inputs the file with MICE primaries to the simulation.
- Validated the hand-over of MICE primaries to Geant4.

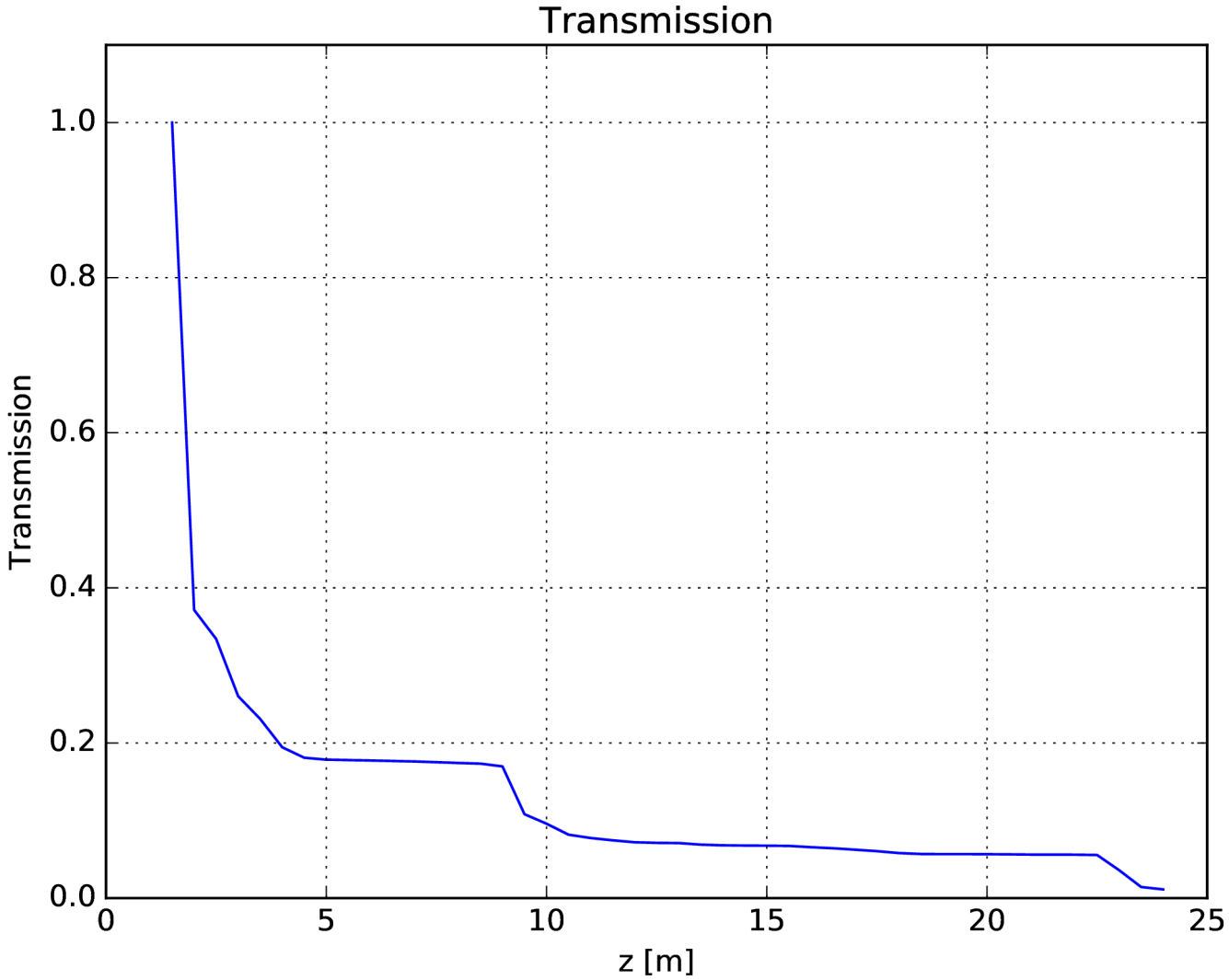
Preliminary Results

- 6π 200 MeV/c positive beam.
- Geometry ID 162 – tracker volume filled with air and evacuated LH2 vessel in AFC. Scaled 1 sigma Kernel-based density by 1e3 and applied aperture cut of 158.5 mm.



Preliminary Results II

- 6π 200 MeV/c positive beam.
- Tracker to tracker good muons analysis. Transmission below,



Looking Ahead

- Test with more beam settings. Speed up the simulation process.
- Compare Kernel-based phase space volume with RMS emittance.
- Increase the statistics.
- Make MICE beam ellipse upright and test the same thing with the “1 sigma” density.