

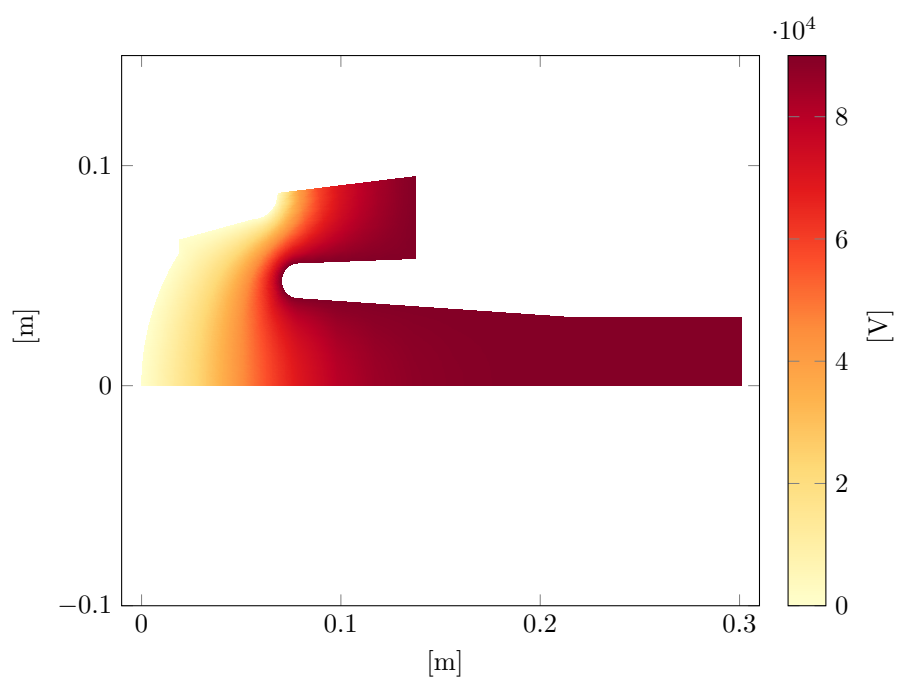
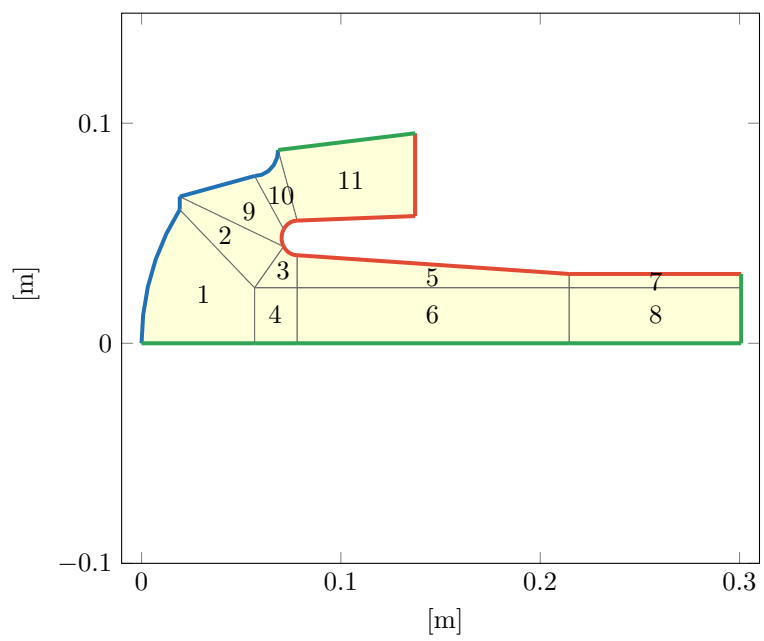
# Electrongun

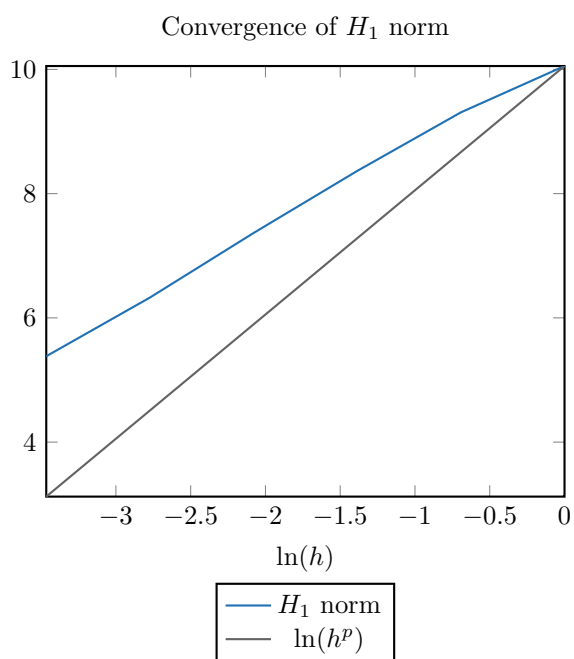
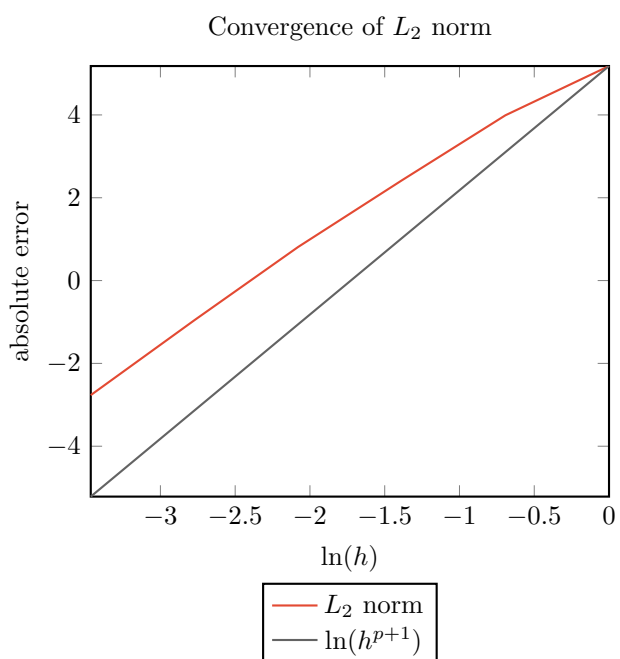
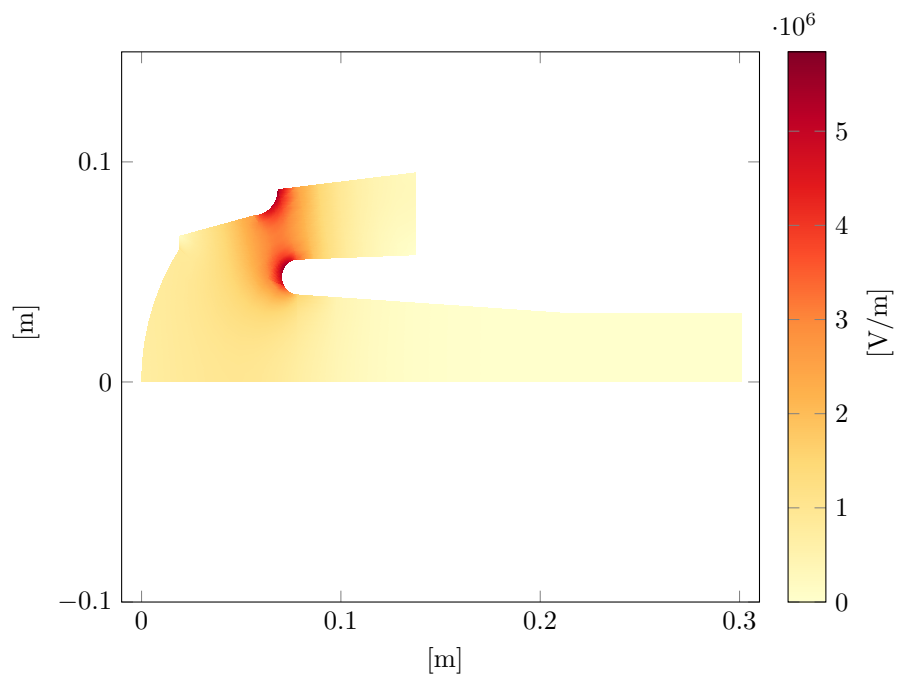
## 1 Overview

- fieldmap uses equidistant points, may improve if the cathode part has higher resolution, show fieldplots in Astra
- maybe choose the points explicitly to obtain sufficient accuracy
- only 3D field maps with nonzero entries in every coordinate direction allowed, current solution uses two very small steps in x-direction
- fieldmap could be mirrored for 3D (only compute one quadrant and take care of the duplicate entries at the interfaces)

## 2 Tracking

- emission is handled on my side, either uniformly or normally distributed particles
- both types depend on multiple parameters:
- none of the parameter combinations have produced ideal results yet, show tracks
- I tried emission over time span, sharply increases computation time and did not yield different results (maybe try almost constant emission over a very short time span 0.1ns or even shorter)
- space charge is included with planar mirror plane (may be improved by approximating our cathode geometry and using the referenced paper, only works for 2D!)
- inclusion of solenoid and 3D tracking should be possible (don't know the computational cost yet)
- start with straight cathode, show tracks also for this case!





### 3 Optimization

- cost function uses outermost beam minimum, distance of beam minima and radial derivatives of minima
- extra constraint to force continuity at  $(0,0)$
- start with straight cathode
- how to correctly manipulate control points to only load the geometry once (increase number of control points with each optimization cycle)