

Higher aspect ratio configurations

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Wistell Meeting, Feb 08, 2019

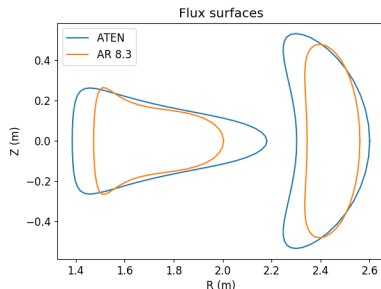
Generating higher aspect ratio configurations

- Methodology
- The long road to low ι configurations

Asking ROSE to find higher aspect ratio configs

Methodology: Include Aspect Ratio as a target in ROSE and ask it to find new configurations

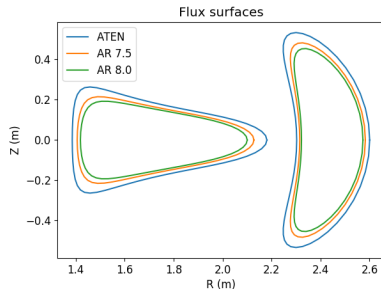
- ROSE is able to find solutions
- However, flux surfaces looked terrible
- Need better solutions



Naively take inner surfaces and scale to have equivalent volume

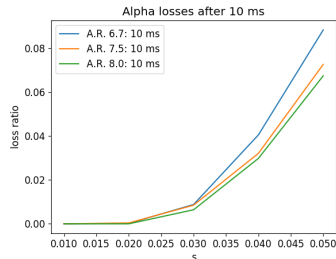
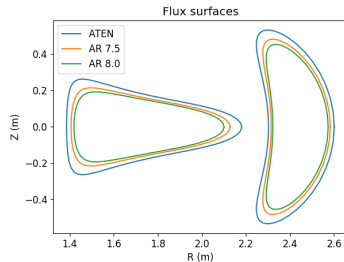
Methodology: Use ATEN configuration, but use internal flux surface as boundary

- Aspect ratios 7.5 and 8.0 obtained
- Scaled to minor radius 0.25 cm
- Smaller minor radius than ATEN which is 0.29 cm

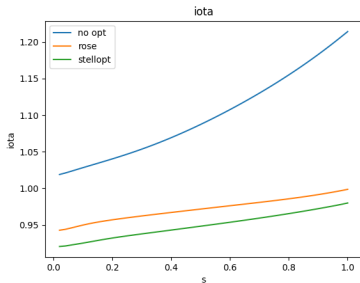
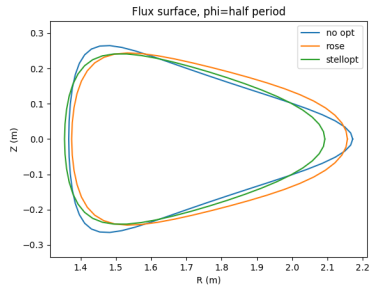
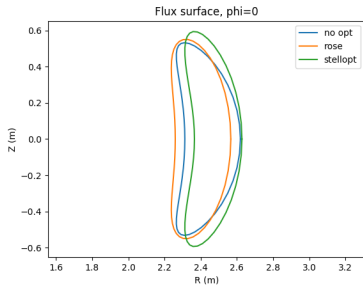


Energetic particles in scaled configurations

- Scale ATEN and other configurations to ARIES volume (450 m^3) and field ($B_0 = 5.7 \text{ T}$)
- Energetic particle confinement improves at higher aspect ratio despite lower ρ^*

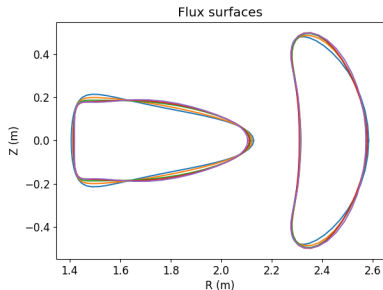
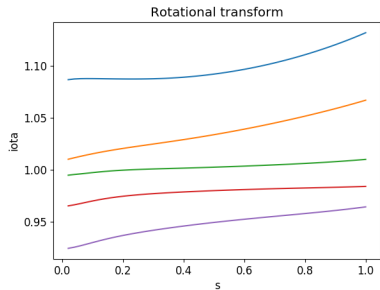


Past attempts at optimization for iota



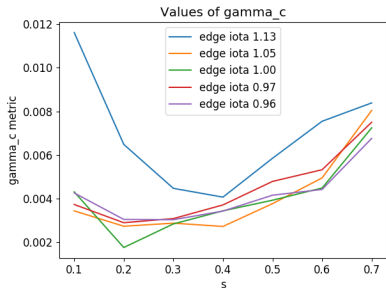
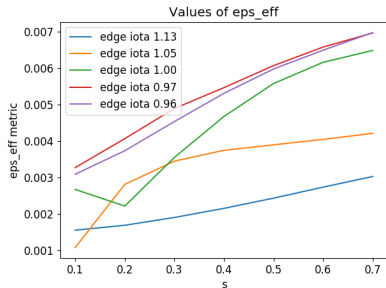
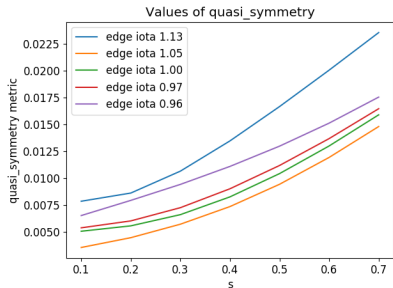
- Results did not look too unreasonable
- Stuff got really bad though with finite current in optimizer

Trying to find lower iota configurations (AR 7.5)



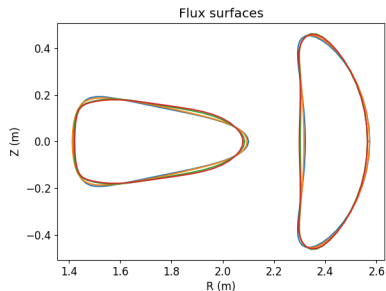
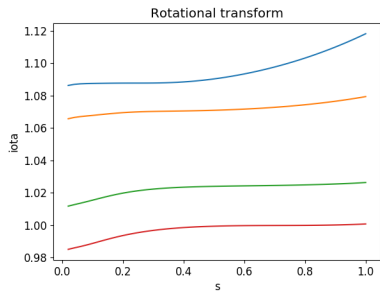
It took many separate ROSE runs, gradually adjusting iota weights to get an equilibrium without too much weird shaping

Trying to find lower iota configurations (AR 7.5)

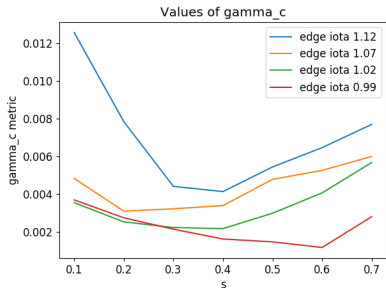
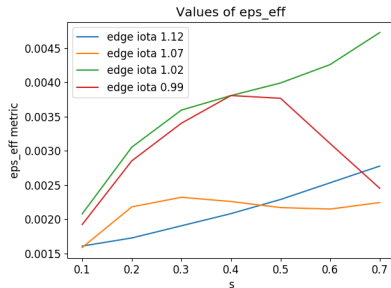
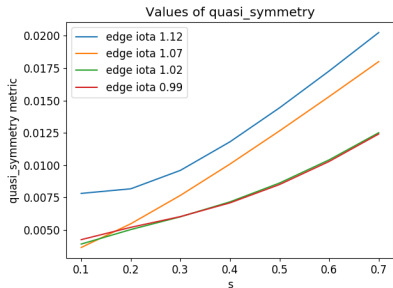


- ϵ_{eff} gets worse with lower ι
- QH first gets better then worsens
- Γ_c good at all lower ι cases

Trying to find lower iota configurations (AR 8.0)



Trying to find lower iota configurations (AR 8.0)



- ϵ_{eff} gets worse with lower ι
- QH and Γ_c get better with lower ι