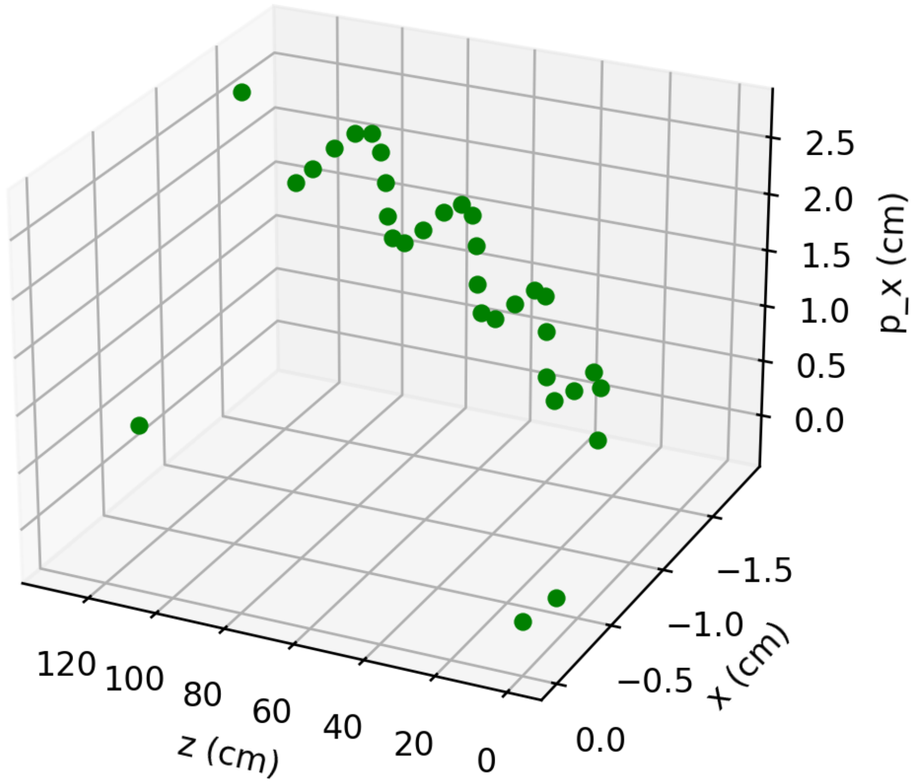
Muon Cooling Project Updates

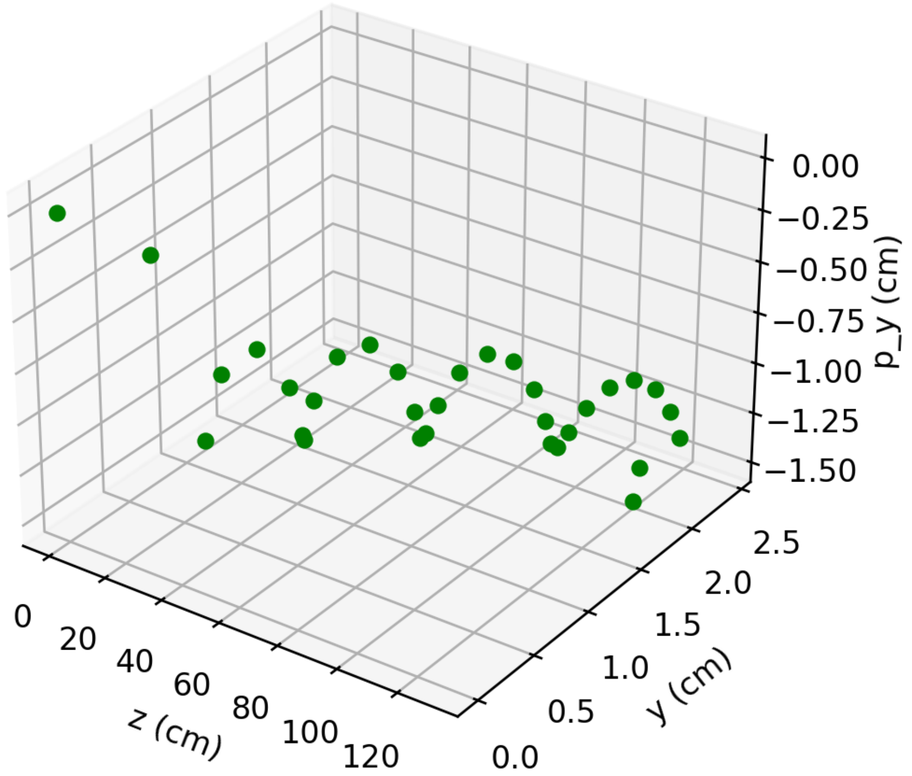
February 28, 2025

https://github.com/criggall/muon-cooling

Poincaré Sections

With 225 MeV/c reference particle





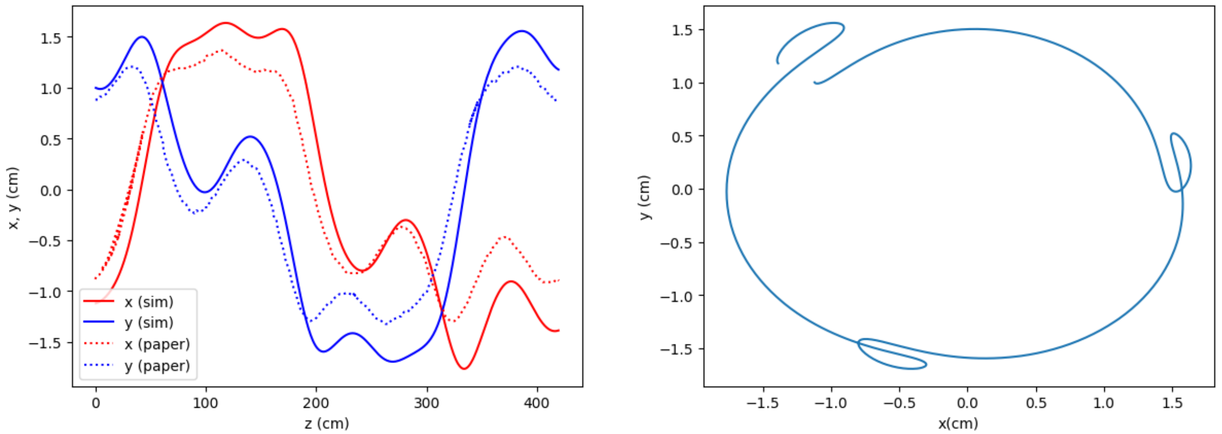
Matching the Reference Particle Momentum

- Noticed that the paper suggested 230 MeV/c for reference particle

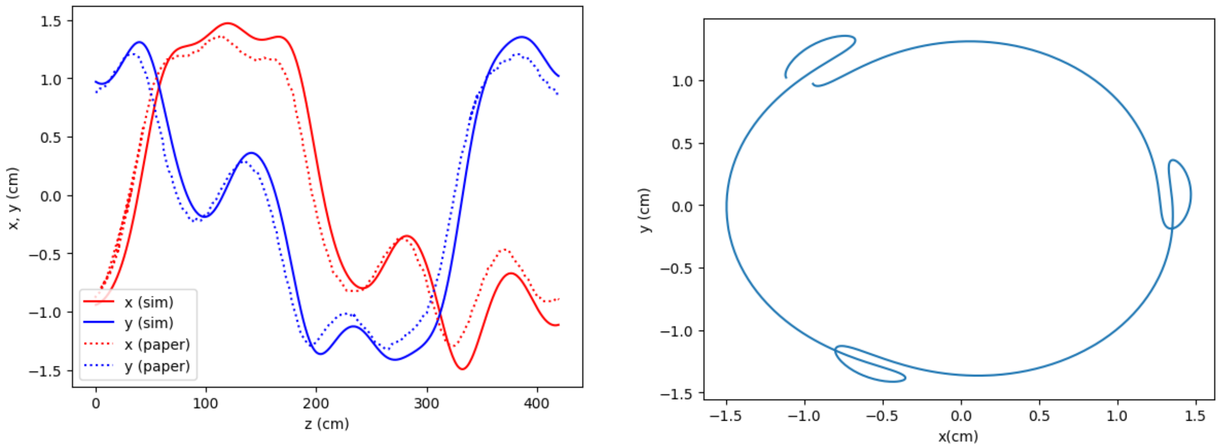
> **4 Properties of Periodic Channel**
>
> The lower two plots in Fig. 1 show the μ^+ equilibrium orbit and dispersion found for a momentum of 230 MeV/c. The normal mode tunes and normalized equilibrium emittances are given in Table 1.

- Found better agreement with 225 MeV/c

230 MeV/c



225 MeV/c

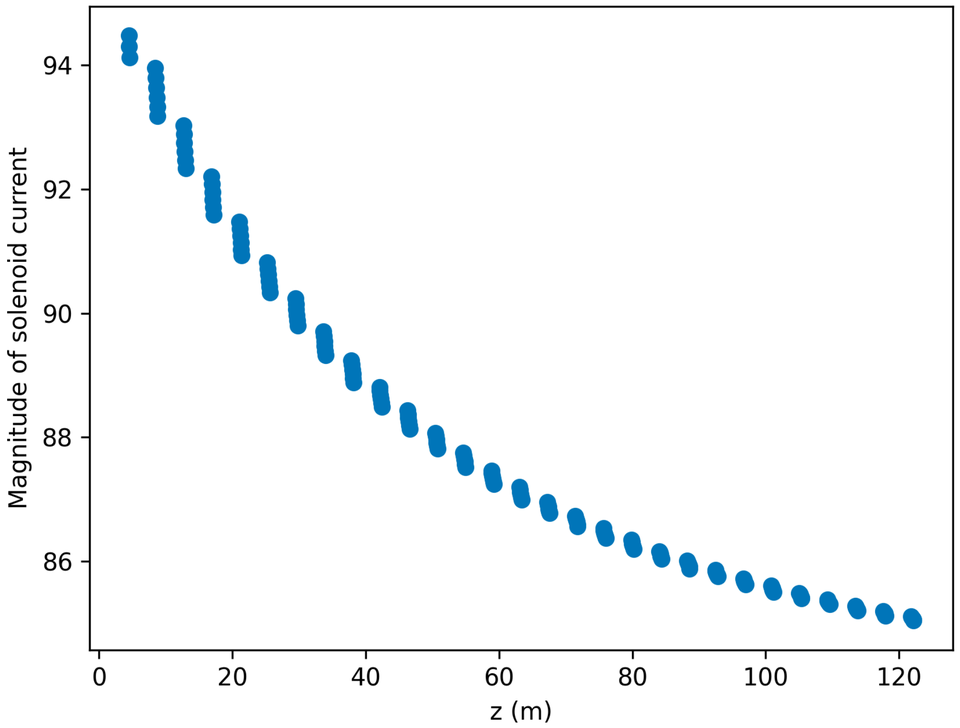


Simplifying the Channel

Plan for rebuilding the simplified channel:

1. Adjust solenoid current to be constant along channel
   - Same as first period to preserve matching
2. Send reference particle with no RF
3. Iteratively add RF, adjusting to keep reference particle E constant
   - Plot reference particle momentum vs. z to see what happens as we place RF

Present configuration:



Immediate Next Steps

- Clean up GitHub repo to prepare for proper version-controlling while simplifying/adjusting the channel configuration
- Fully redefine solenoid placement file to keep constant current
- Convert to phase basis ($\phi_0 = 2\pi f t_0$), enabling future scan over RF offset