Additional Calculations of the MERIT Mercury Jet Using the UCLA HIMAG Code

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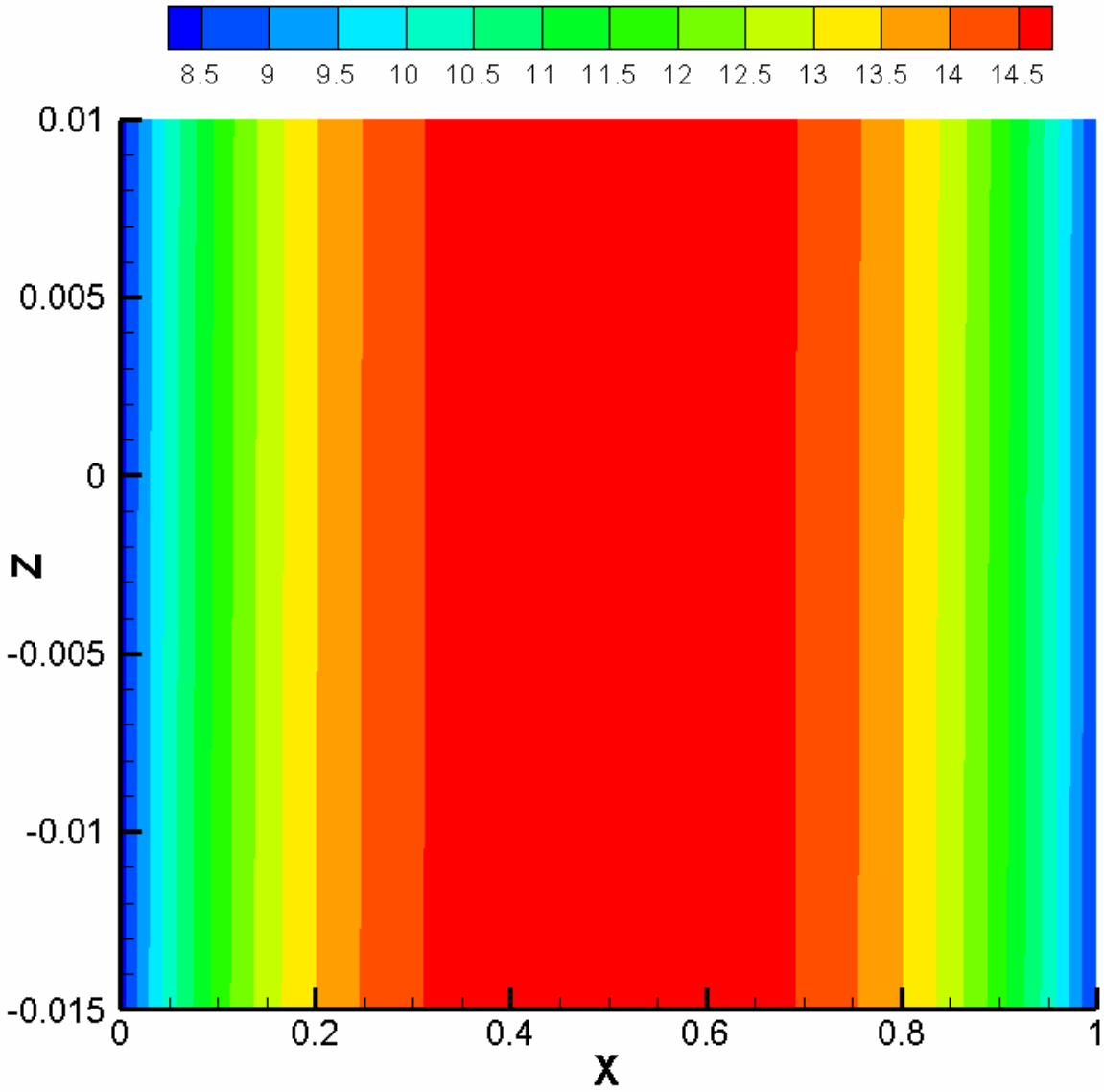
UCLA

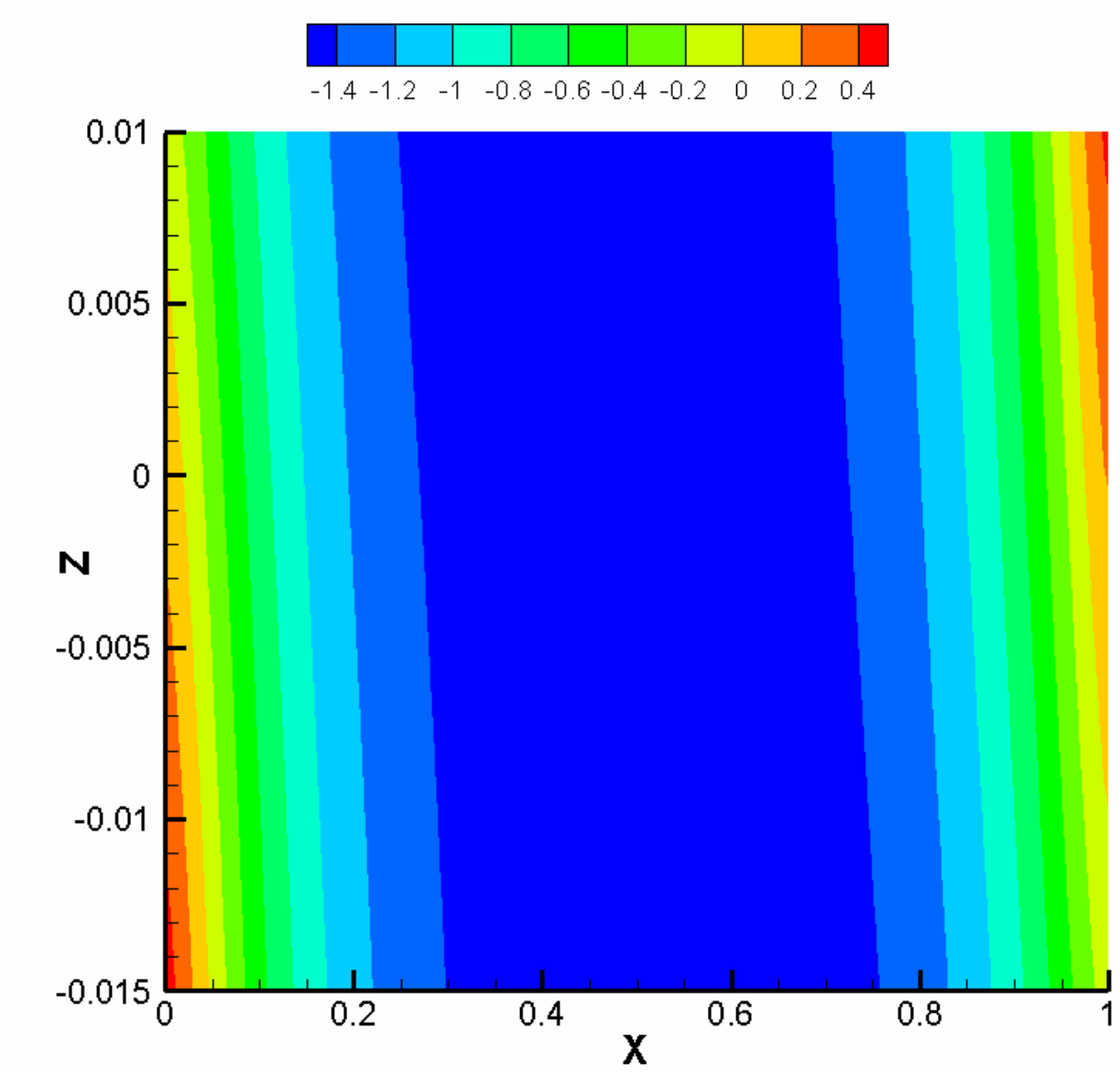
UCLA new jet deformation results

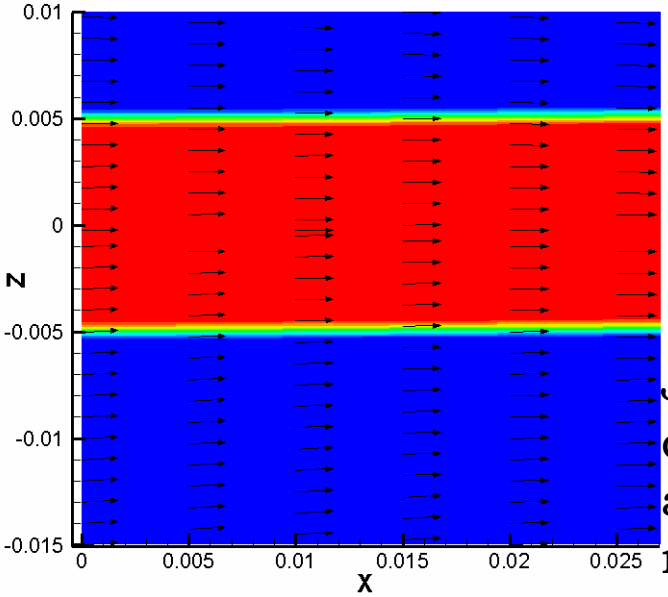
- All plots are in the frame of the inlet nozzle, with X axis representing the nozzle axis (tilted at +100 mrad to the horizontal), Z axis at 100 mrad from vertical.
- The magnetic axis of the solenoid is horizontal. Magnetic field simulated as 24 x 78 windings with 7200 A spaced uniformly in ID 20 cm and OD 80 cm and axial length 1 m
- Inlet velocity 20 m/s
- Injection point of the jet is located at -5 cm below the magnetic axis and -50 cm from the solenoid center.
- The inlet electric potential condition is $\Phi = 0$, trying to simulate disturbances from a perfectly conducting nozzle
- MHD forces are turned off at the exit two diameter before the computational boundary
- Computational area 2.5 x 2.5 x 100 cm with 100 x 100 x 200 computational cells: 2M cells.

B_x distribution in the X-Z plane in the jet frame. The jet axis is along X. The jet inlet is located 5 cm below the magnetic axis. The magnetic axis is inclined at 6 deg relative to the jet frame but is horizontal relative to gravity.



B_z distribution in the X-Z plane in the jet frame. The jet axis is along X. The jet inlet is located 5cm below the magnetic axis. The magnetic axis is inclined at 6 deg relative to the jet frame but is horizontal relative to gravity.

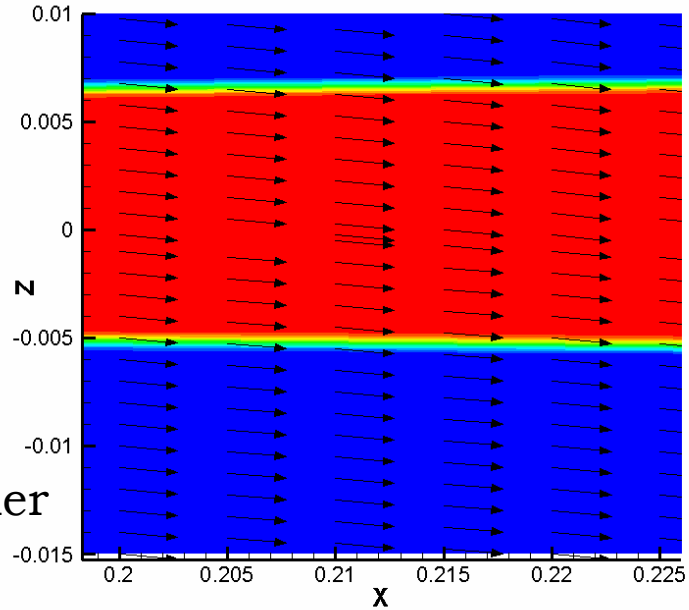




The first 2.5 cm axial length

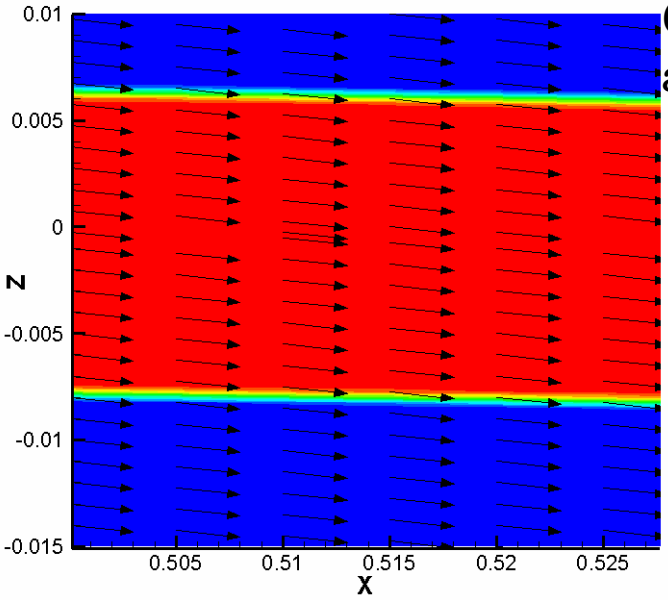
Jet section at the centerline (Y = 0) along with the planer magnetic field vectors.

Gravity is inclined at 6 degrees from the Z axis.

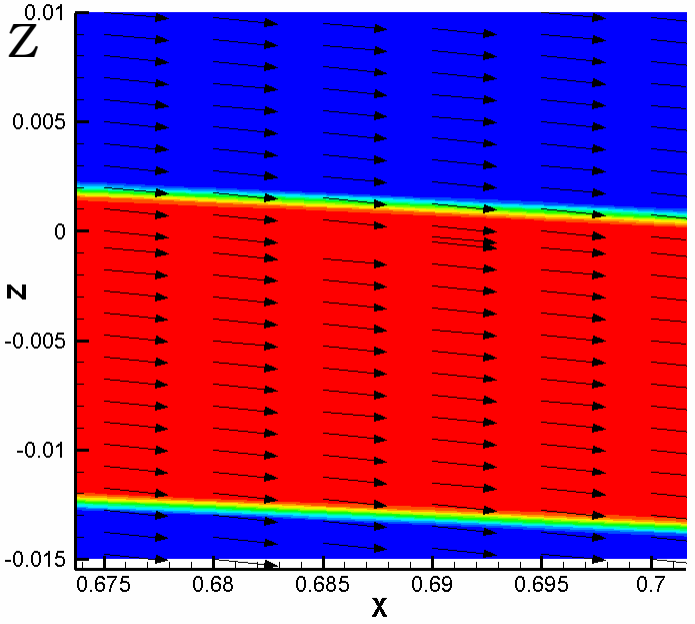


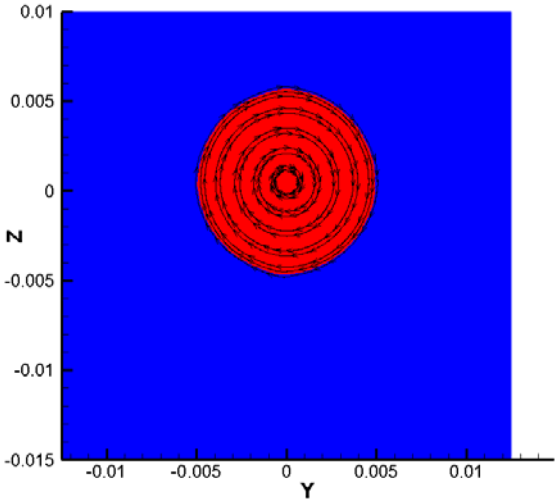
Axial length from 20cm to 22.5 cm

Axial length from 50cm to 52.5 cm

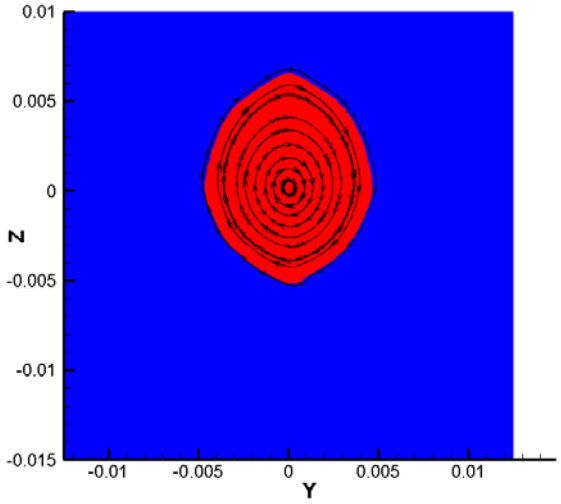


Axial length from 67.7cm to 70 cm

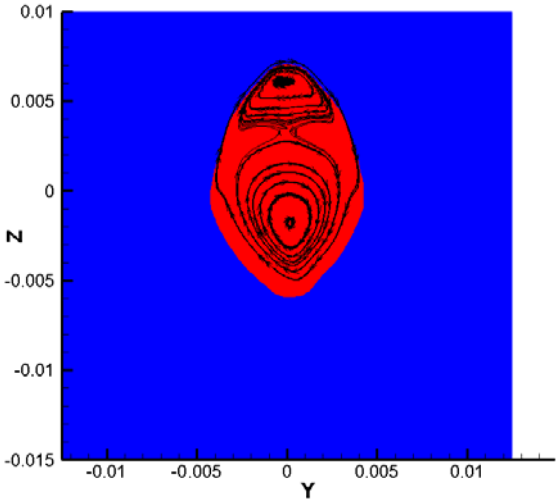




Jet section at inlet, current streamlines clockwise

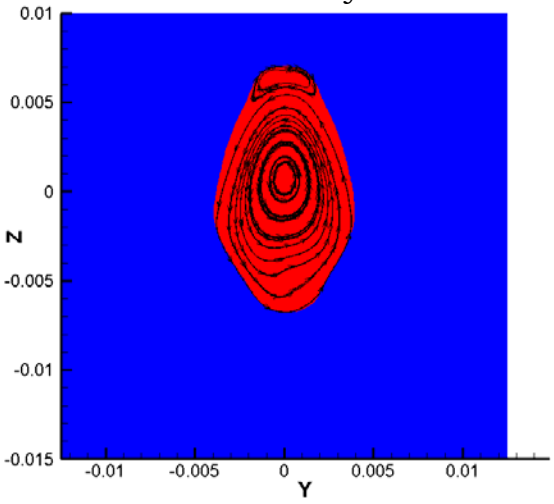


Jet section at X = 20cm, current streamlines clockwise

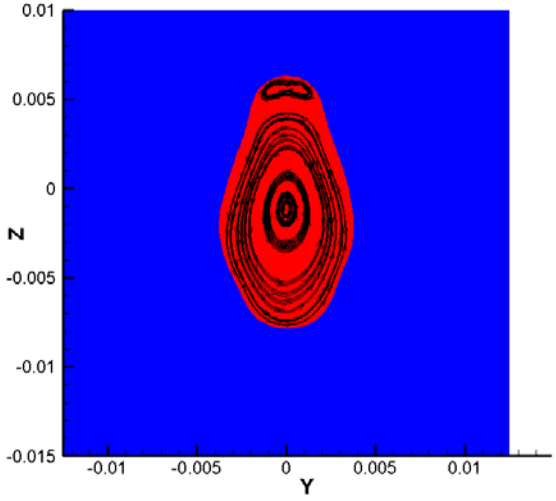


Jet section at X = 30cm, current streamlines clockwise, weird null

Jet section at X =40 cm , current streamlines anticlockwise, but clockwise secondary cell



Jet section at X =50 cm , current streamlines anticlockwise



Jet section at X =60 cm , current streamlines anticlockwise