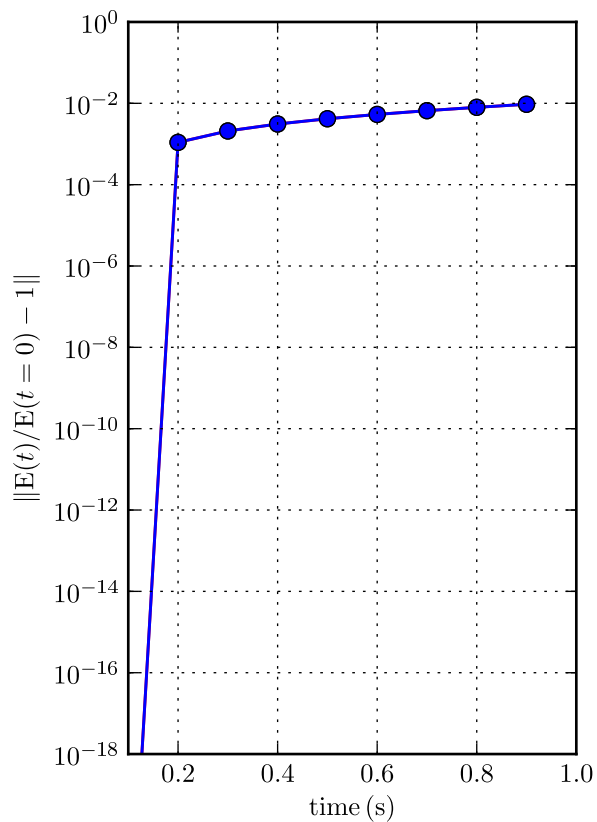
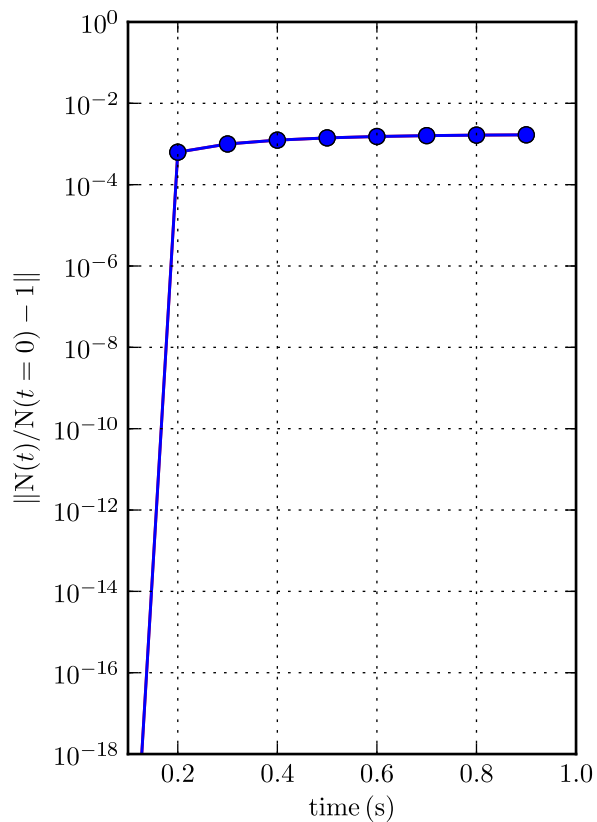
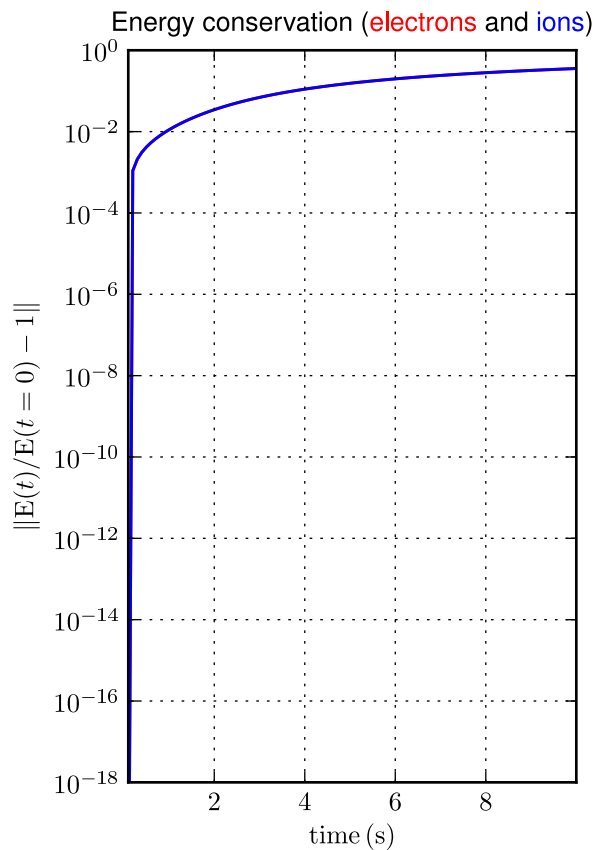
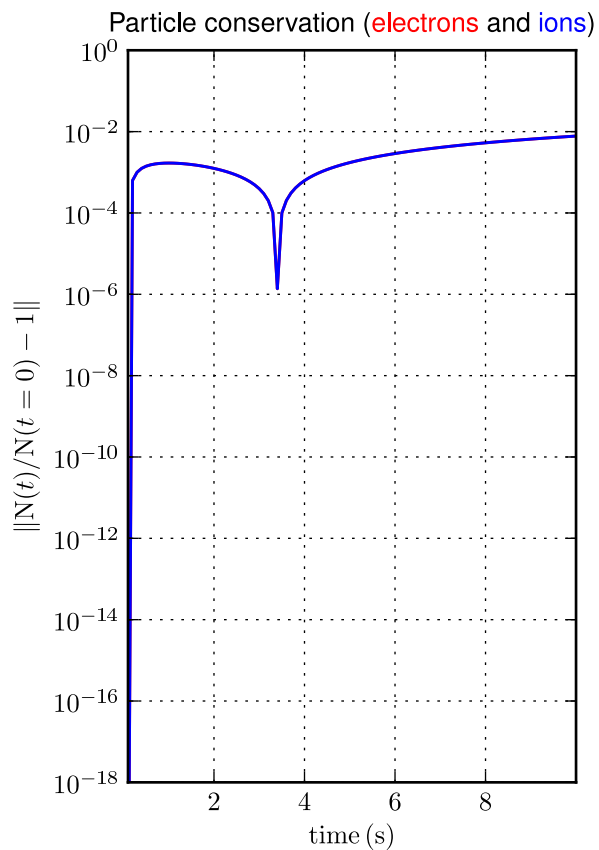


Part. & Energy conservation

[Case: I.1.5.i, Solver: 3, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

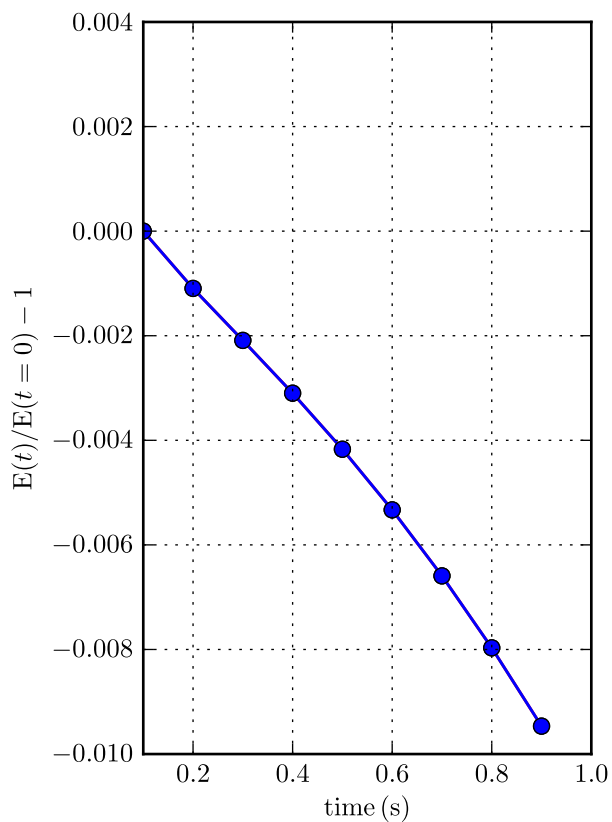
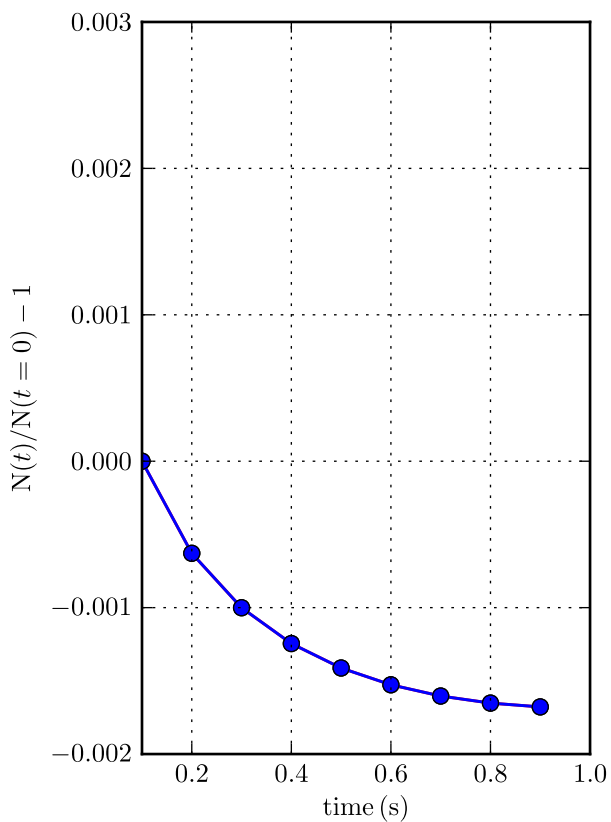
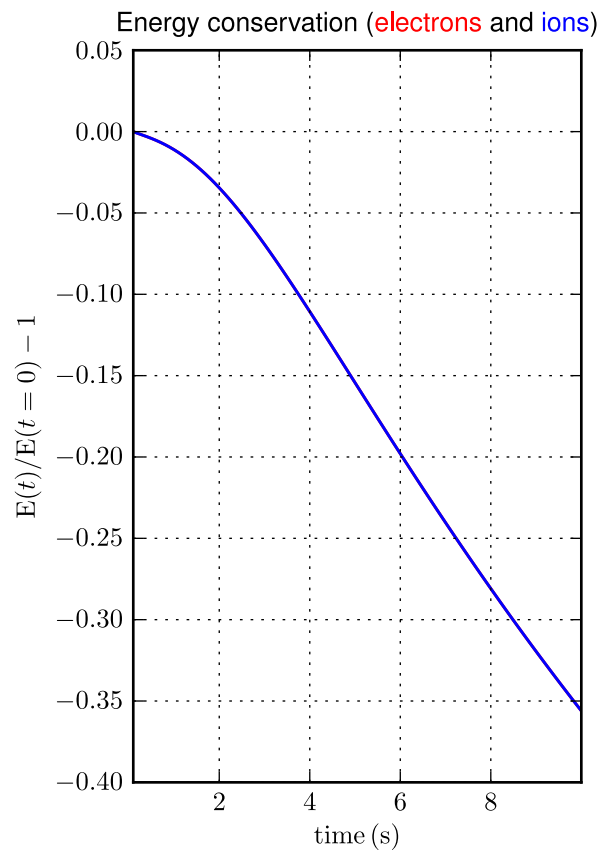
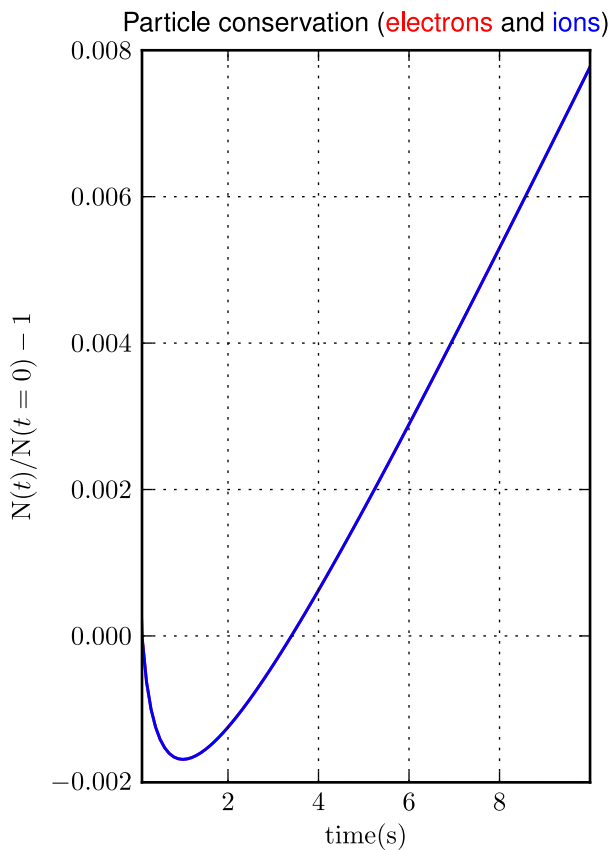
Comparison with initial solution - log scale; total time and zoom over time



Part. & Energy conservation

[Case: I.1.5.i, Solver: 3, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

Comparison with initial solution - linear scale; total time and zoom over time

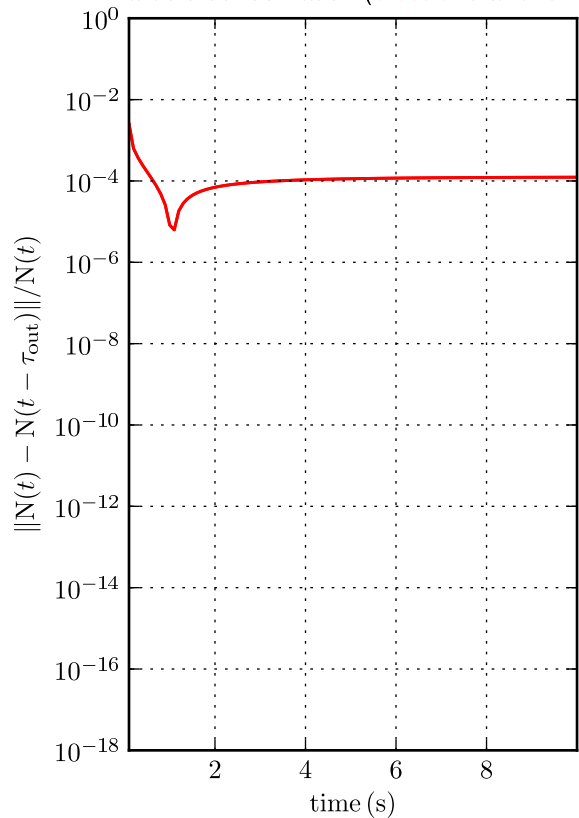


Part. & Energy conservation

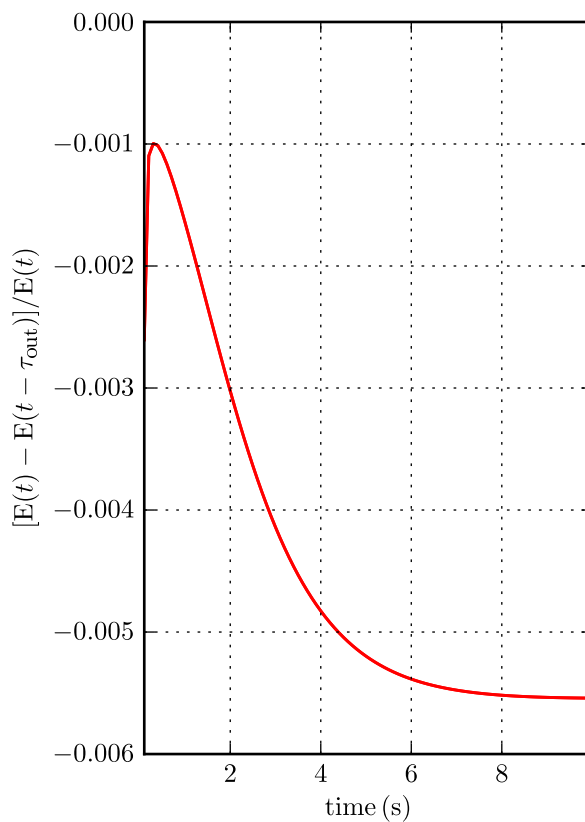
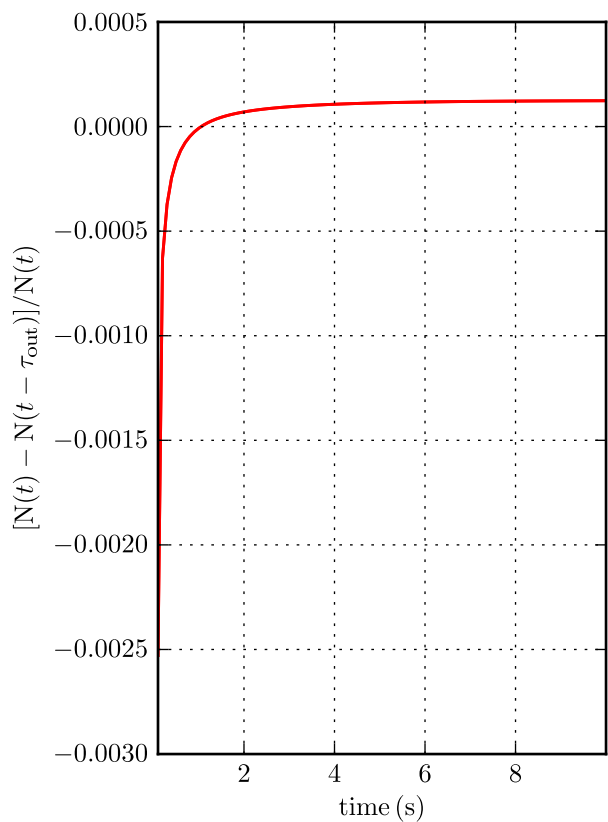
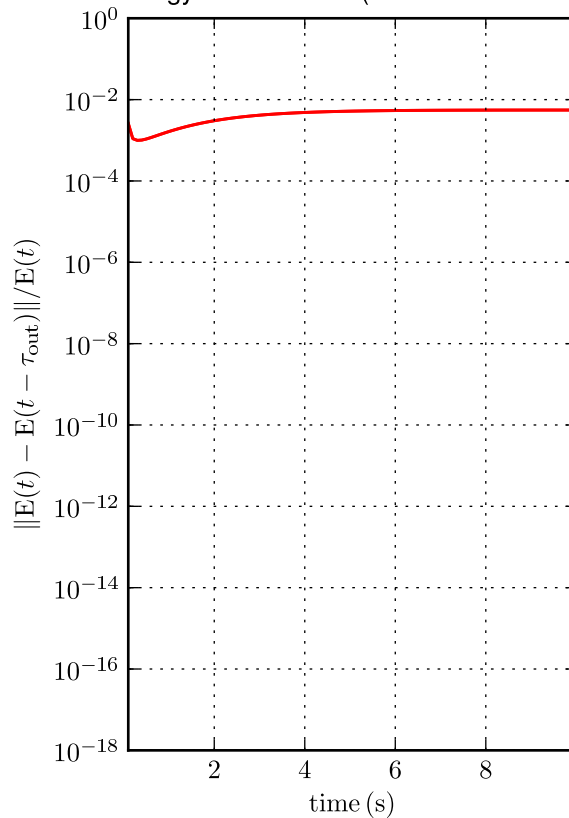
[Case: I.1.5.i, Solver: 3, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_p = 101$]

Comparison with previous time-sampled (τ_{out}) solution - log and linear scales

Particle conservation (electrons and ions)

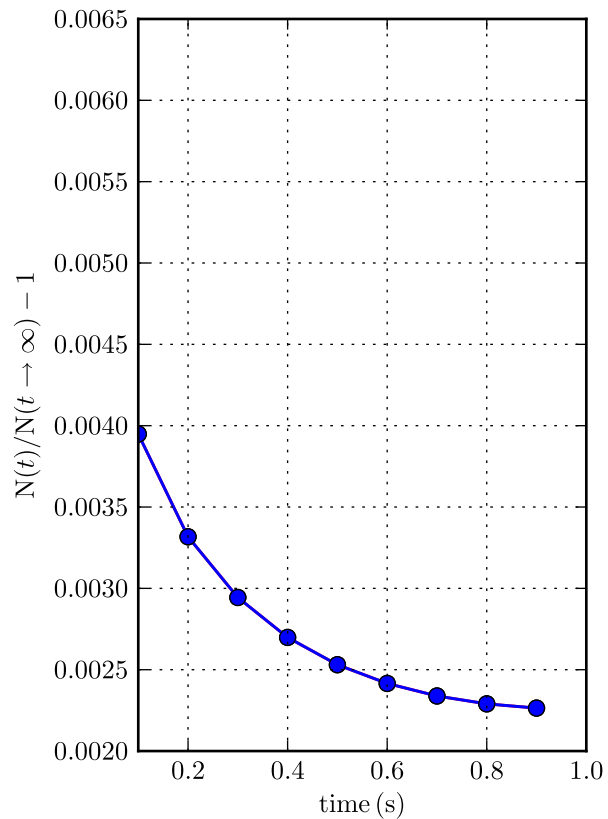
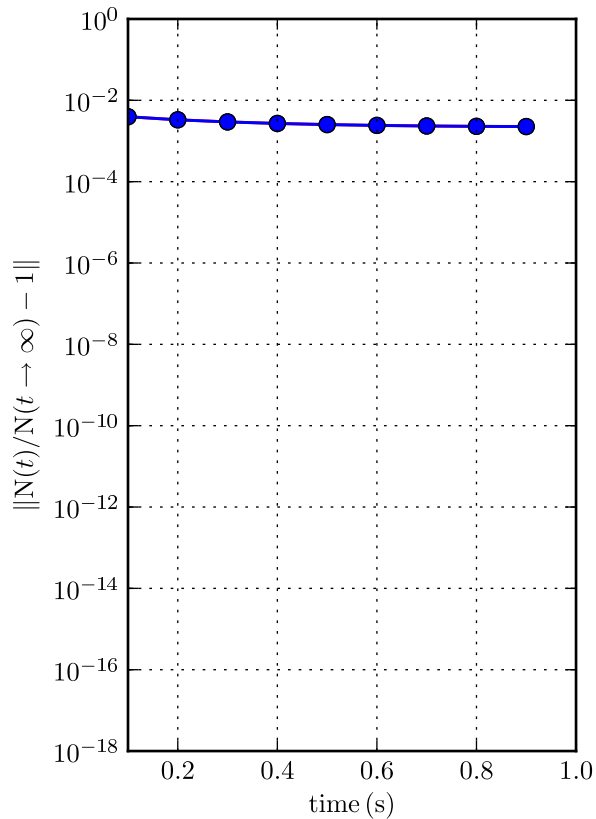
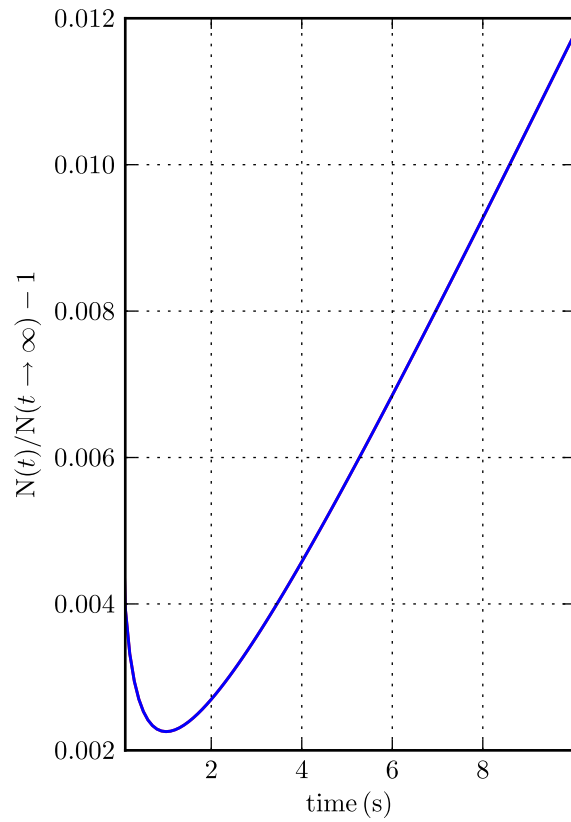
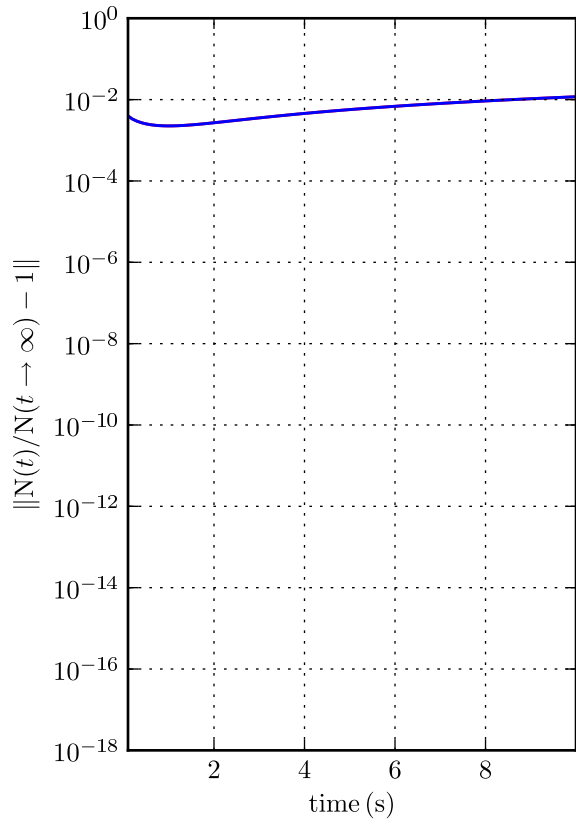


Energy conservation (electrons and ions)



Particle conservation

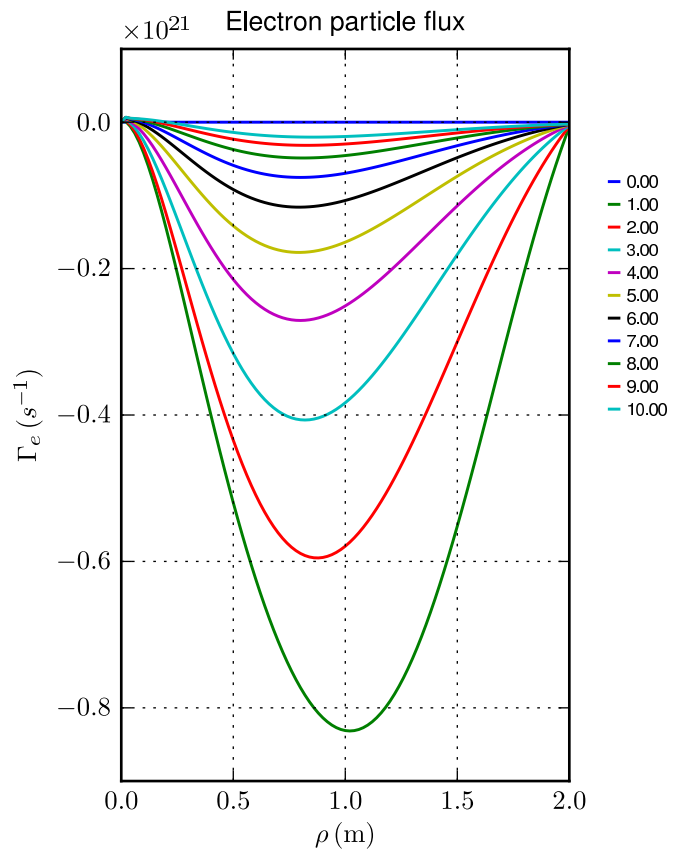
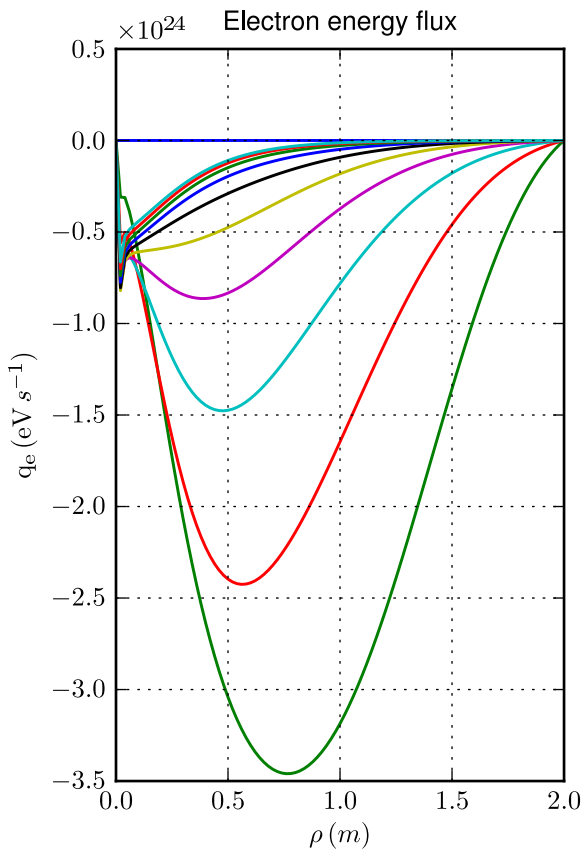
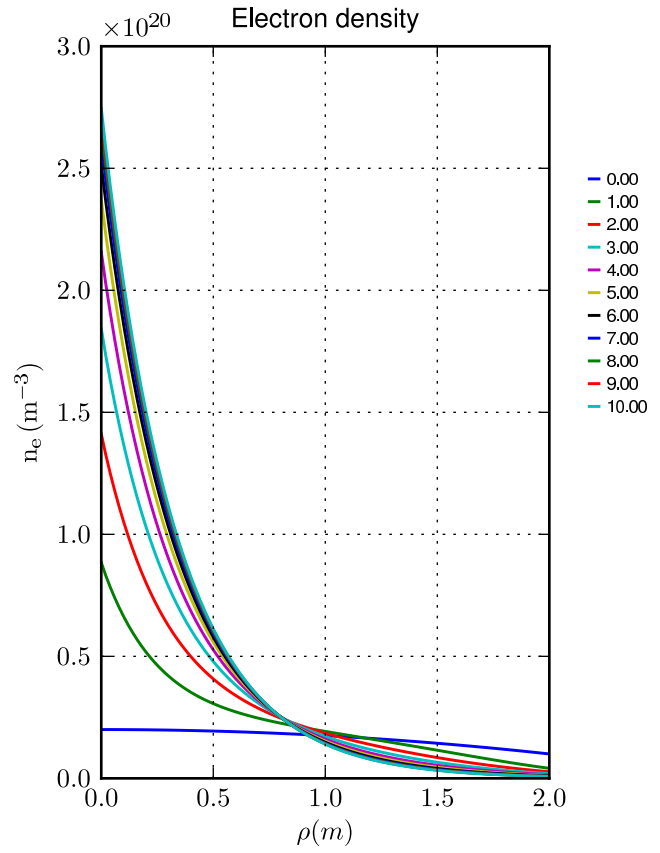
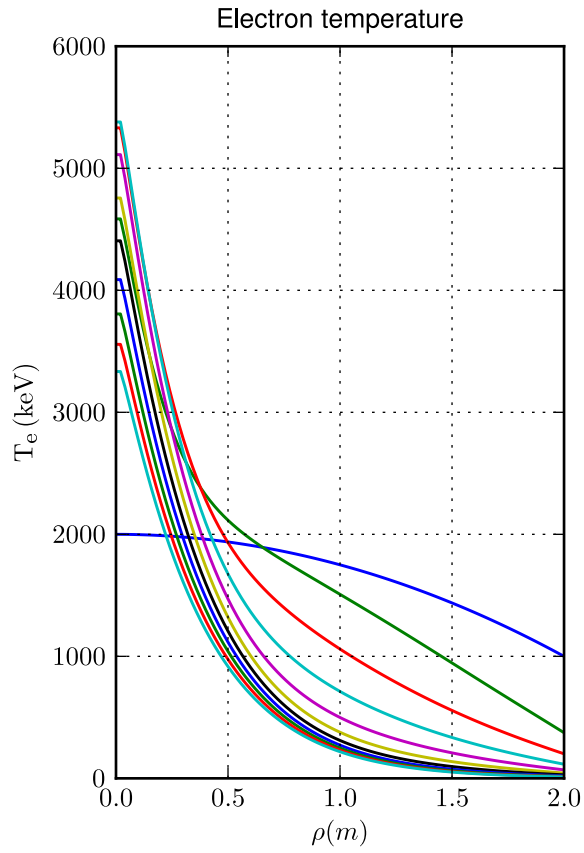
[Case: I.1.5.i, Solver: 3, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_p = 101$]
Comparison with asymptotic solution (electrons and ions); total time and zoom over time



Profiles

[Case: I.1.5.i, Solver: 3, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

Time sampling: total simulation time/10

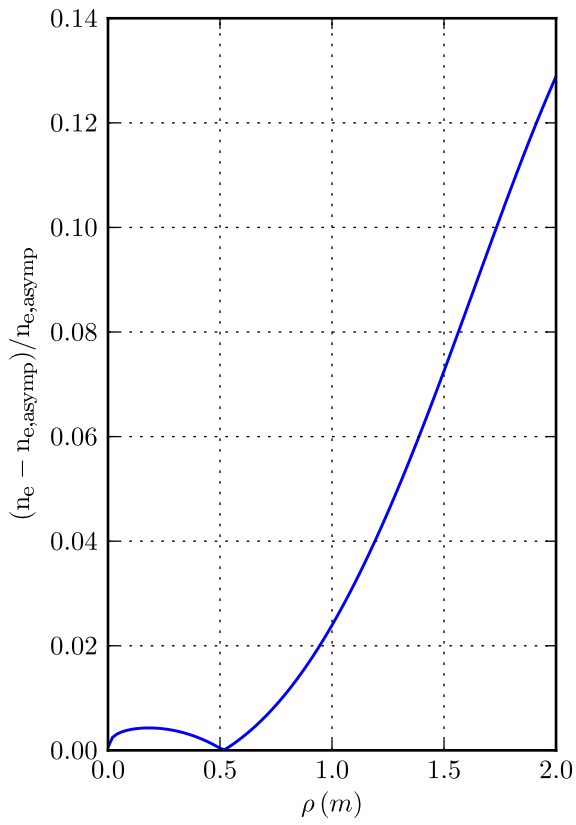


Profiles

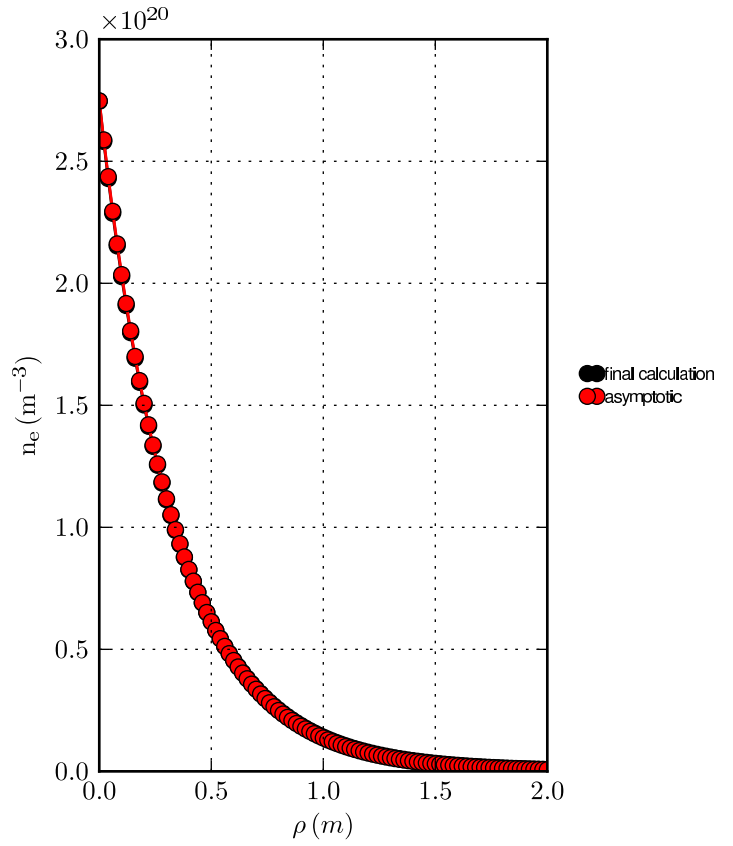
[Case: I.1.5.i, Solver: 3, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

Comparison with asymptotic solution

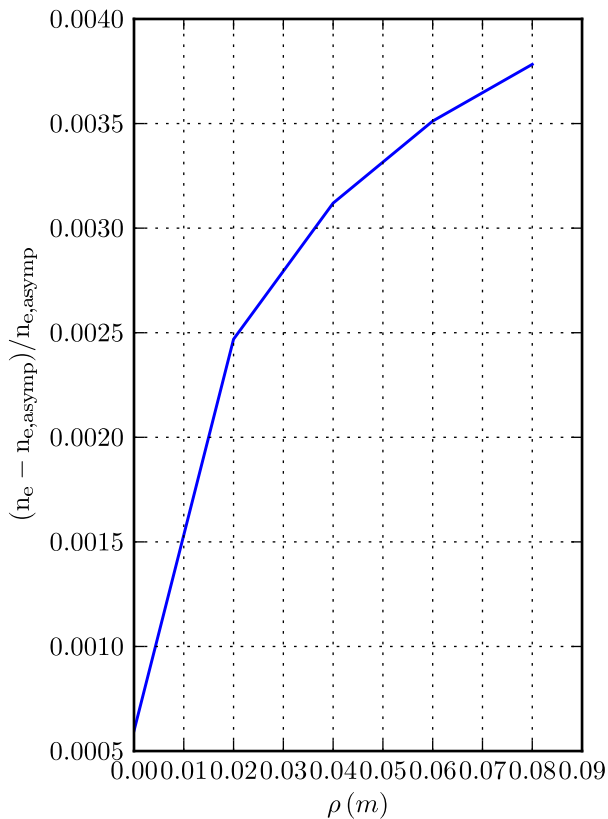
Electron density relative error



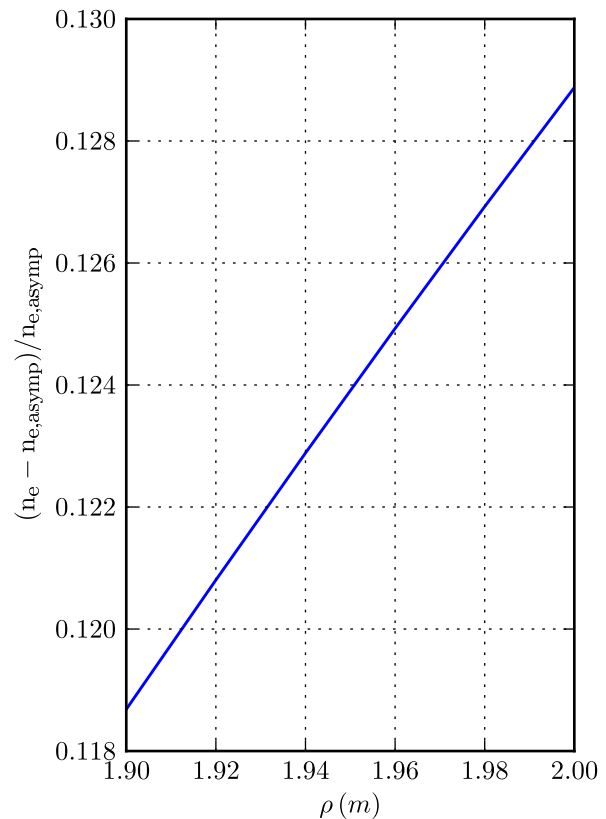
Electron density



Error: zoom over axis



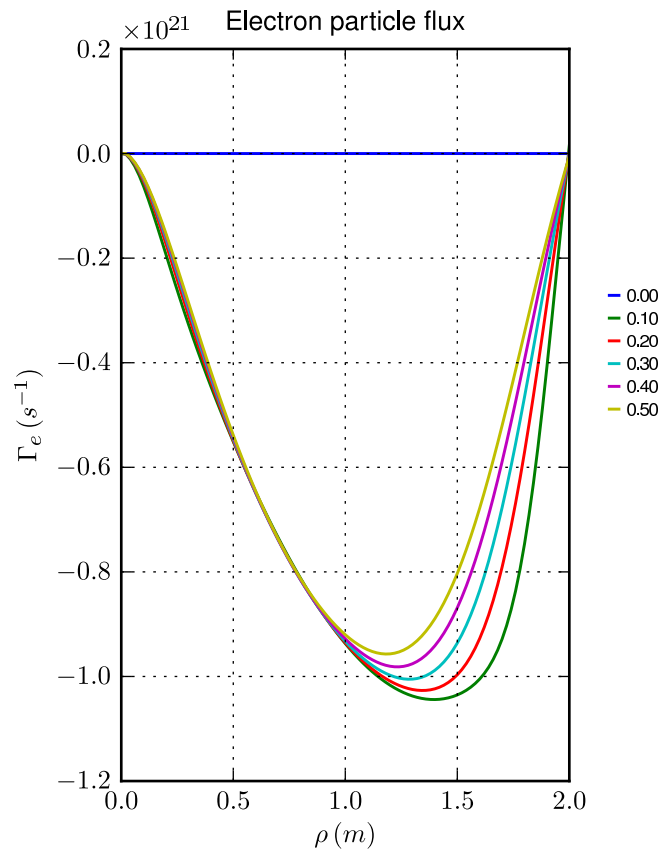
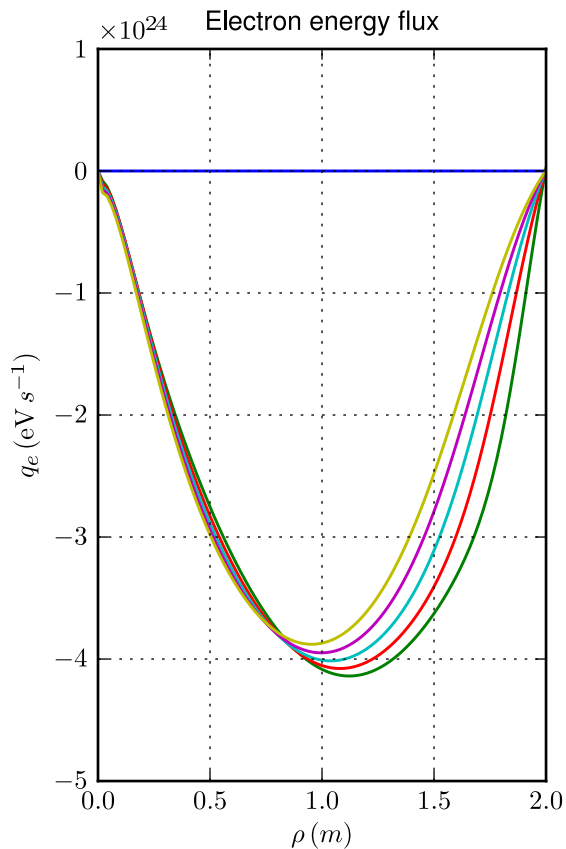
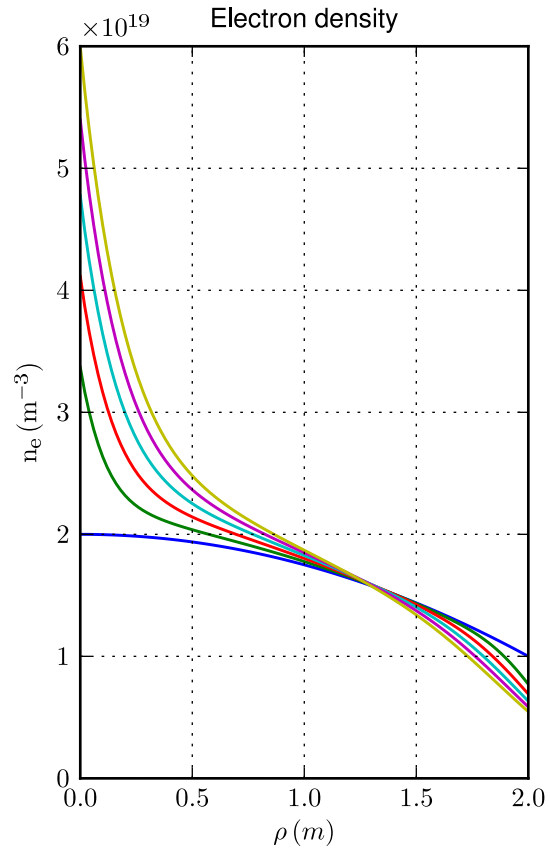
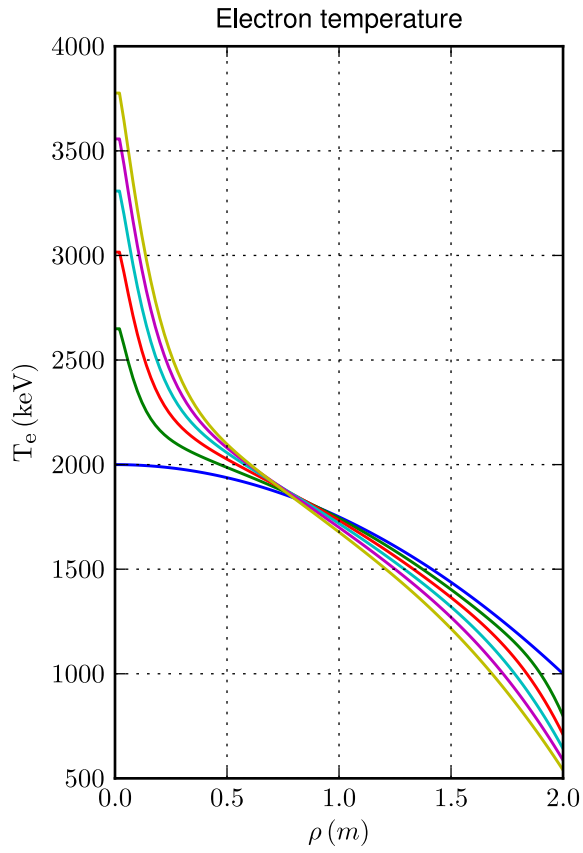
Error: zoom over edge



Profiles

[Case: I.1.5.i, Solver: 3, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

Time sampling: first 10 time slices or zoom over time $0.1 \times (a^2/D)/|1 - (Va/D)| = 0.57 \text{ s}$

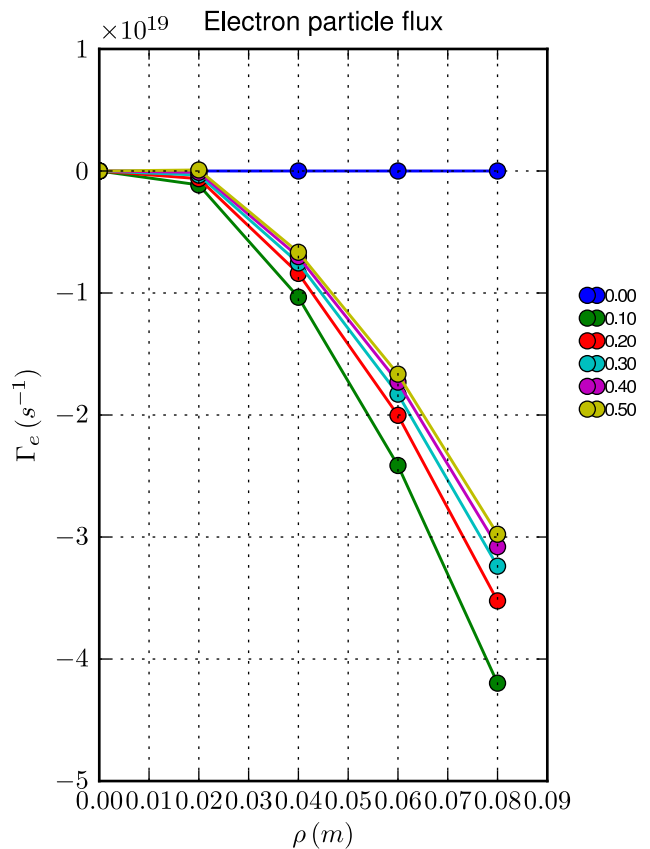
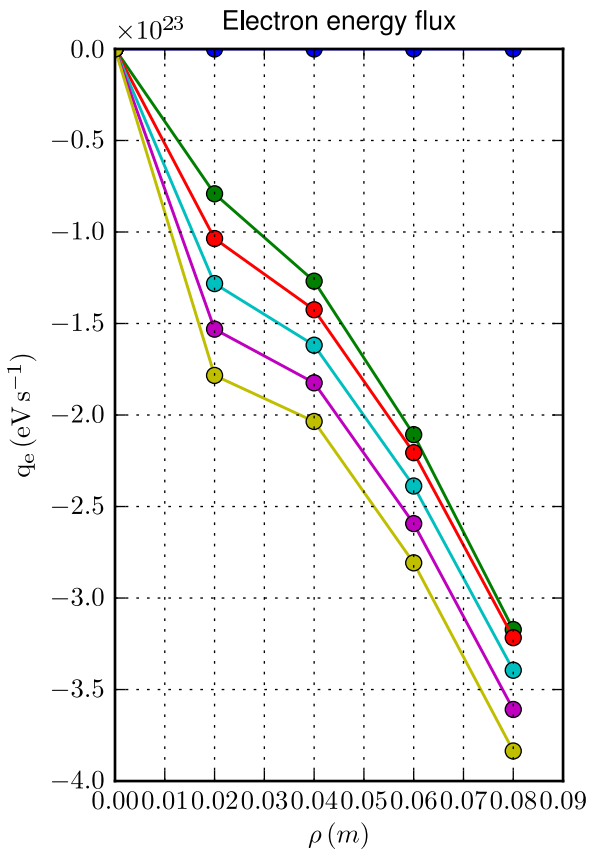
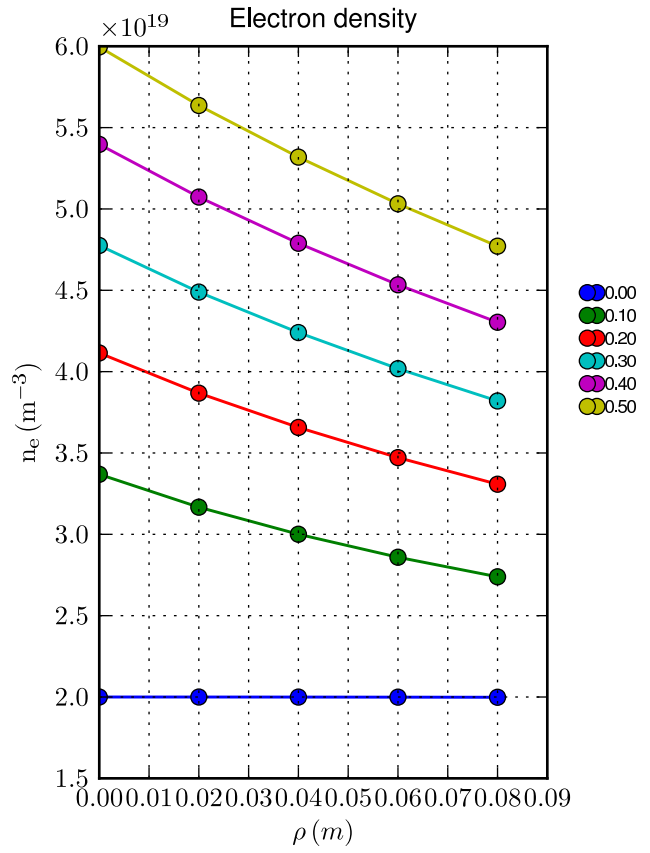
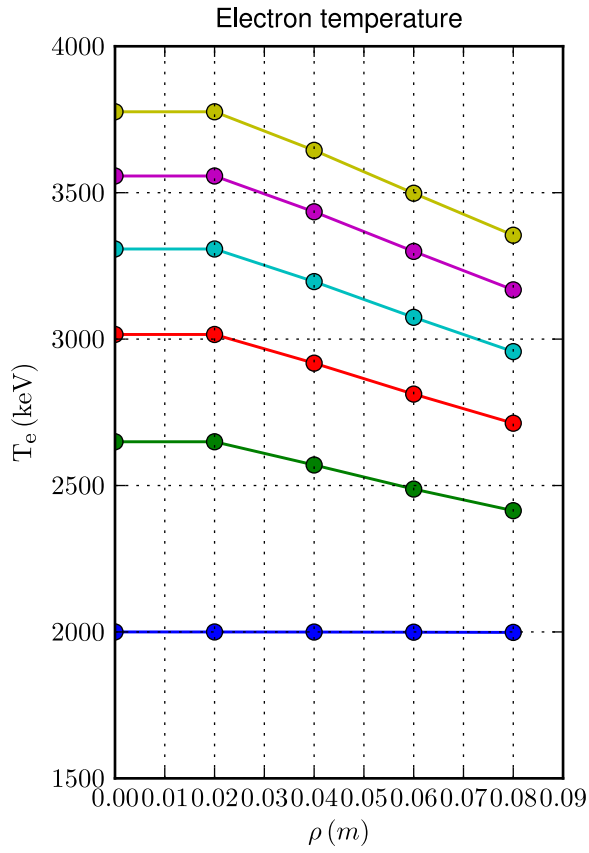


Profiles

[Case: I.1.5.i, Solver: 3, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

Spatial zoom over magnetic axis

Time sampling: first 10 time slices or zoom over time $0.1 \times (a^2/D)/|1 - (Va/D)| = 0.57 \text{ s}$

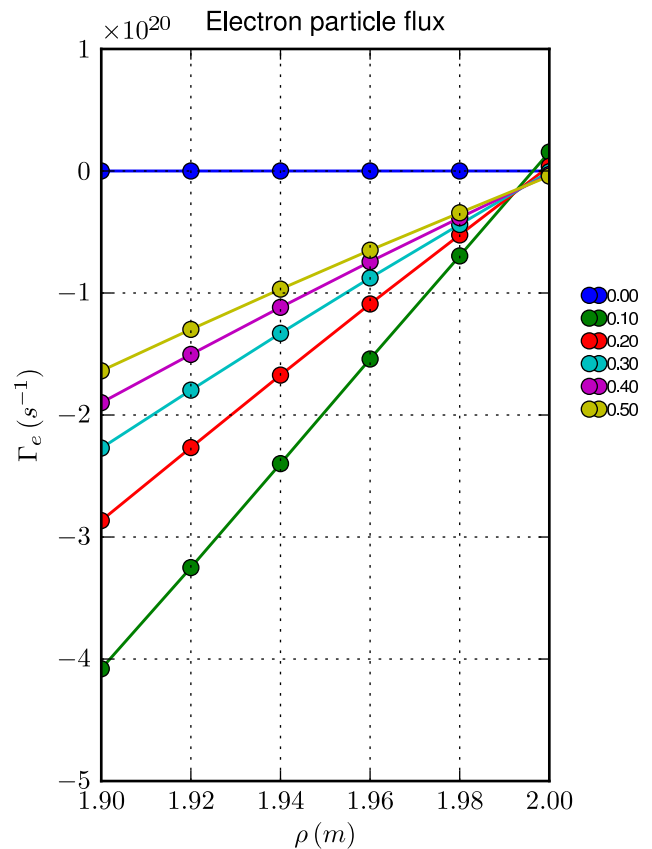
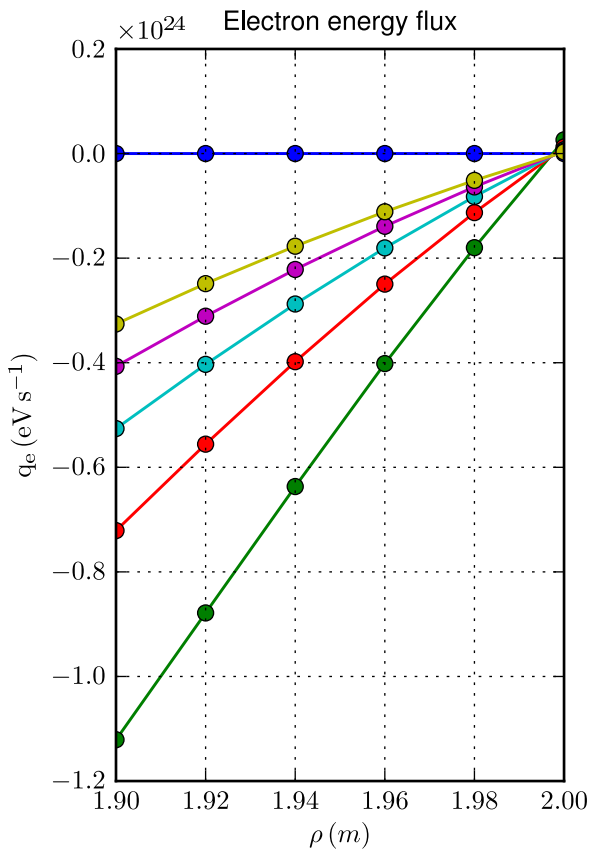
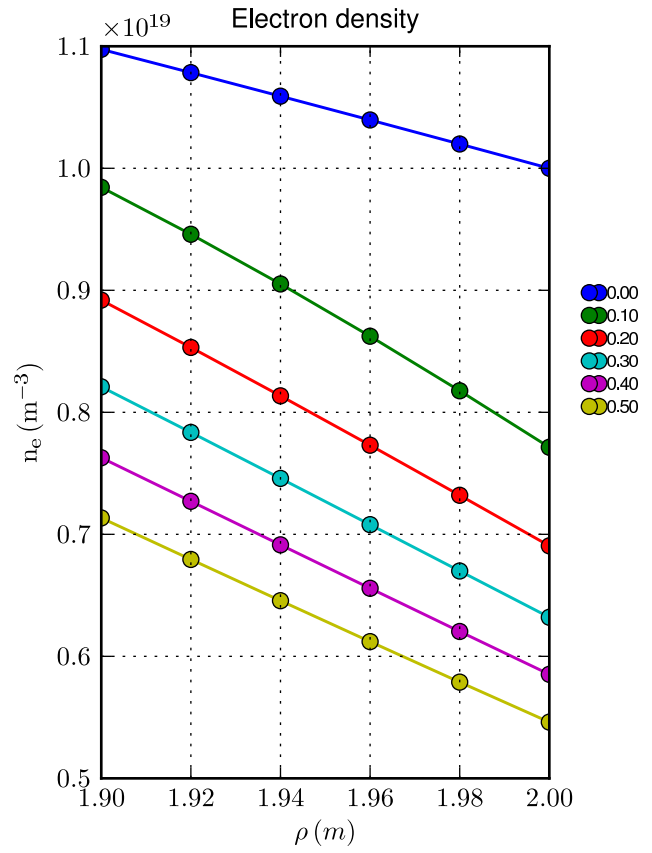
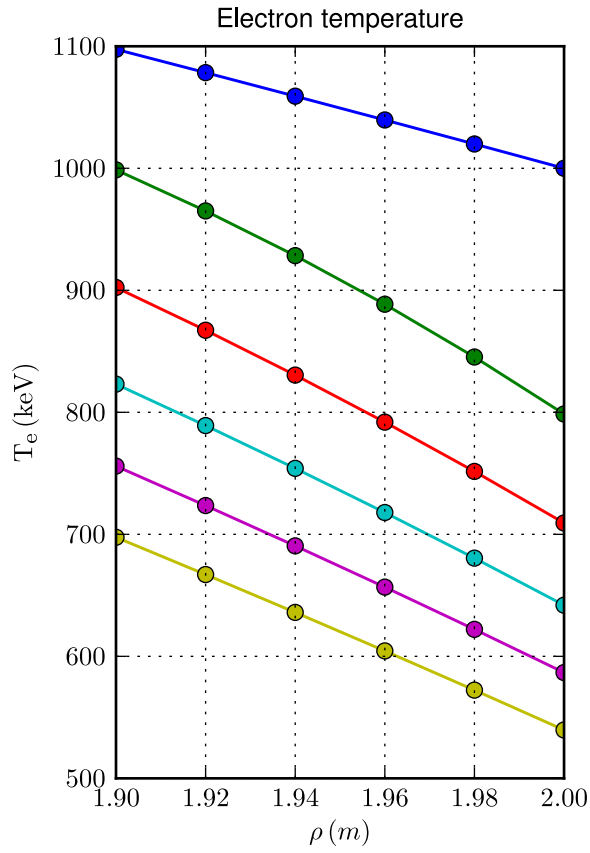


Profiles

[Case: I.1.5.i, Solver: 3, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

Spatial zoom over edge

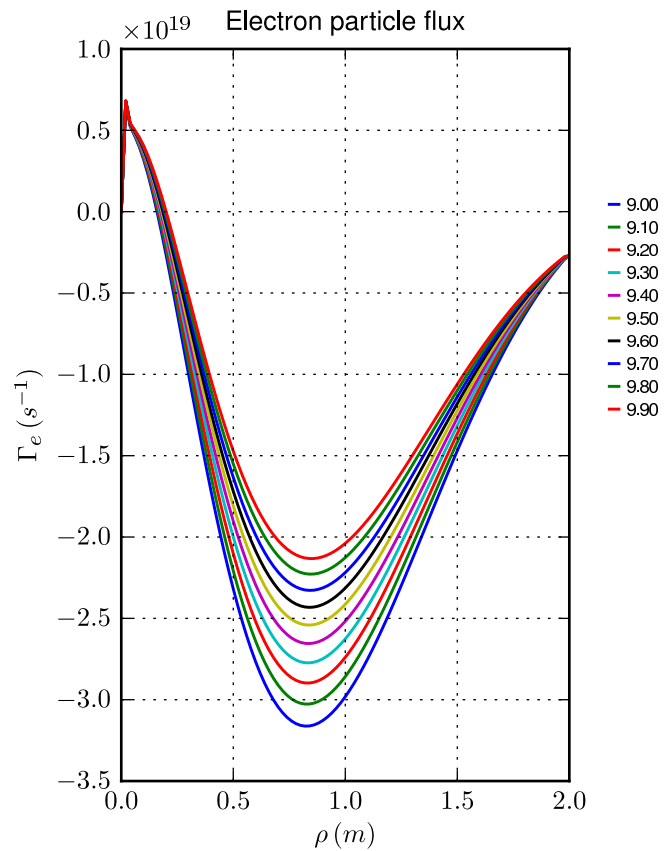
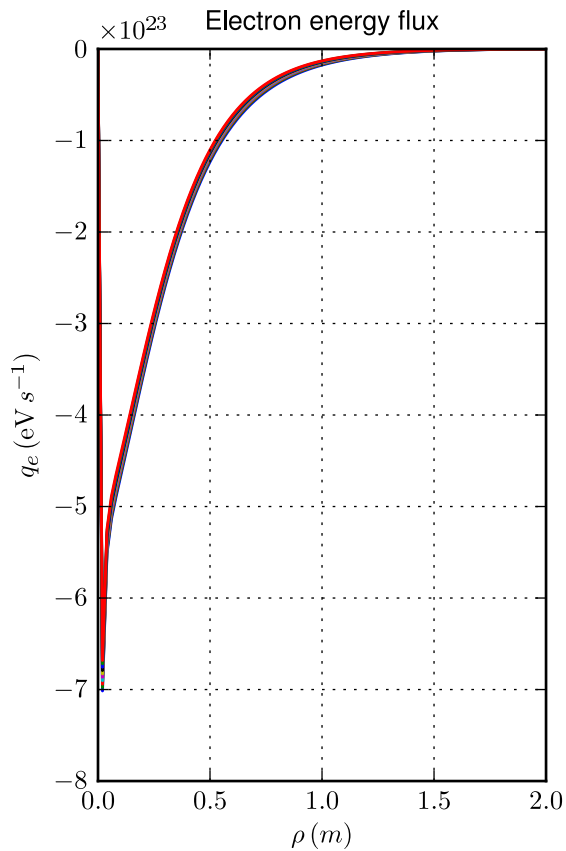
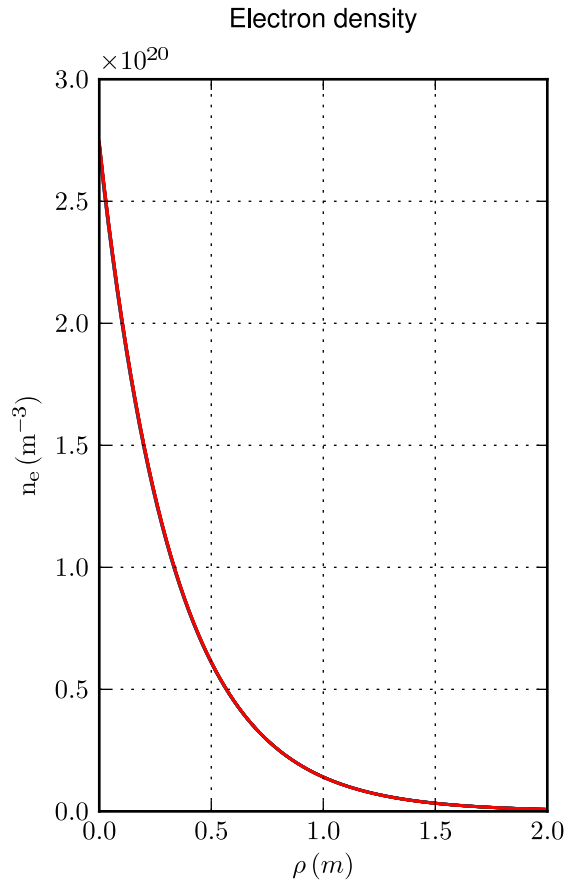
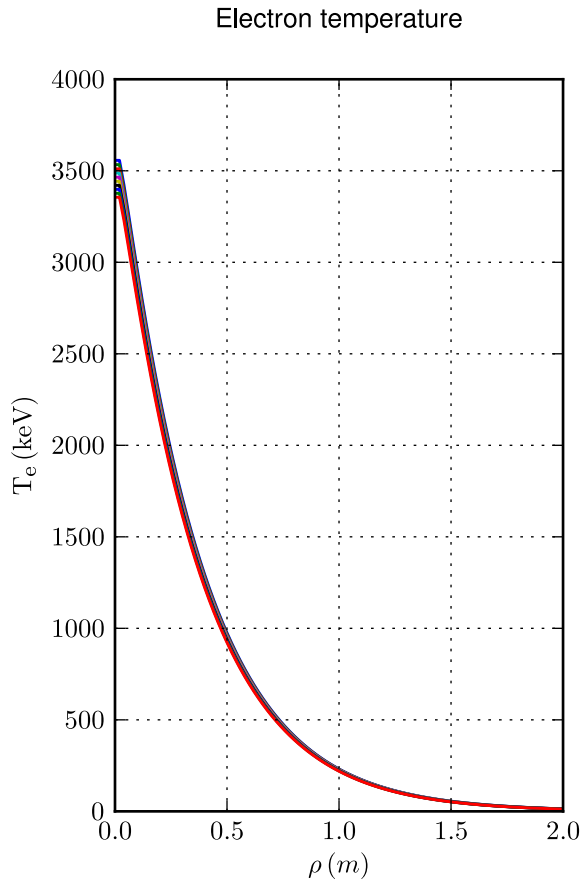
Time sampling: first 10 time slices or zoom over time $0.1 \times (a^2/D)/|1 - (Va/D)| = 0.57 \text{ s}$



Profiles

[Case: I.1.5.i, Solver: 3, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

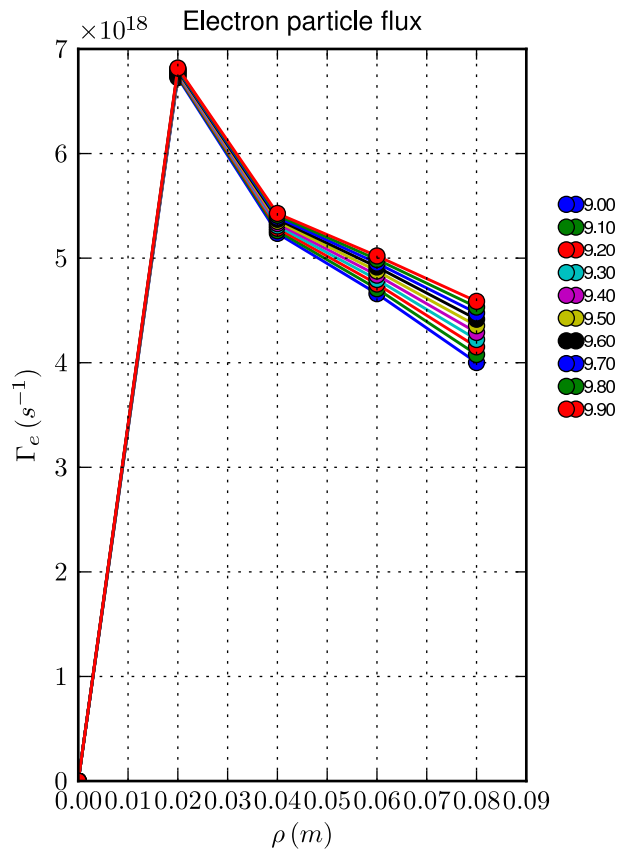
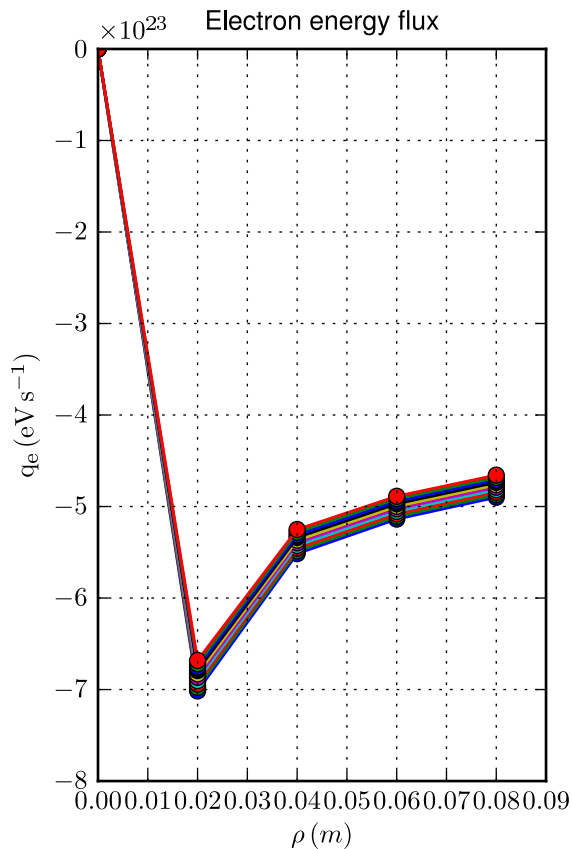
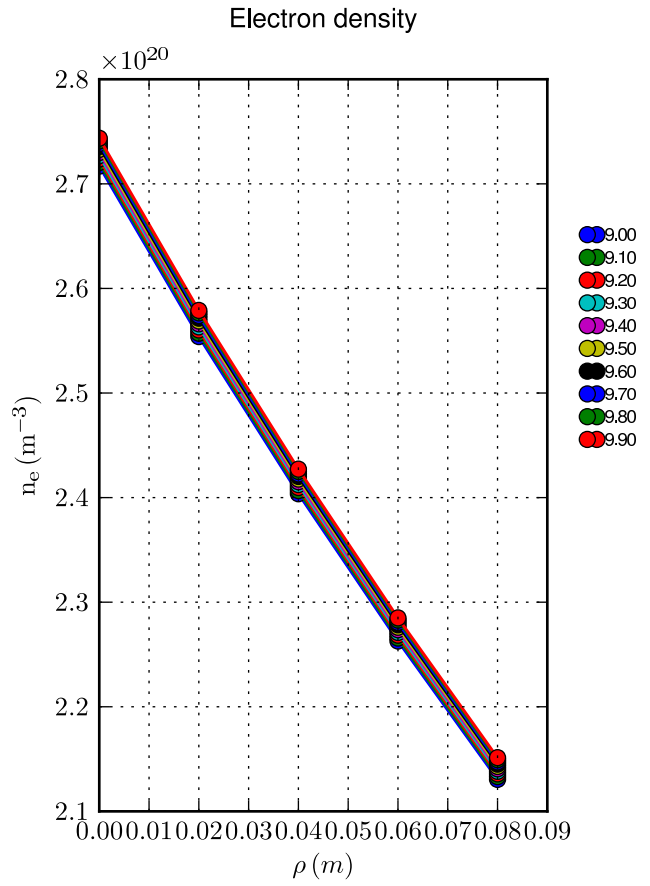
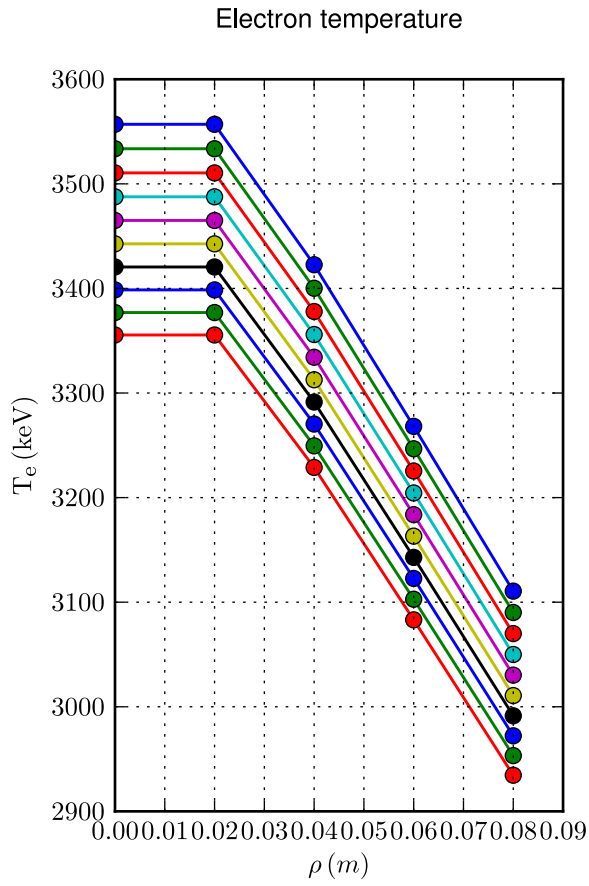
Time sampling: last 10 time slices



Profiles

[Case: I.1.5.i, Solver: 3, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

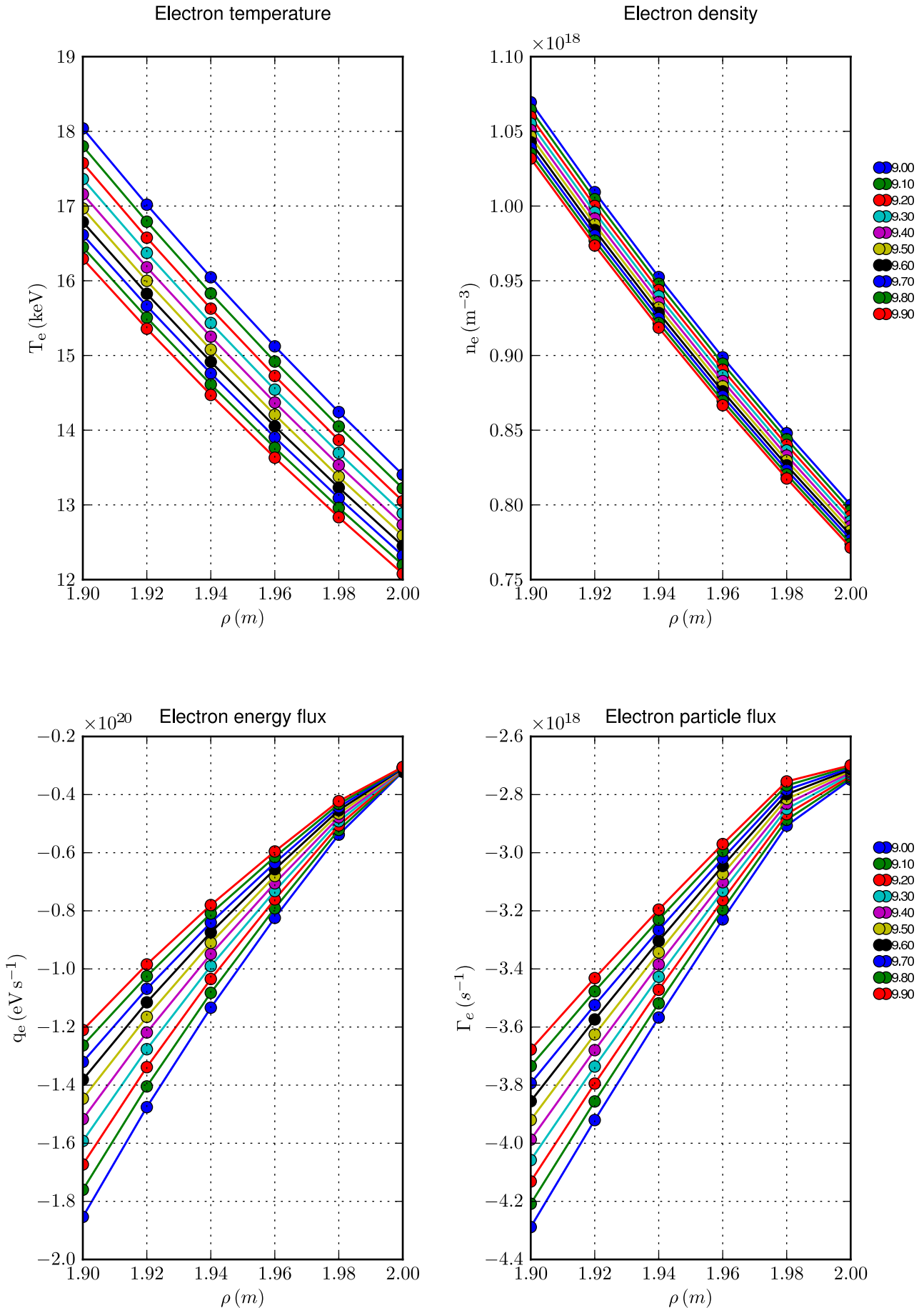
Spatial zoom over magnetic axis; time sampling: last 10 time slices



Profiles

[Case: I.1.5.i, Solver: 3, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

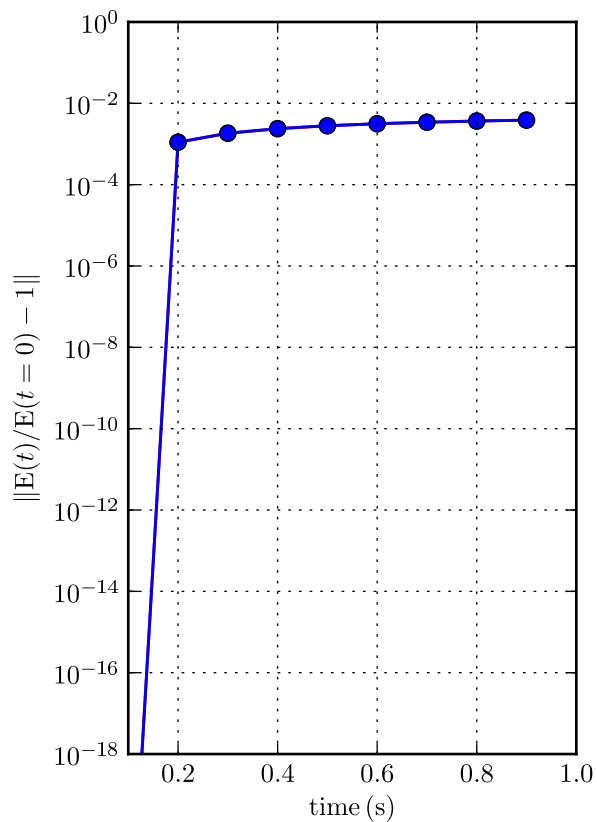
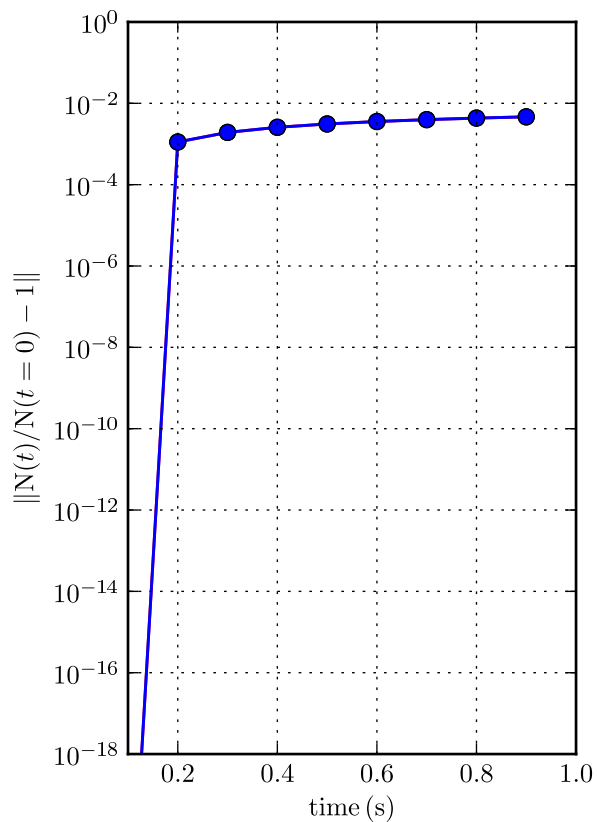
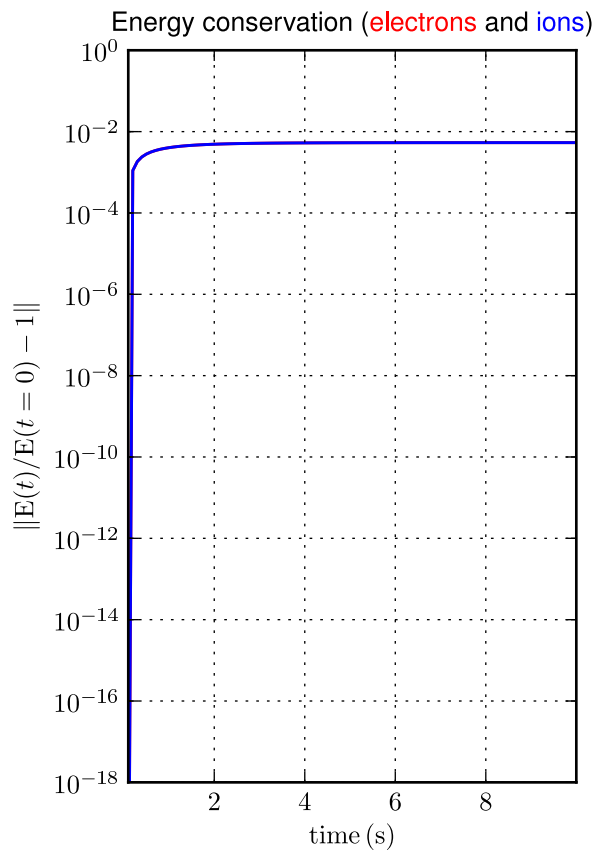
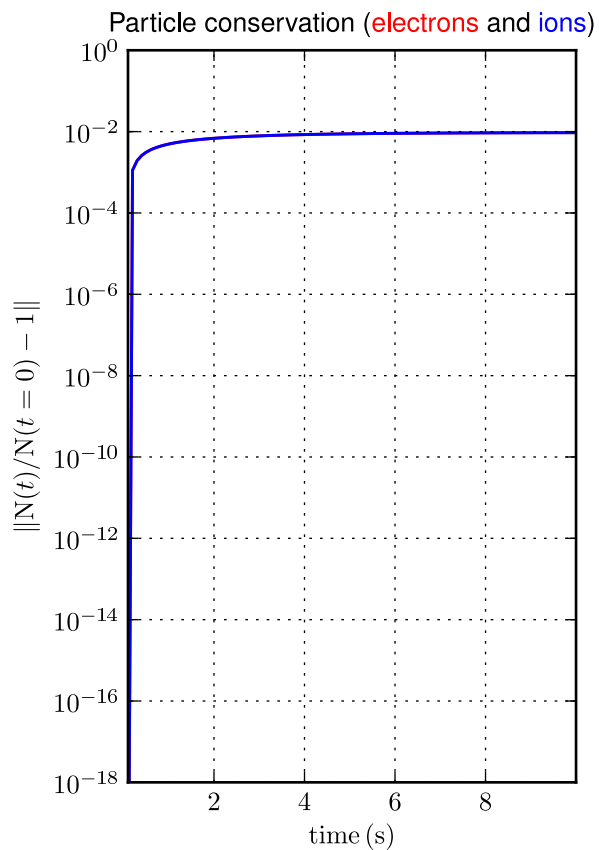
Spatial zoom over edge; time sampling: last 10 time slices



Part. & Energy conservation

[Case: I.1.5.i, Solver: 4, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

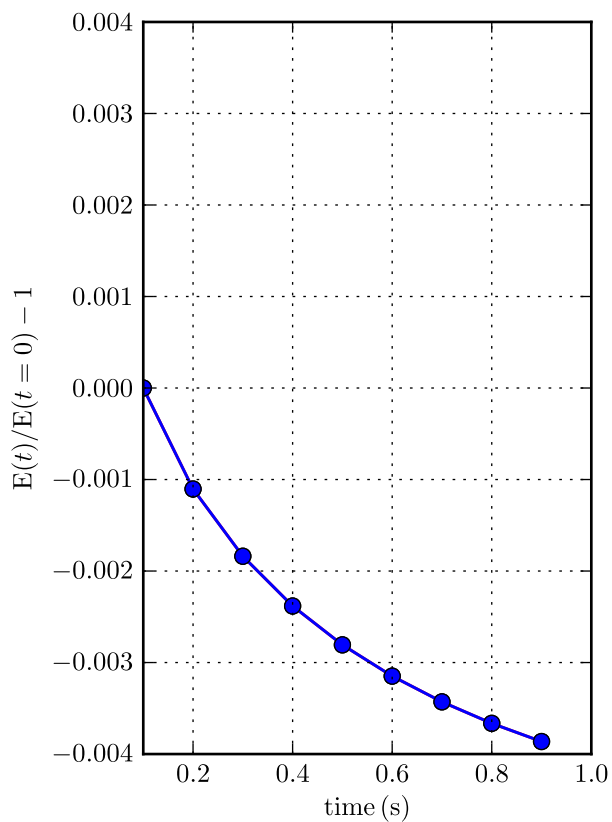
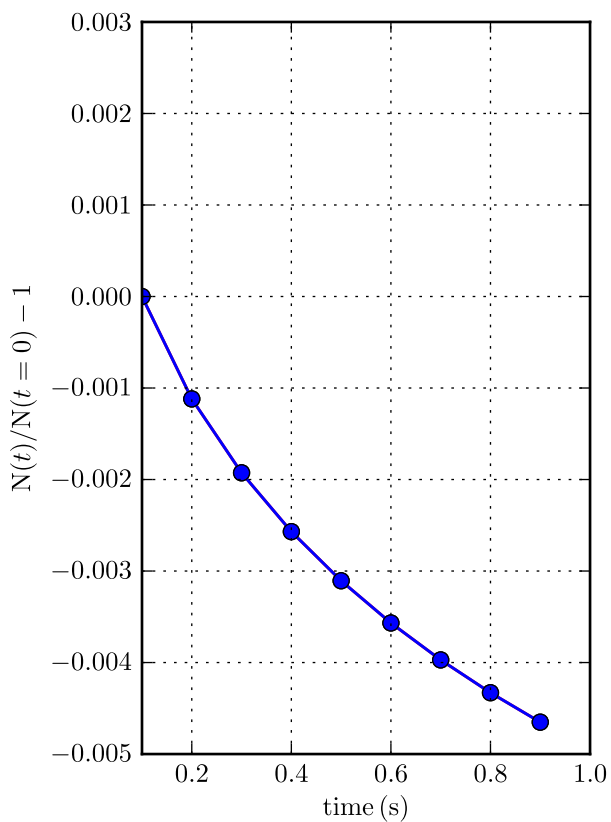
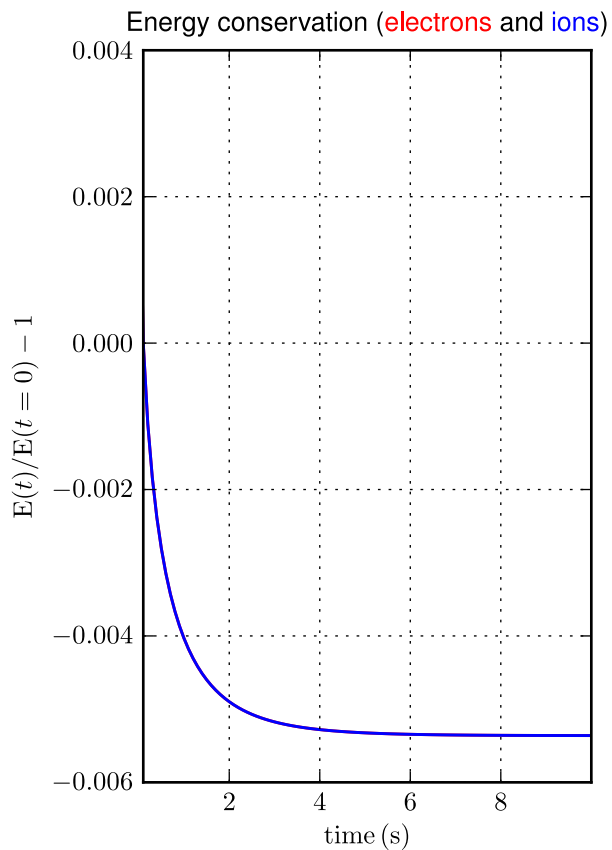
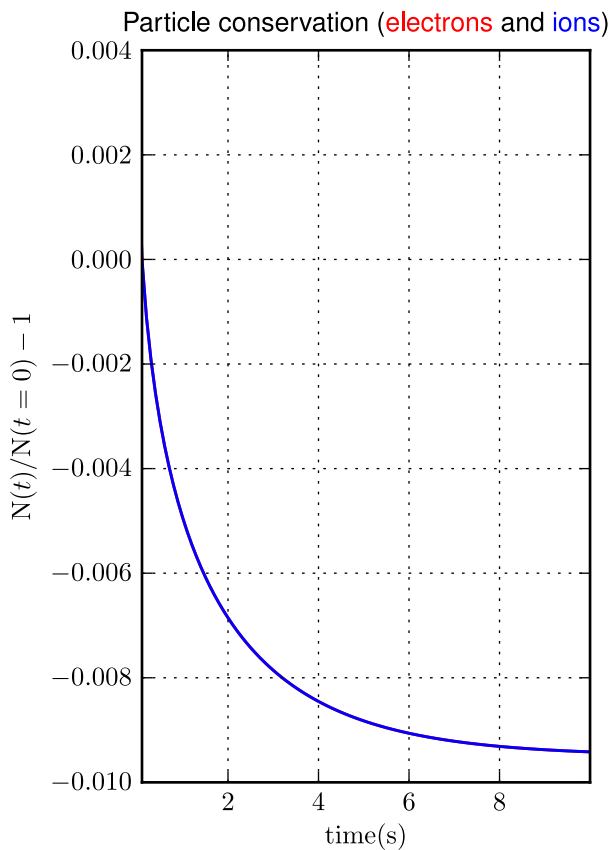
Comparison with initial solution - log scale; total time and zoom over time



Part. & Energy conservation

[Case: I.1.5.i, Solver: 4, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

Comparison with initial solution - linear scale; total time and zoom over time

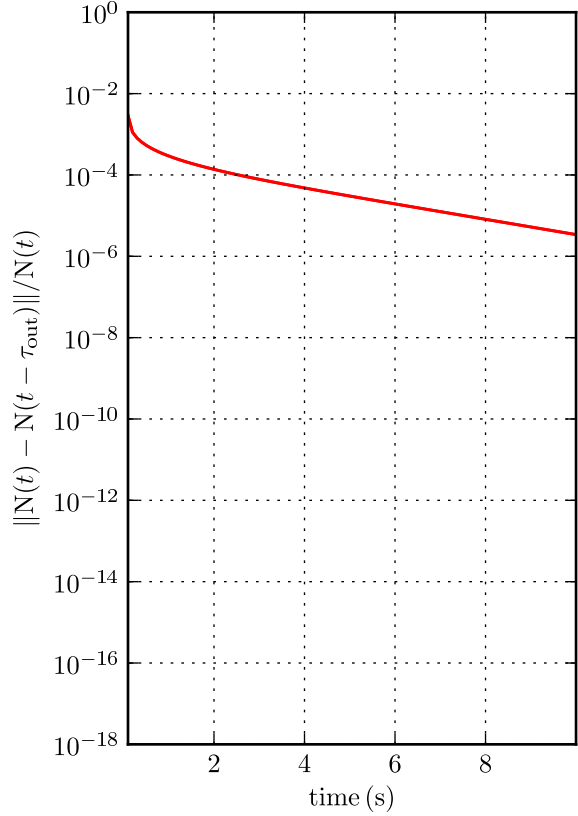


Part. & Energy conservation

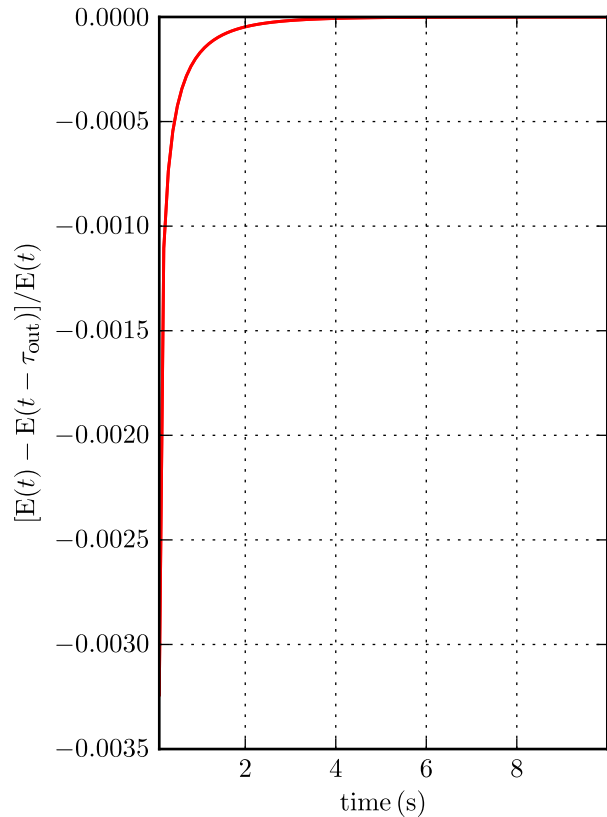
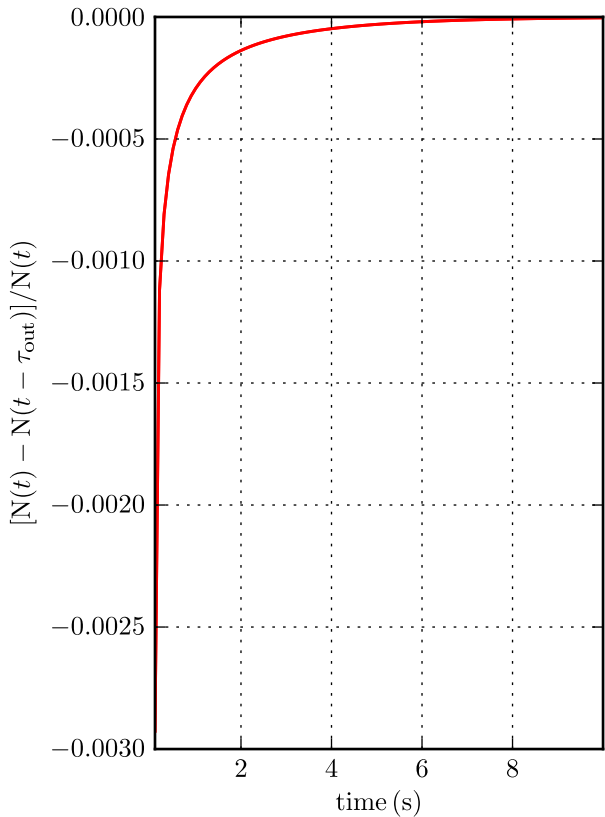
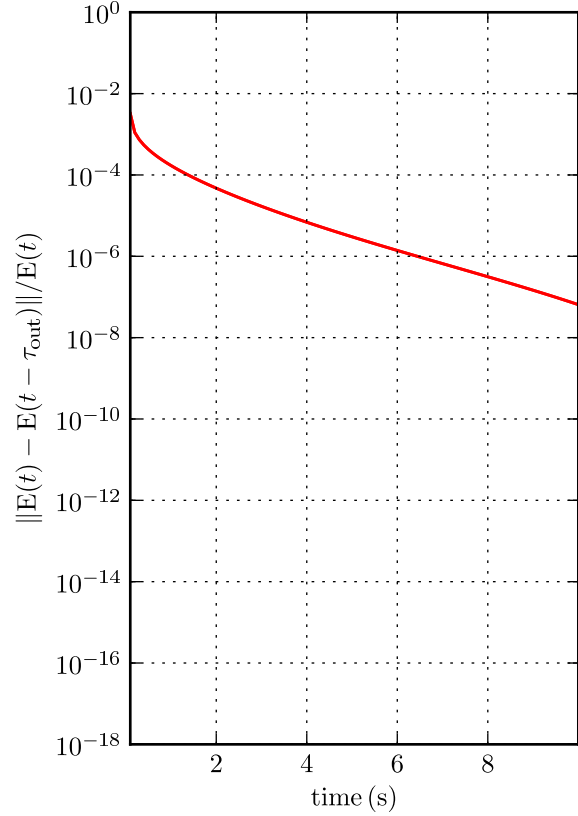
[Case: I.1.5.i, Solver: 4, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

Comparison with previous time-sampled (τ_{out}) solution - log and linear scales

Particle conservation (electrons and ions)

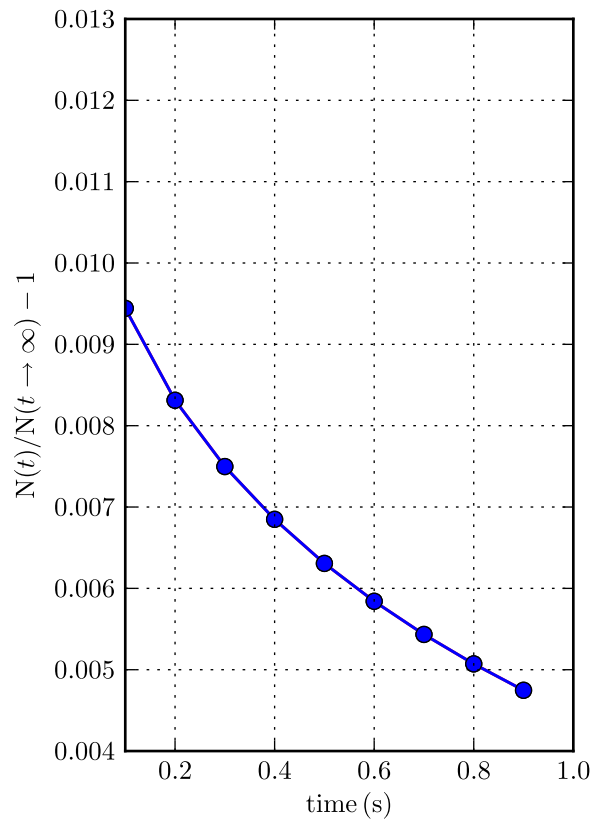
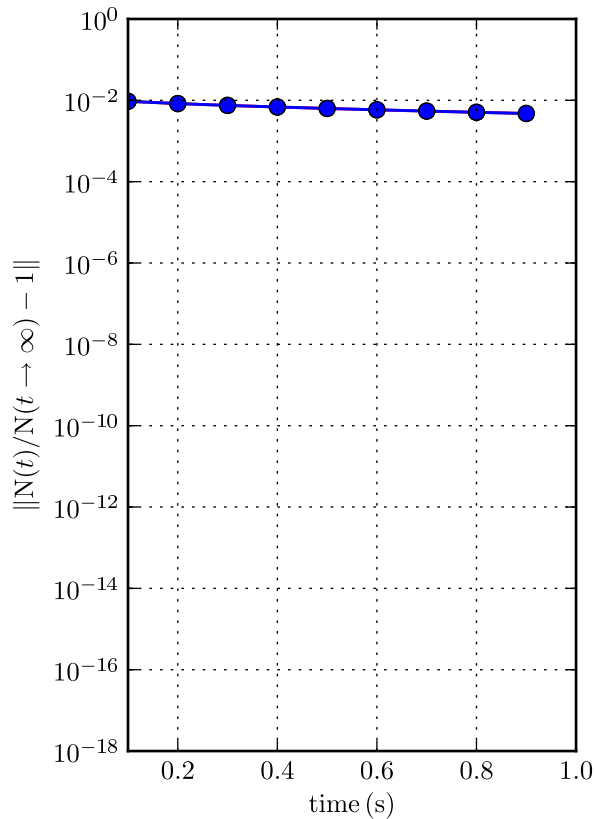
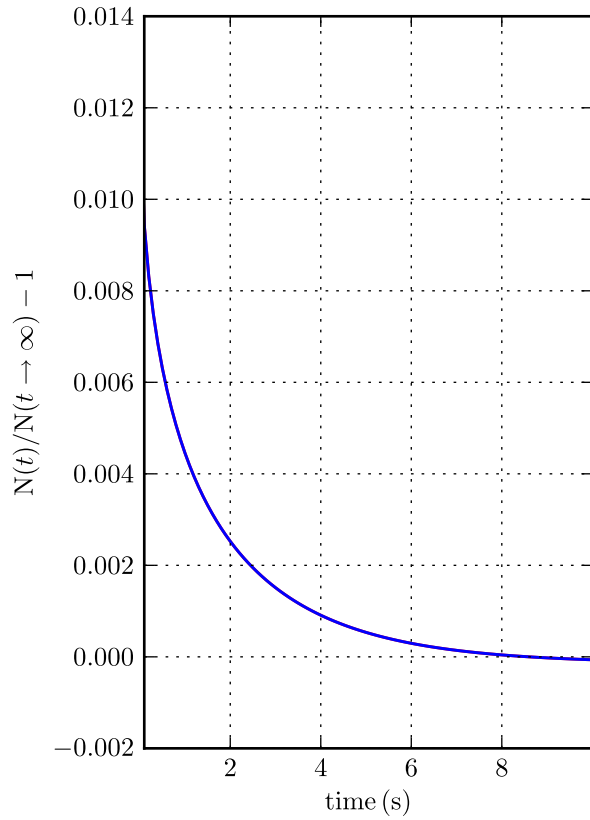
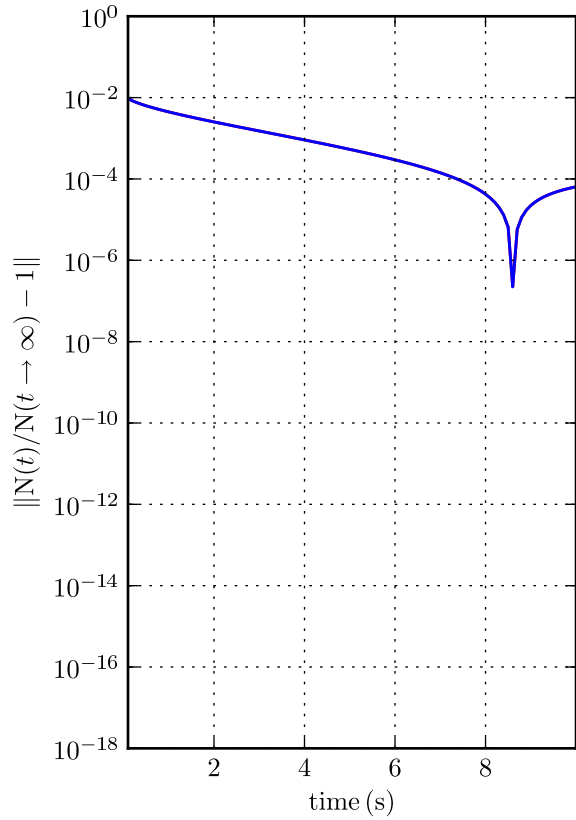


Energy conservation (electrons and ions)



Particle conservation

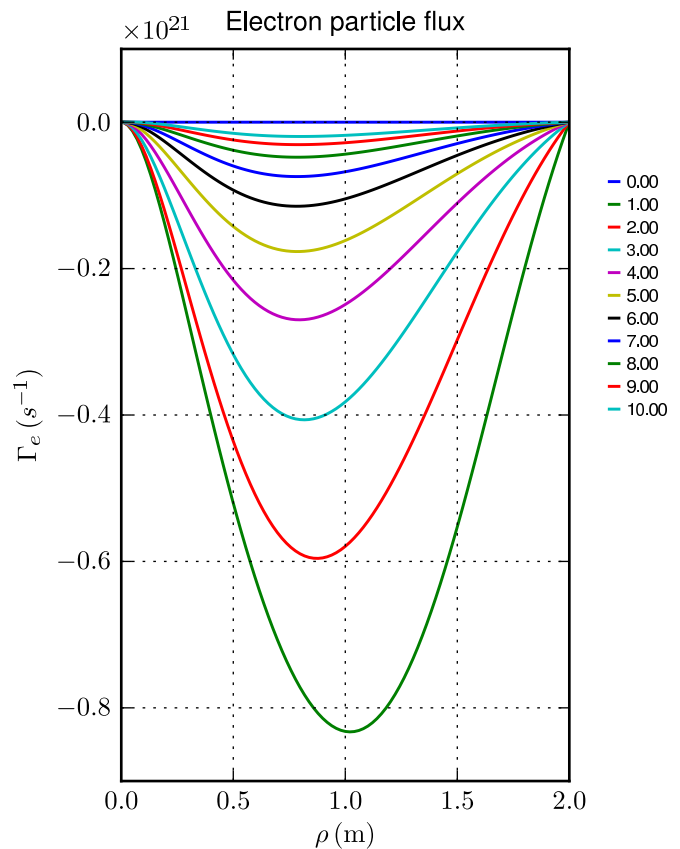
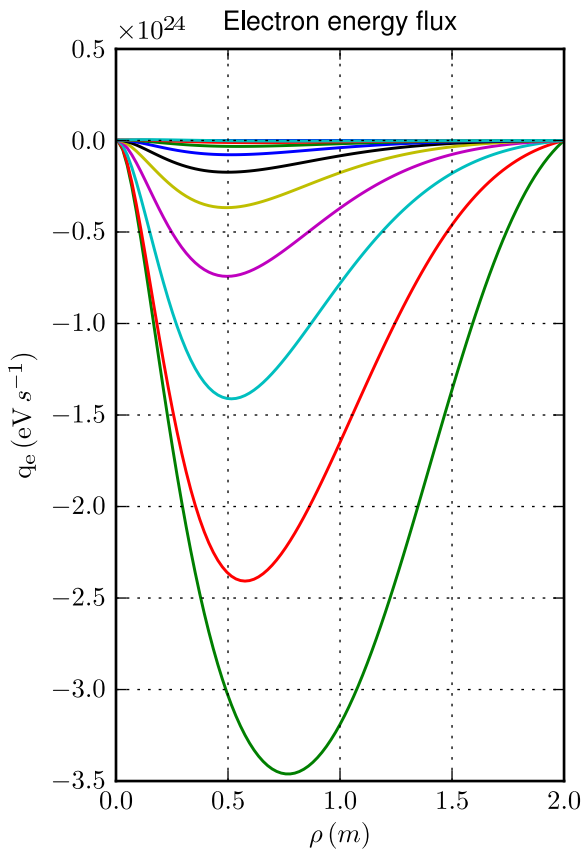
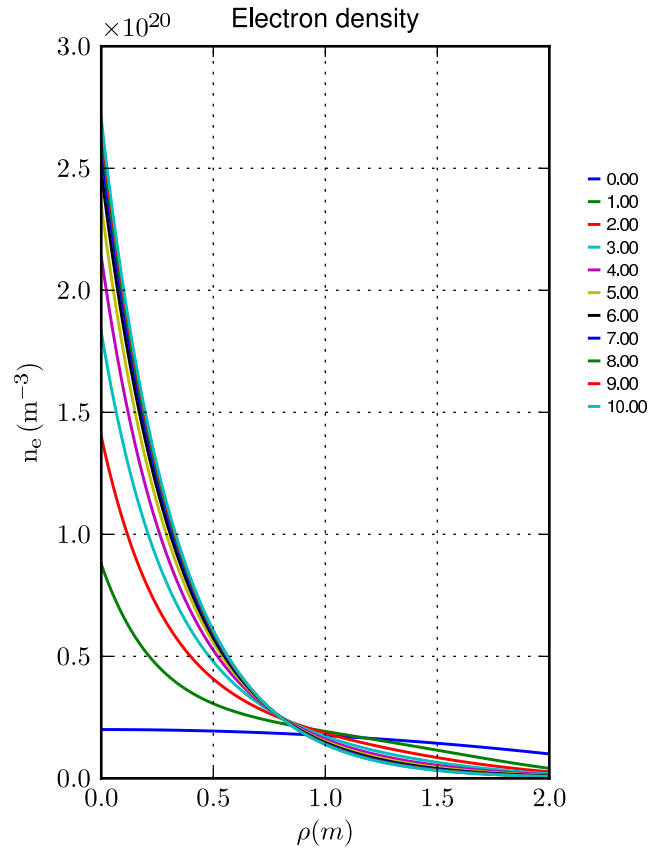
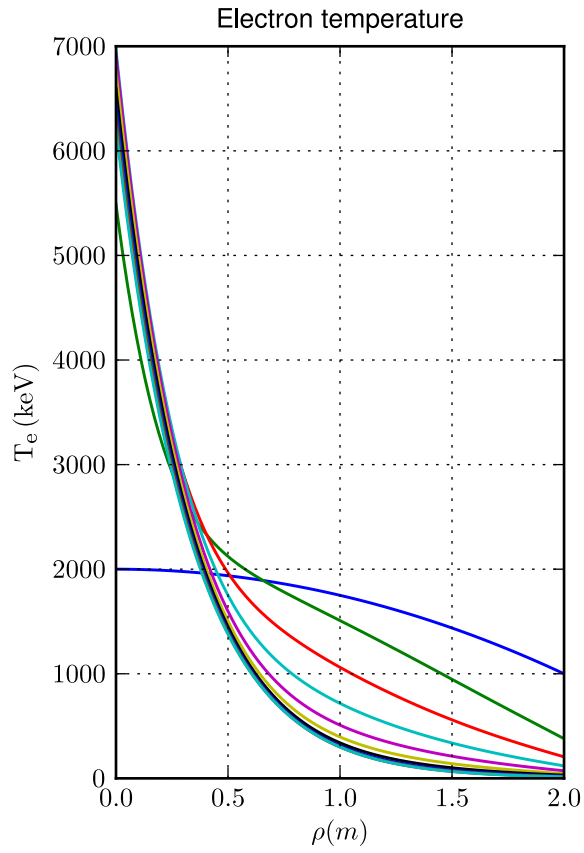
[Case: I.1.5.i, Solver: 4, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]
Comparison with asymptotic solution (electrons and ions); total time and zoom over time



Profiles

[Case: I.1.5.i, Solver: 4, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

Time sampling: total simulation time/10

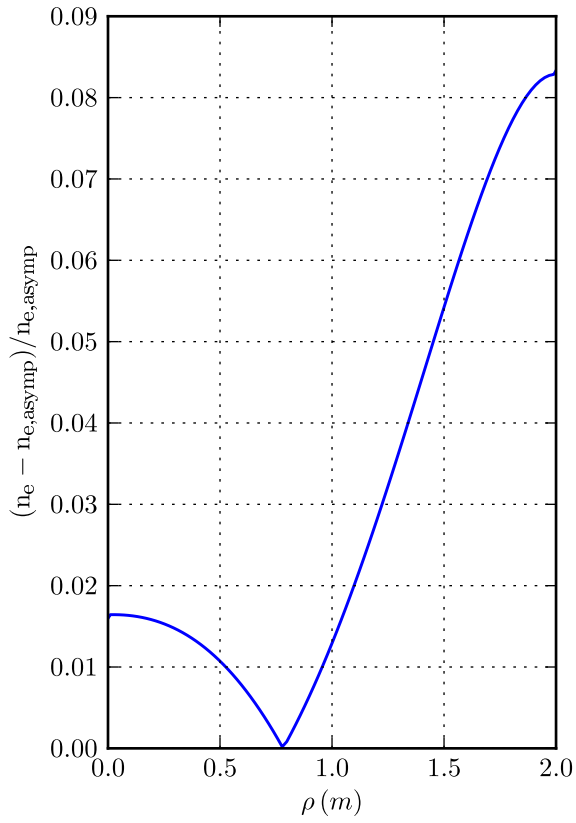


Profiles

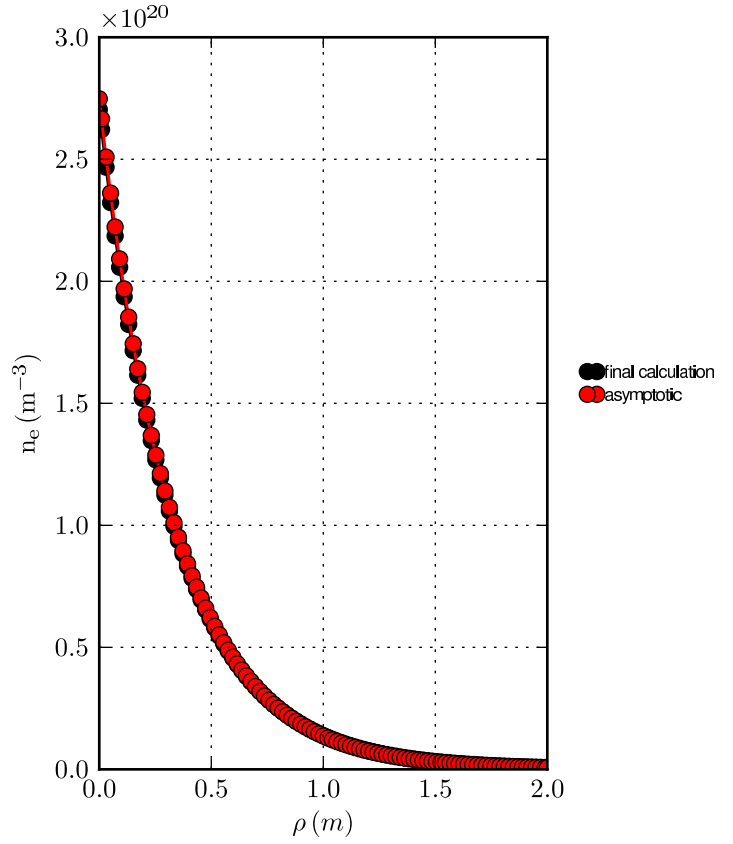
[Case: I.1.5.i, Solver: 4, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

Comparison with asymptotic solution

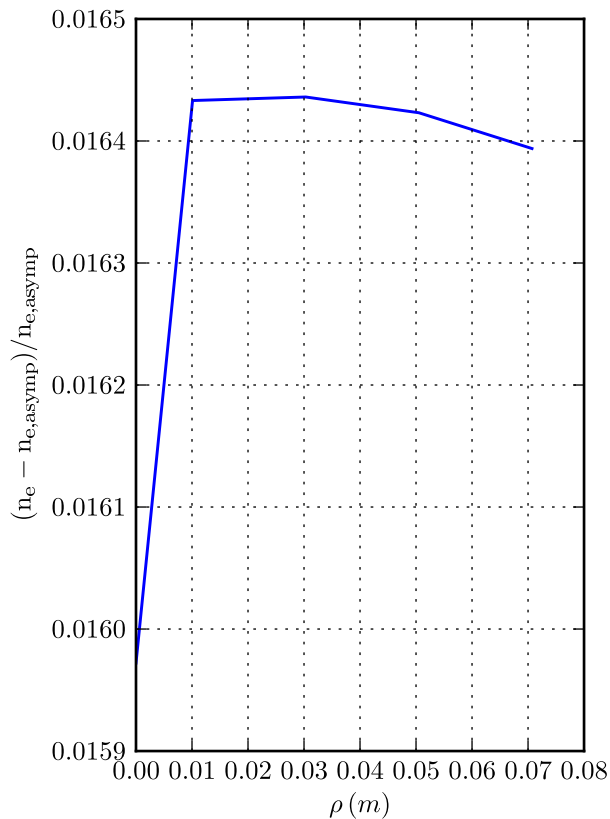
Electron density relative error



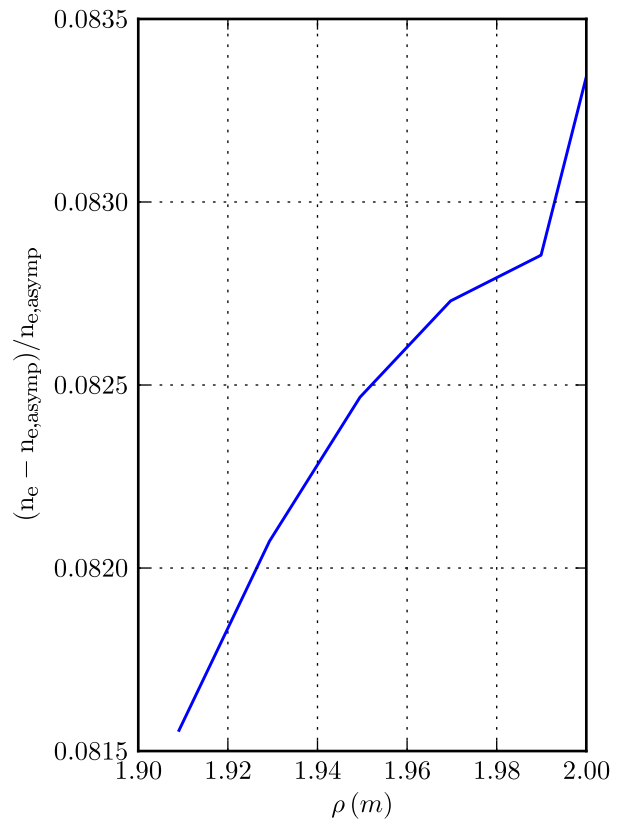
Electron density



Error: zoom over axis



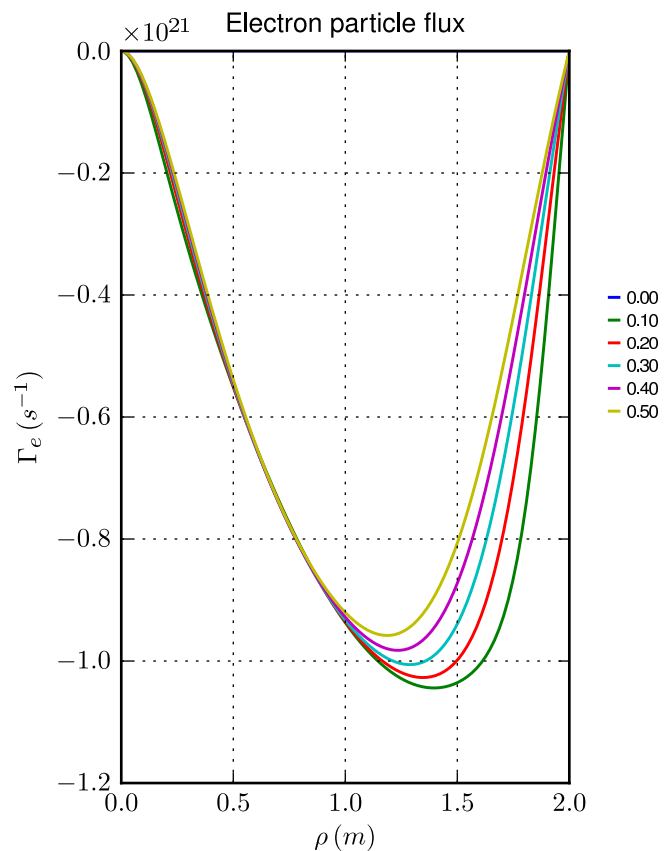
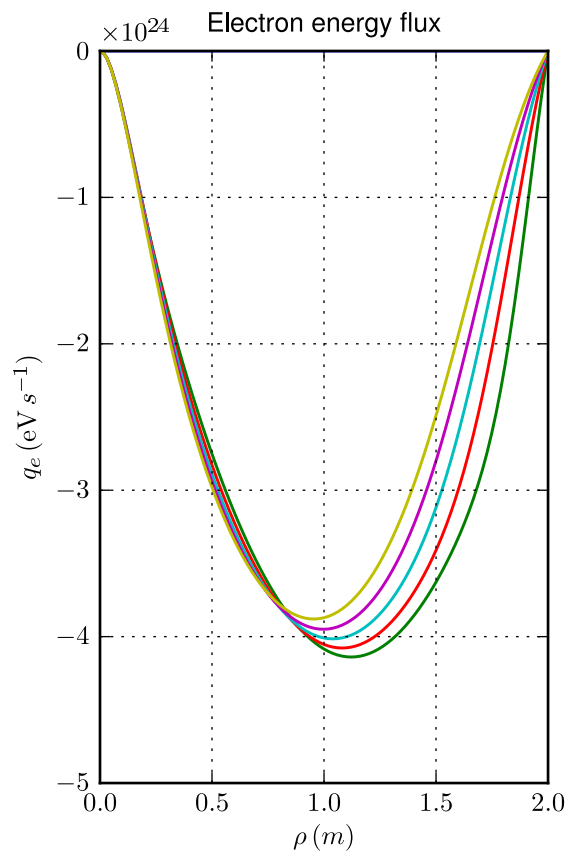
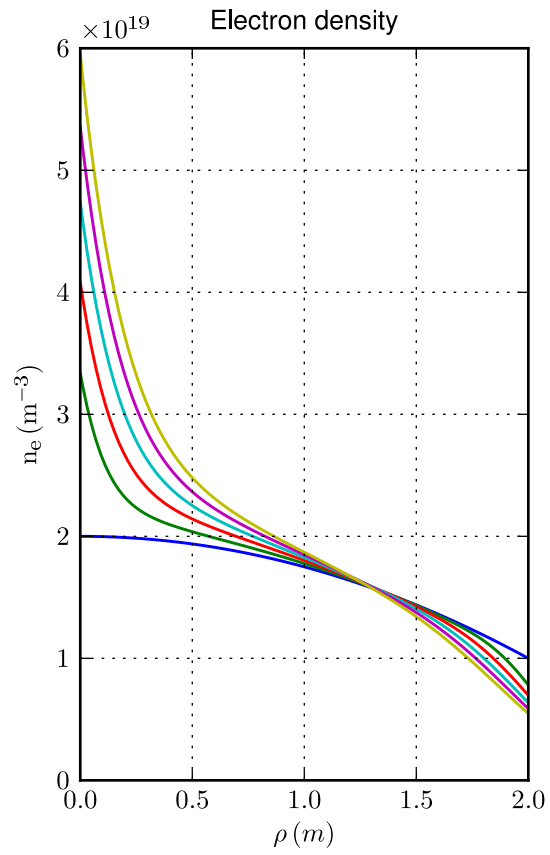
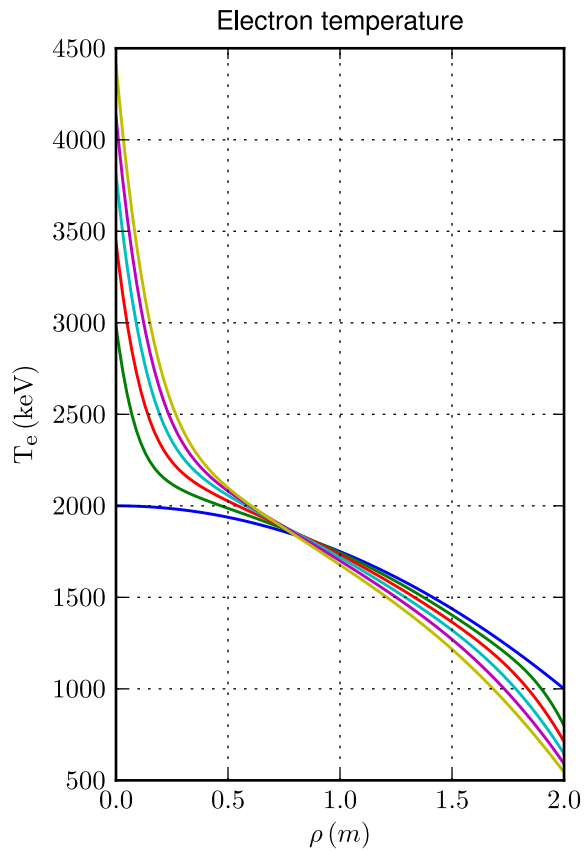
Error: zoom over edge



Profiles

[Case: I.1.5.i, Solver: 4, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

Time sampling: first 10 time slices or zoom over time $0.1 \times (a^2/D)/|1 - (Va/D)| = 0.57 \text{ s}$

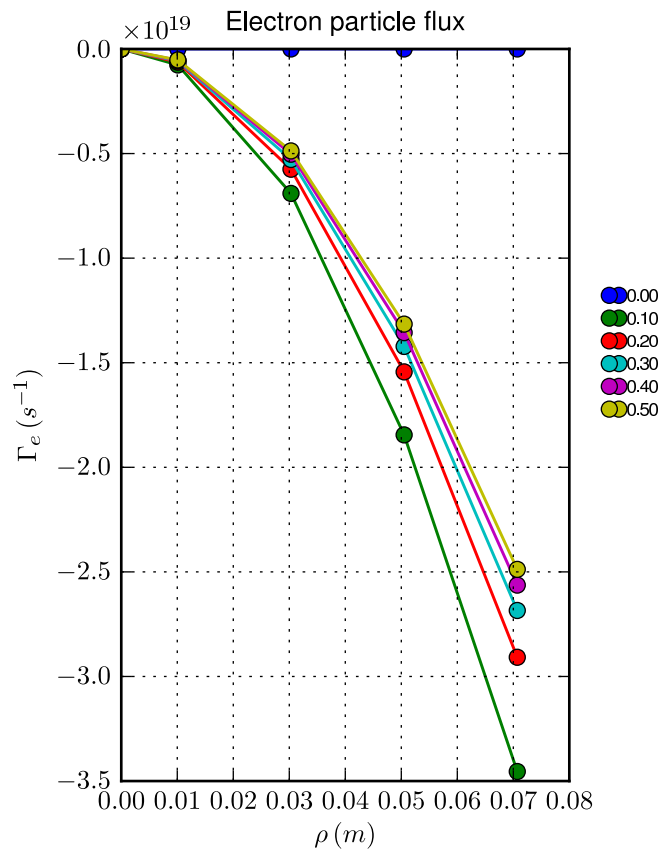
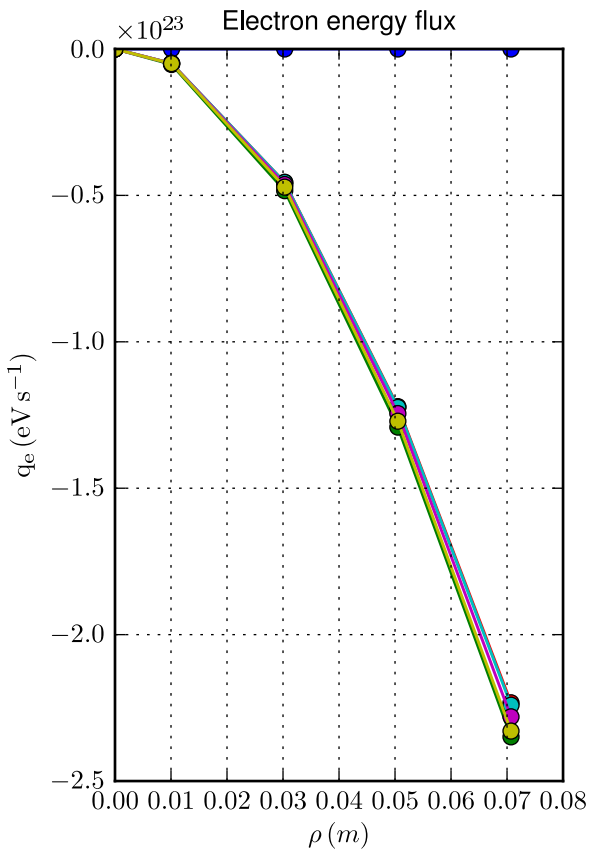
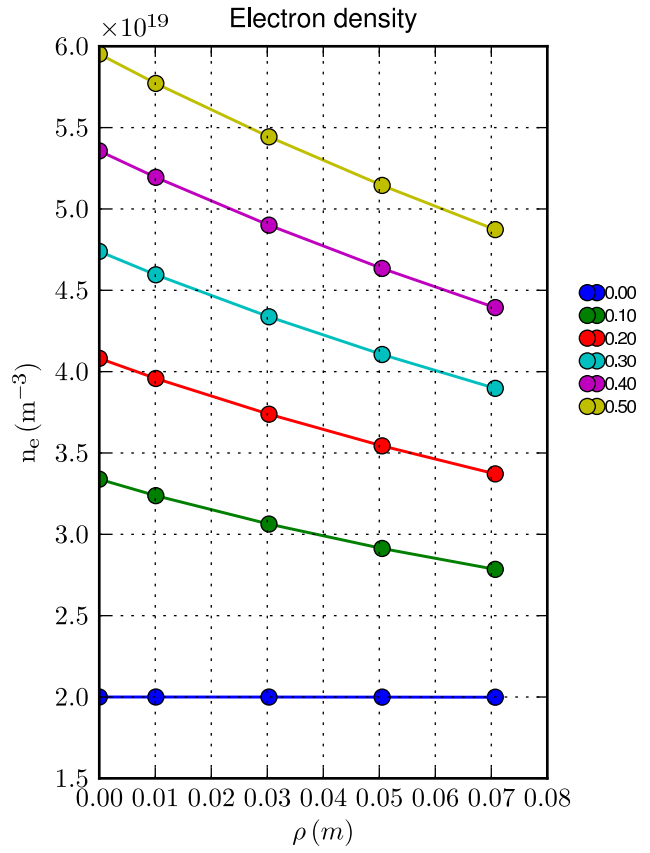
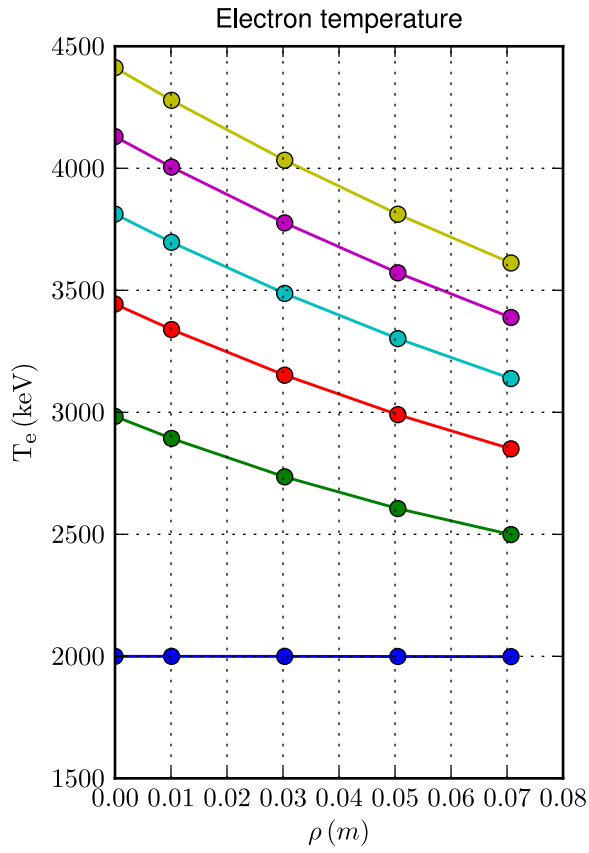


Profiles

[Case: I.1.5.i, Solver: 4, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

Spatial zoom over magnetic axis

Time sampling: first 10 time slices or zoom over time $0.1 \times (a^2/D)/|1 - (Va/D)| = 0.57 \text{ s}$

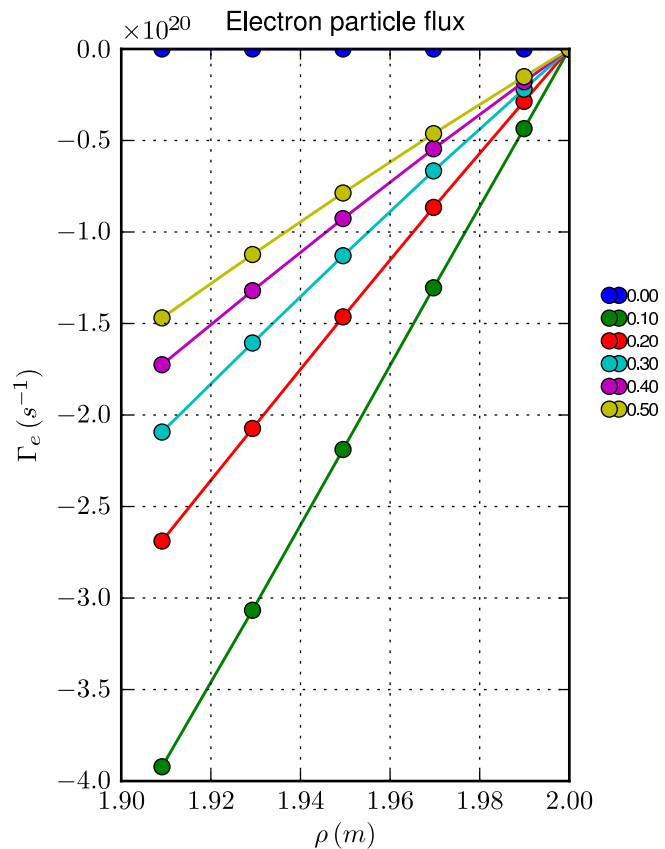
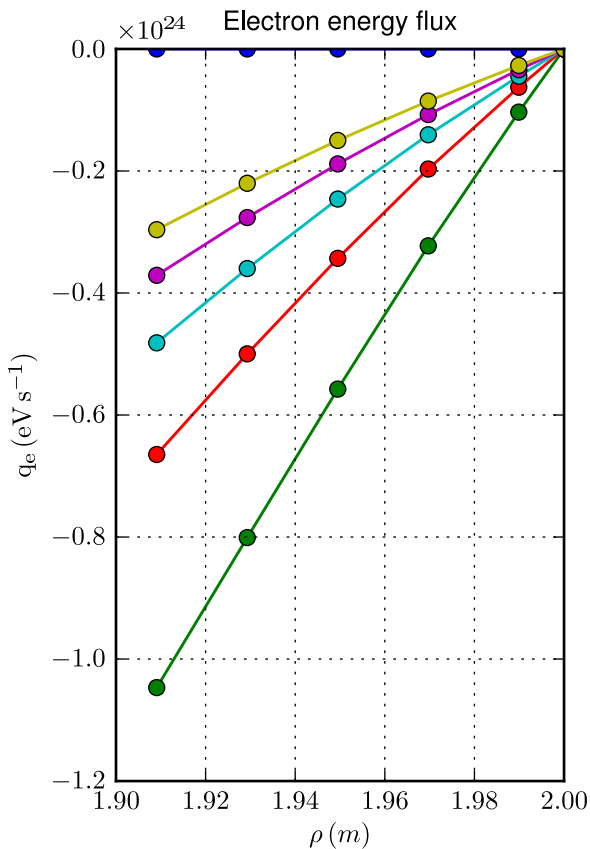
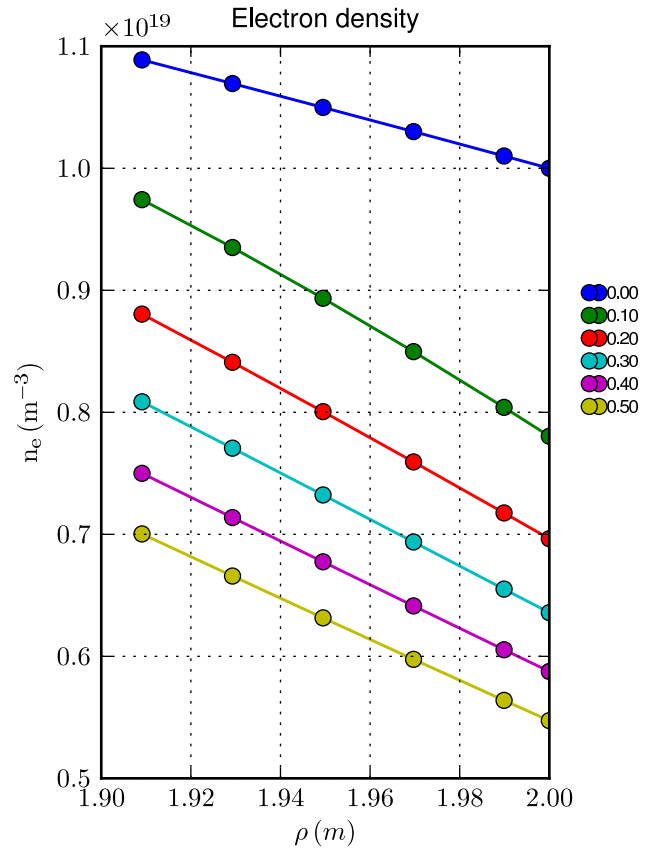
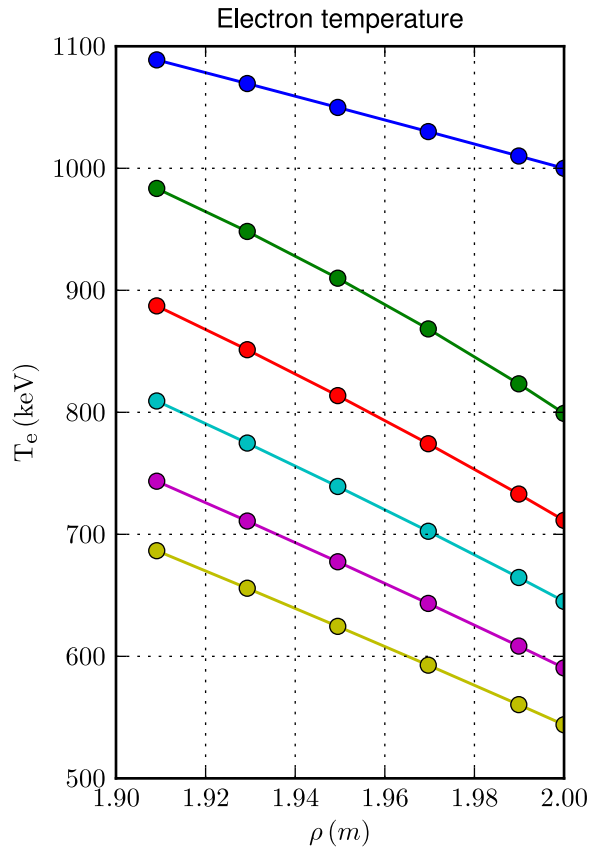


Profiles

[Case: I.1.5.i, Solver: 4, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

Spatial zoom over edge

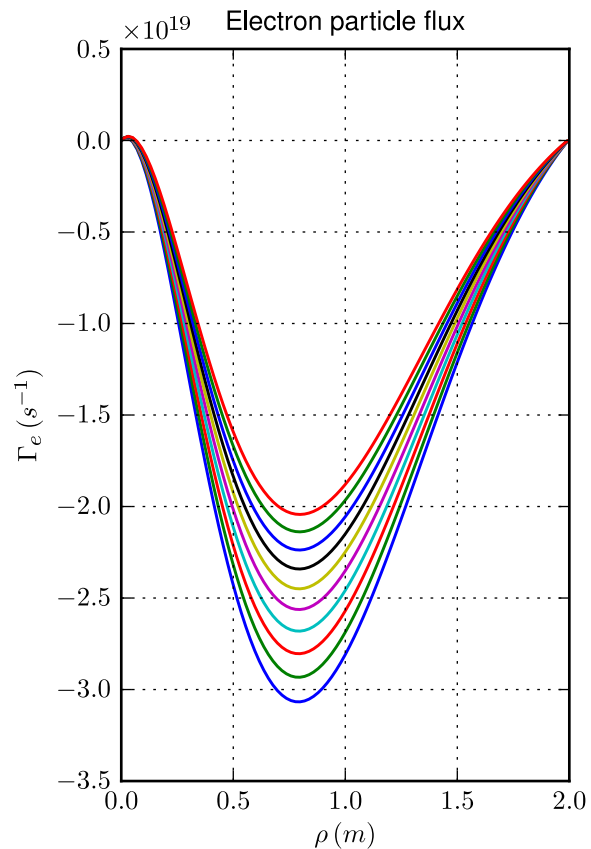
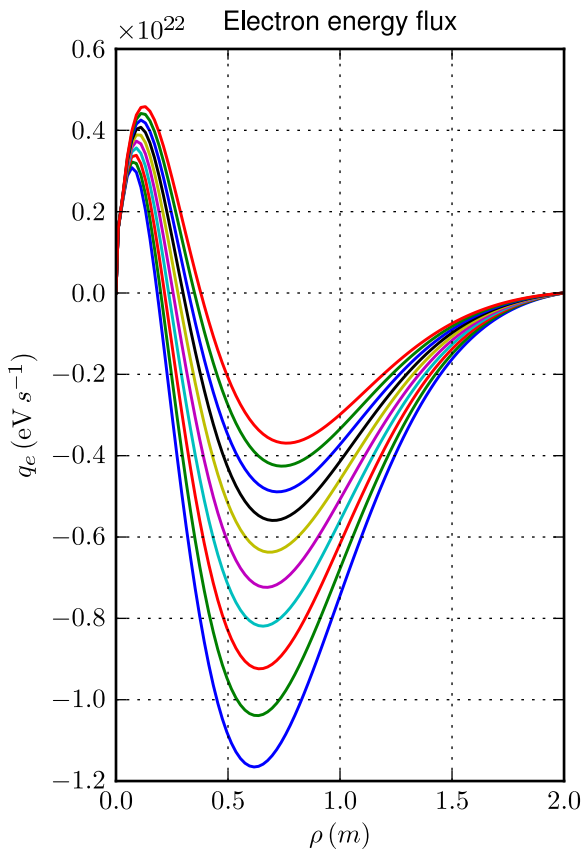
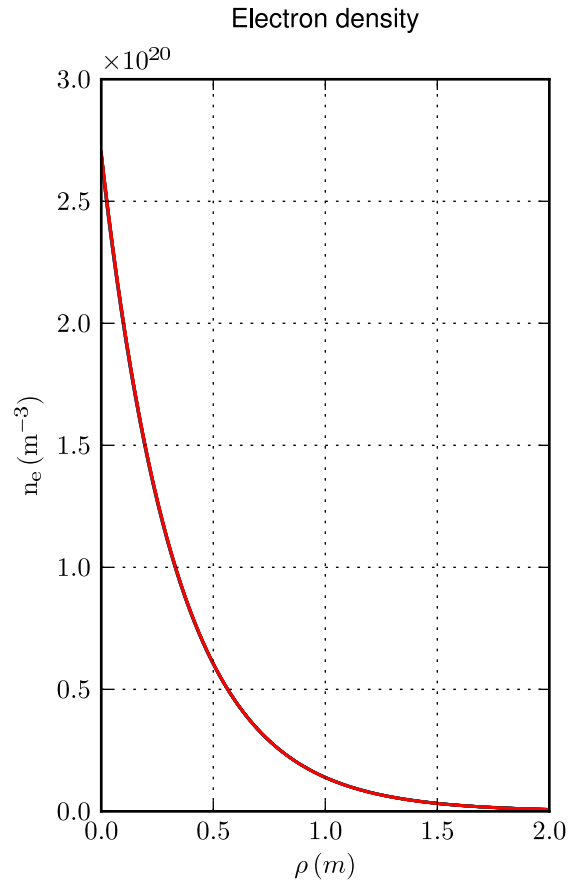
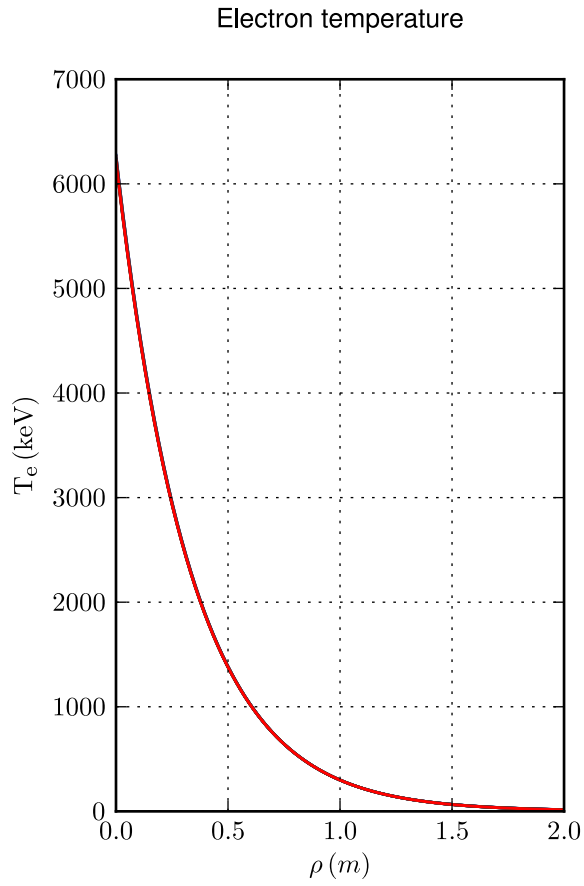
Time sampling: first 10 time slices or zoom over time $0.1 \times (a^2/D)/|1 - (Va/D)| = 0.57 \text{ s}$



Profiles

[Case: I.1.5.i, Solver: 4, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

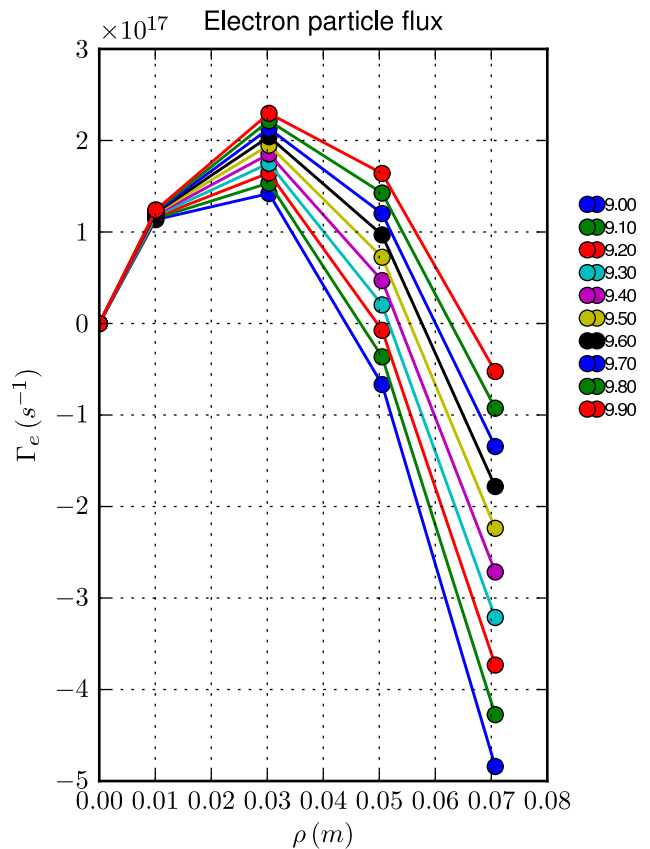
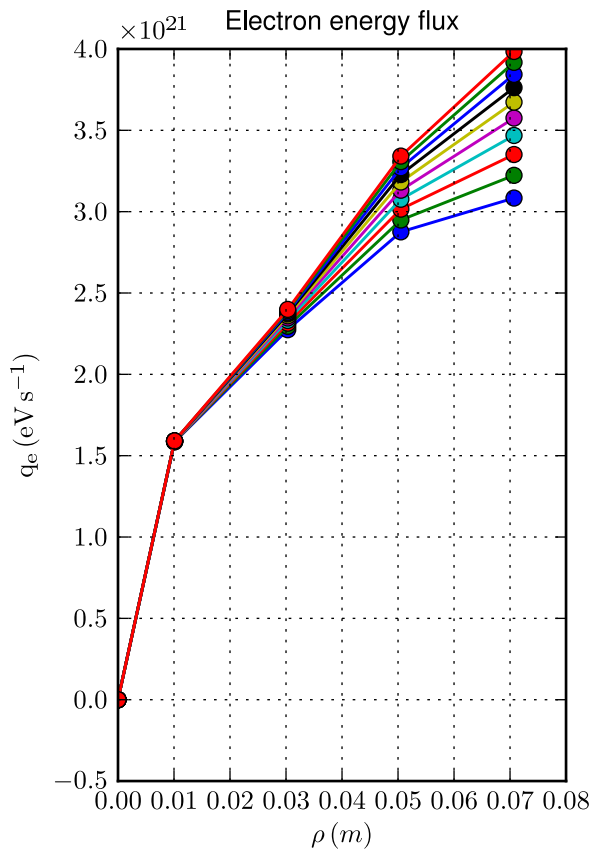
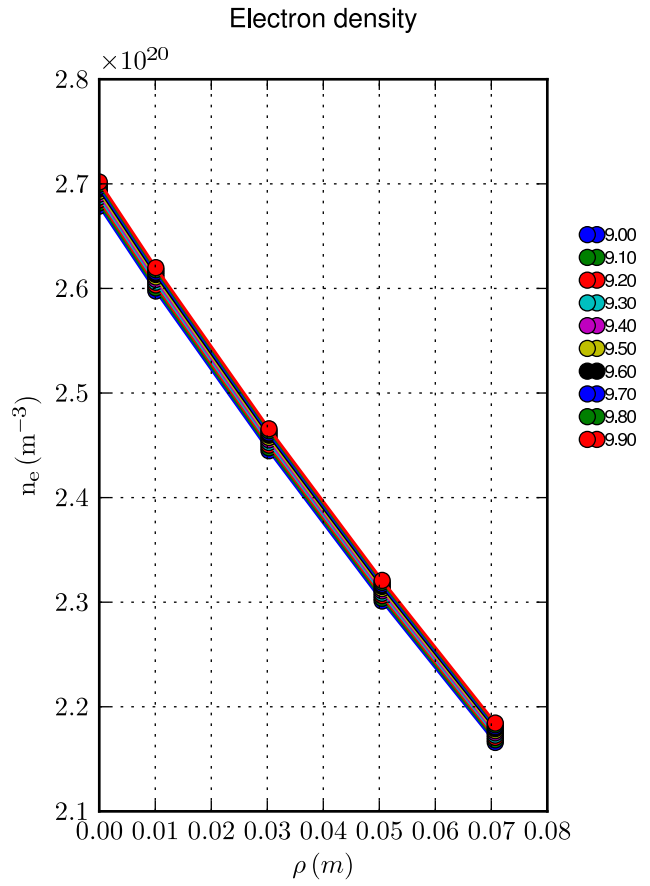
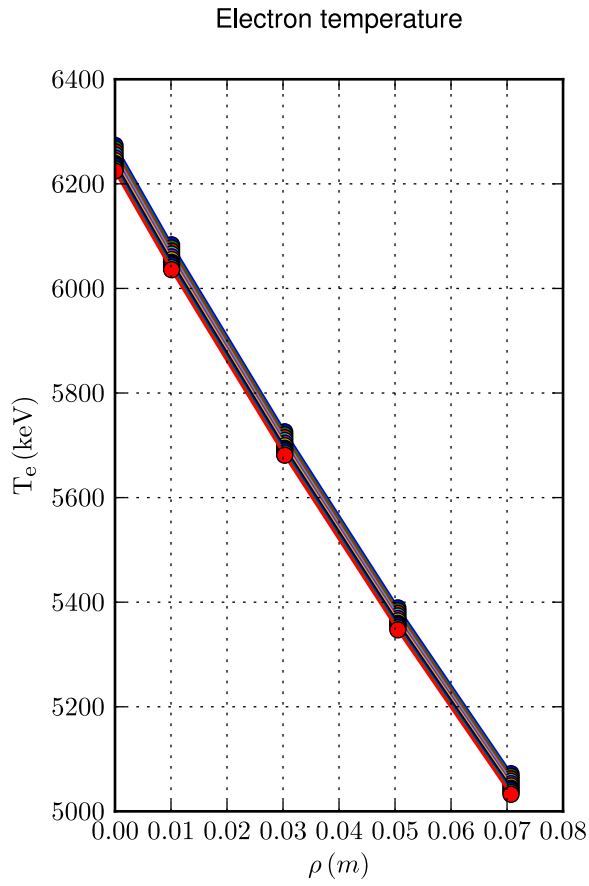
Time sampling: last 10 time slices



Profiles

[Case: I.1.5.i, Solver: 4, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

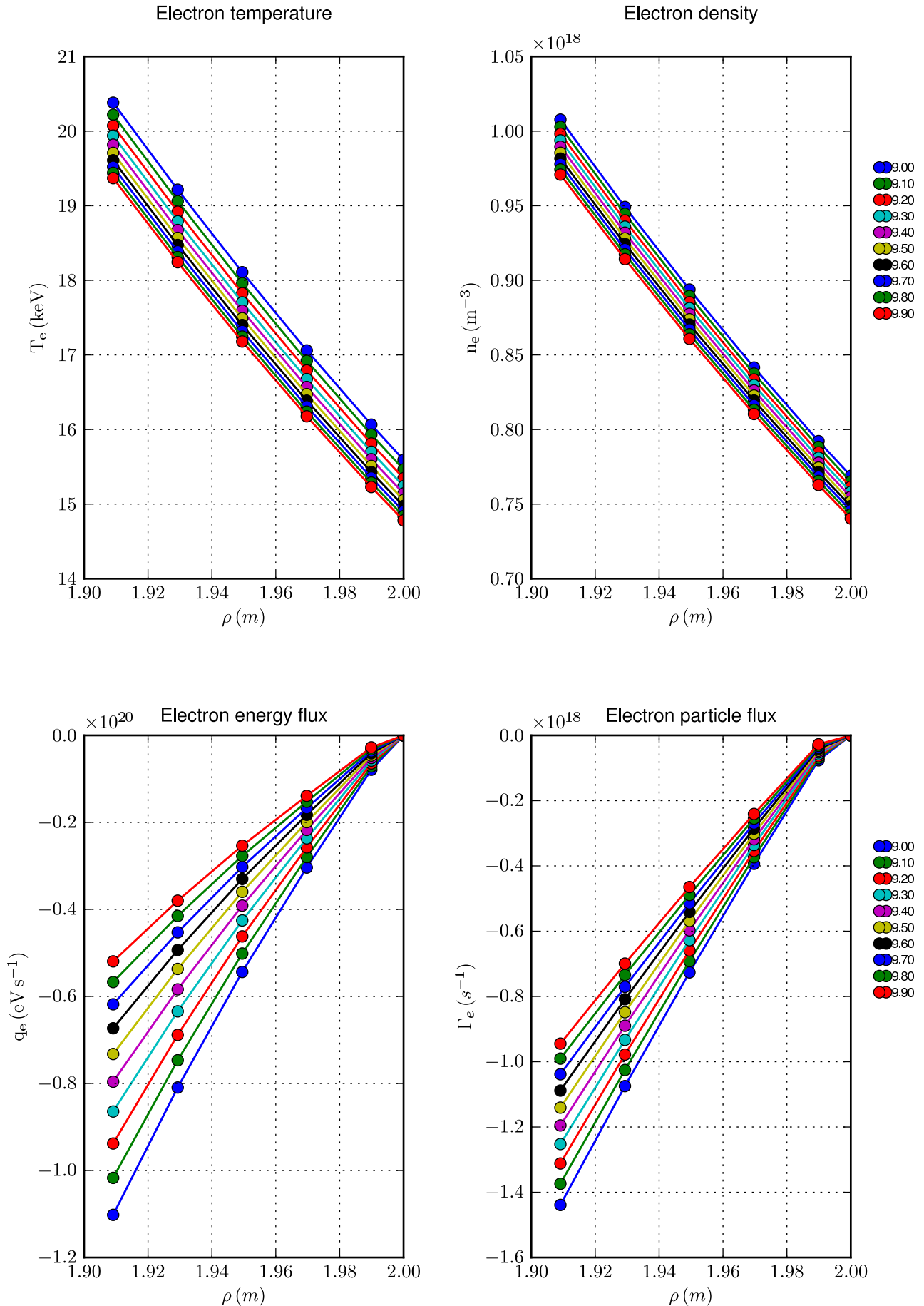
Spatial zoom over magnetic axis; time sampling: last 10 time slices



Profiles

[Case: I.1.5.i, Solver: 4, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

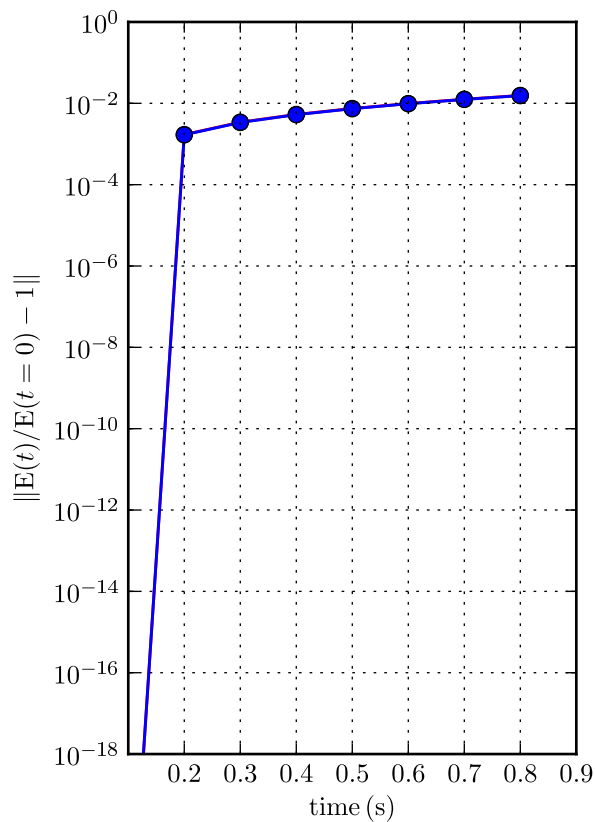
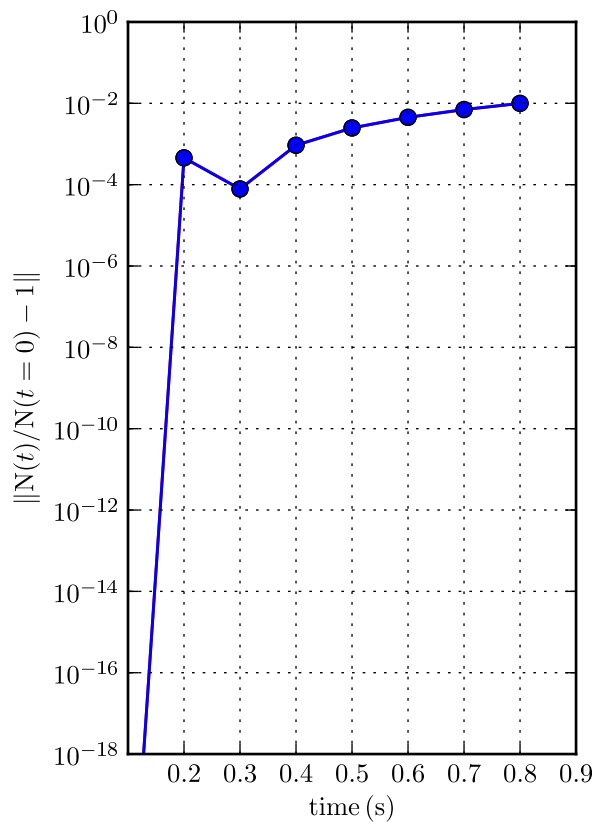
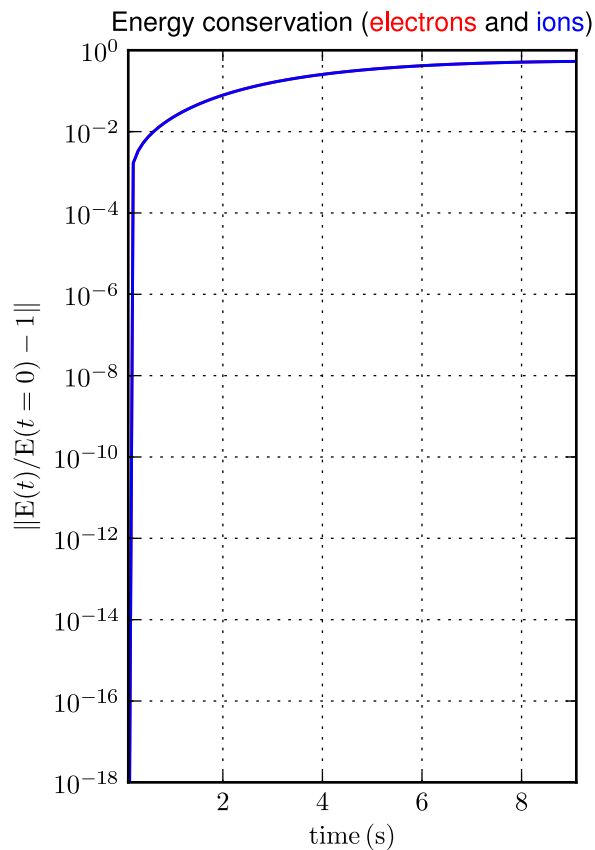
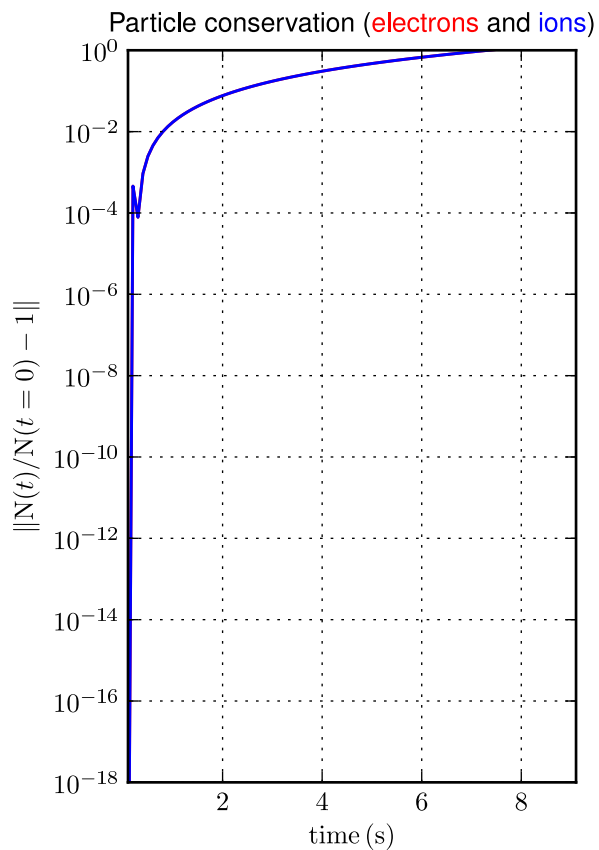
Spatial zoom over edge; time sampling: last 10 time slices



Part. & Energy conservation

[Case: I.1.5.i, Solver: 7, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

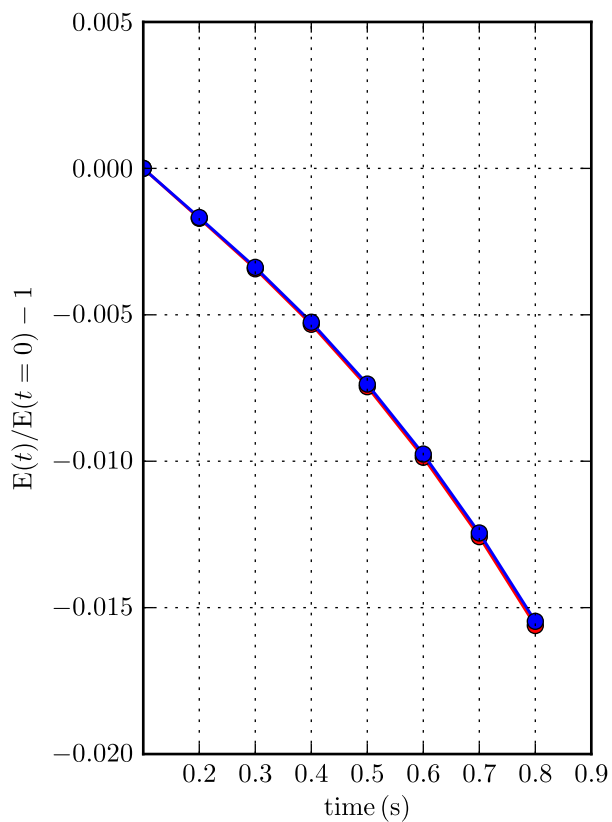
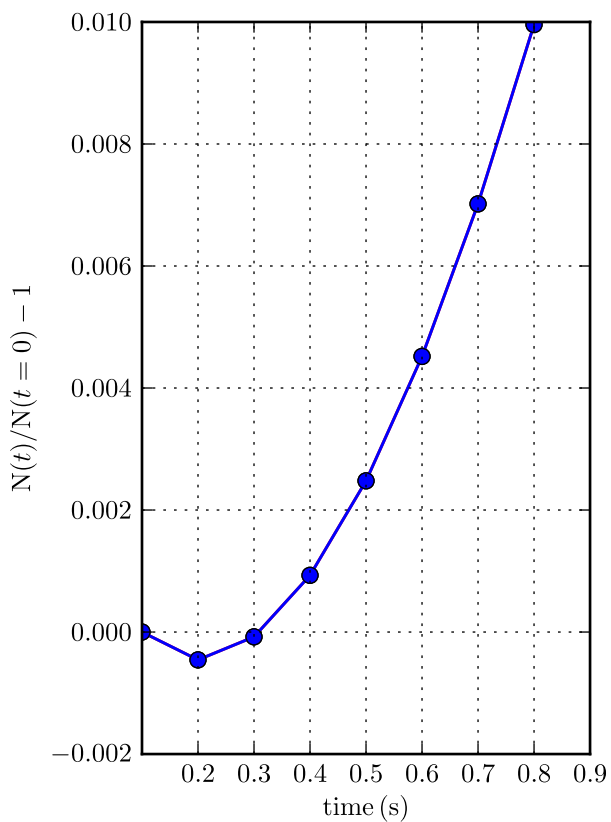
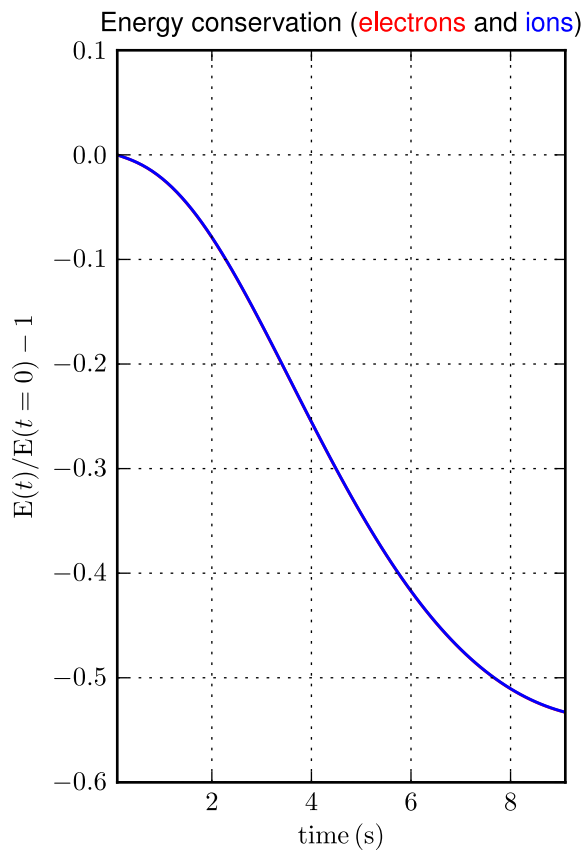
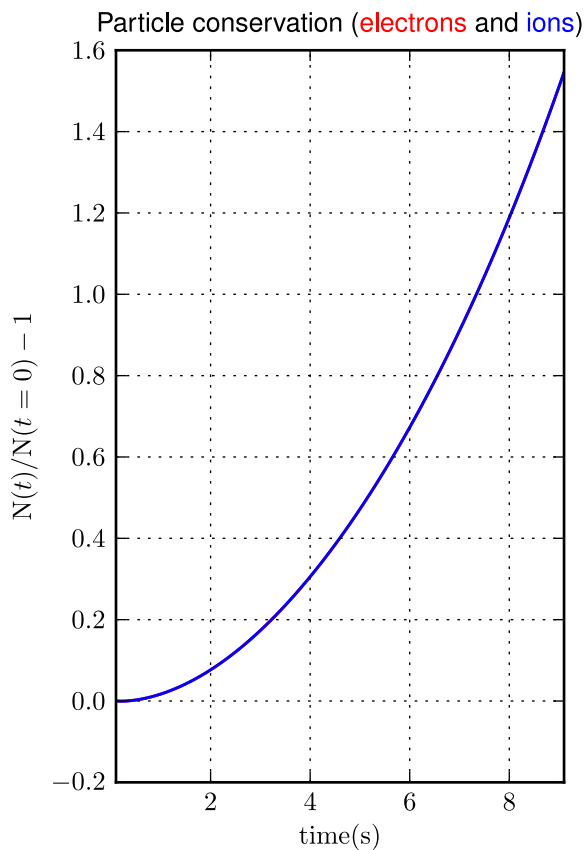
Comparison with initial solution - log scale; total time and zoom over time



Part. & Energy conservation

[Case: I.1.5.i, Solver: 7, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

Comparison with initial solution - linear scale; total time and zoom over time

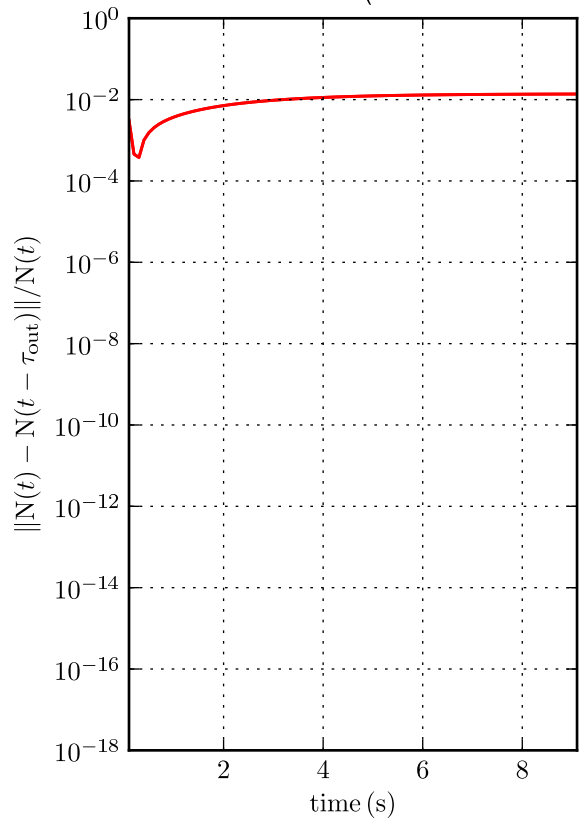


Part. & Energy conservation

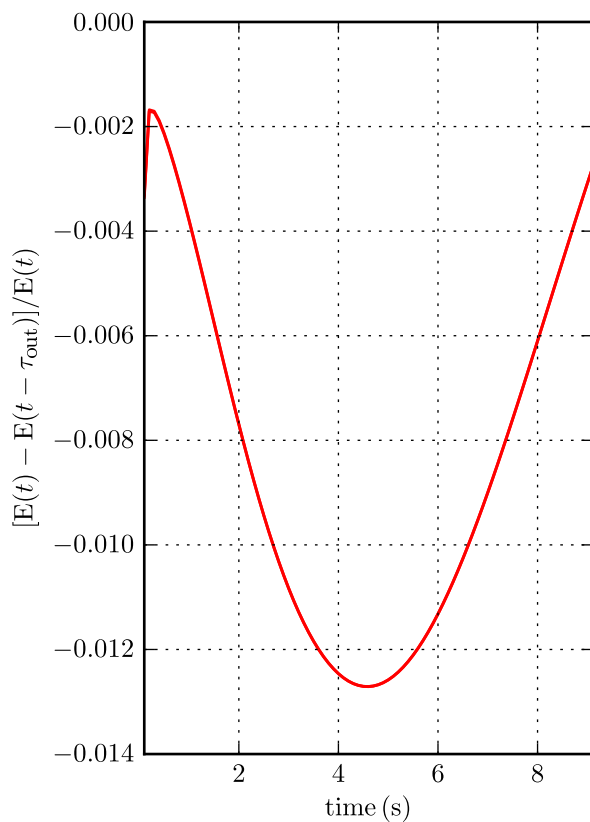
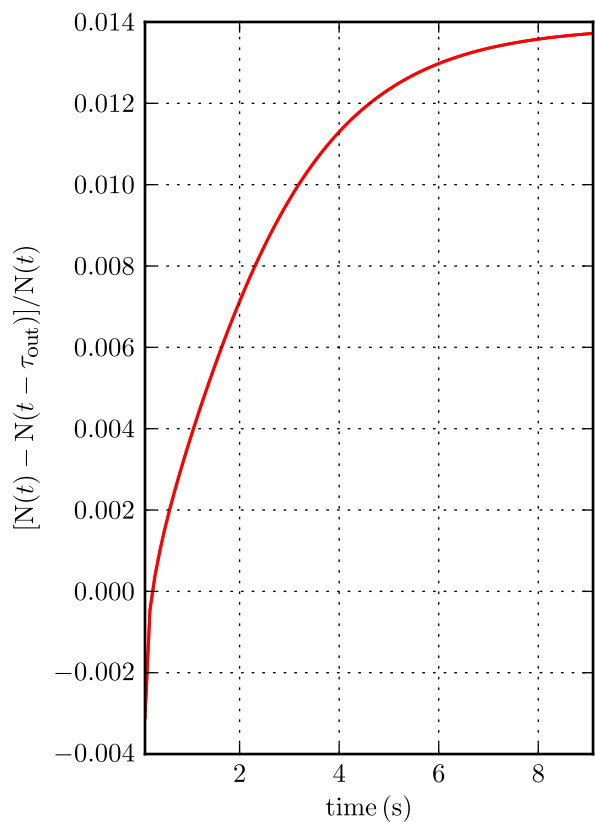
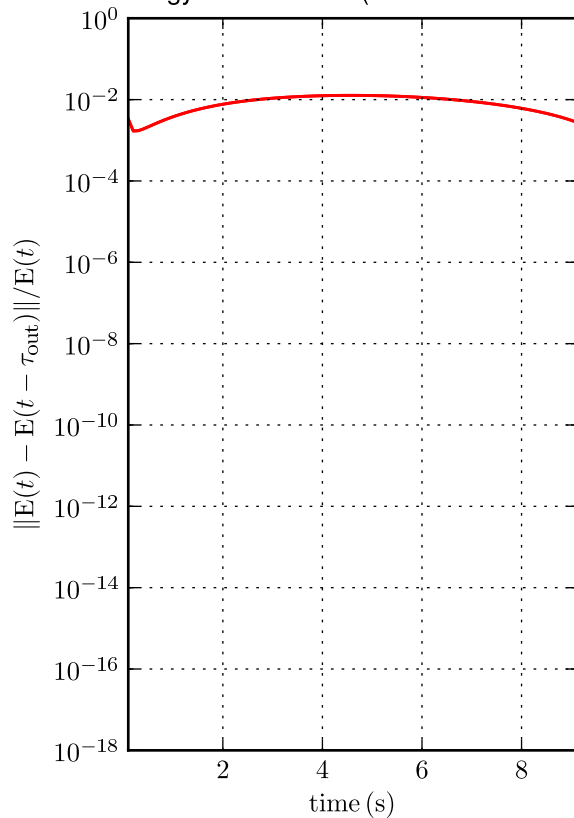
[Case: I.1.5.i, Solver: 7, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

Comparison with previous time-sampled (τ_{out}) solution - log and linear scales

Particle conservation (electrons and ions)

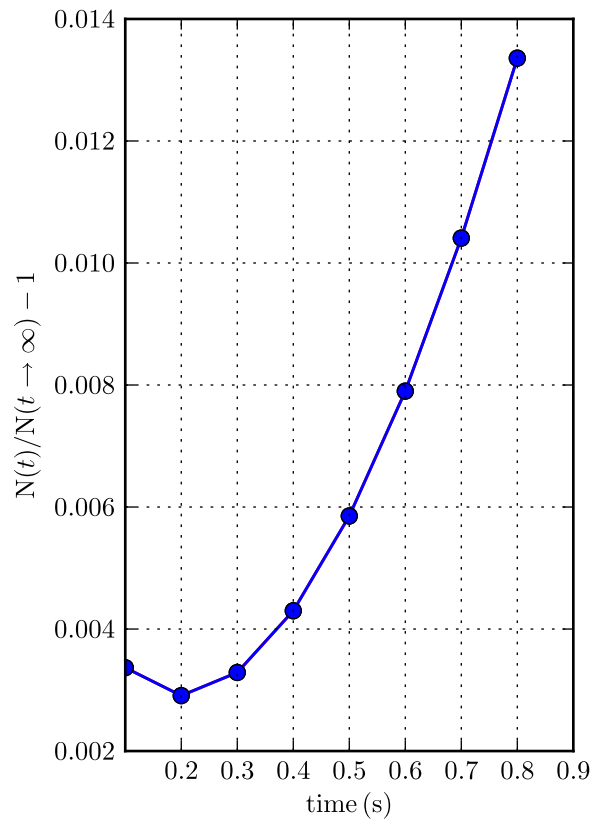
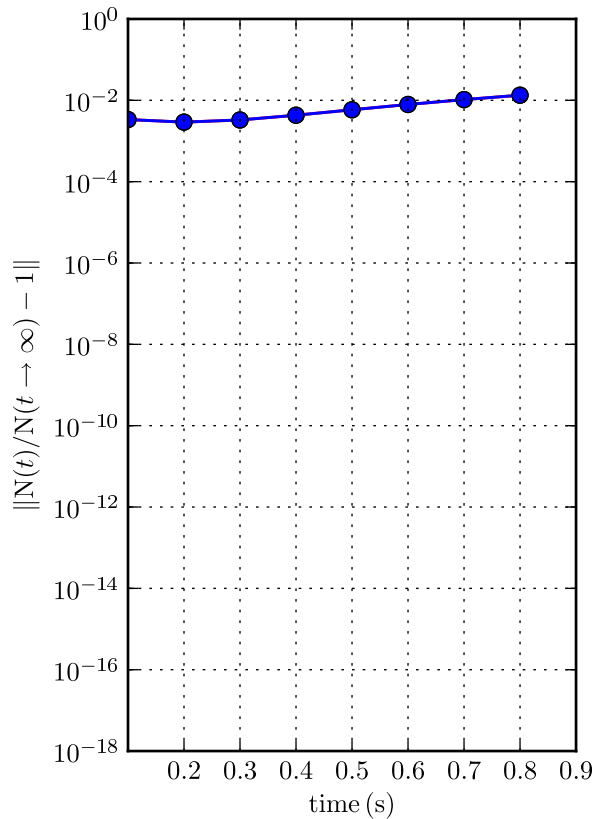
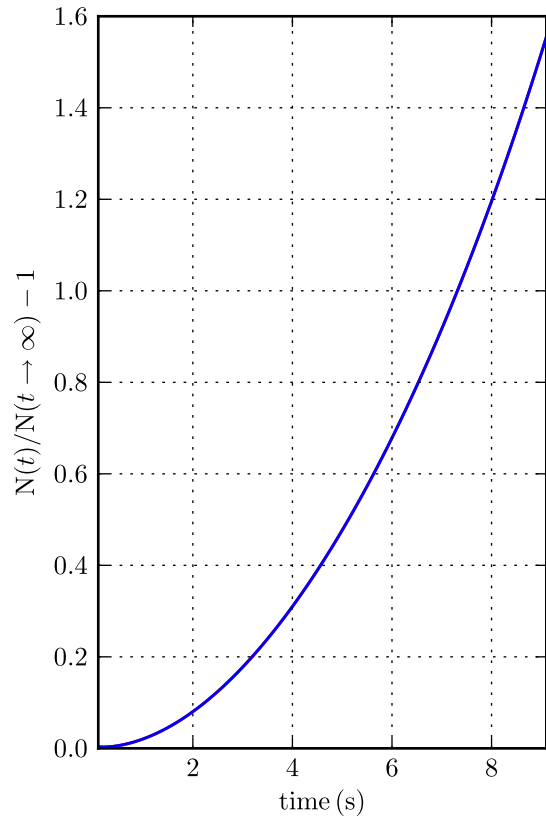
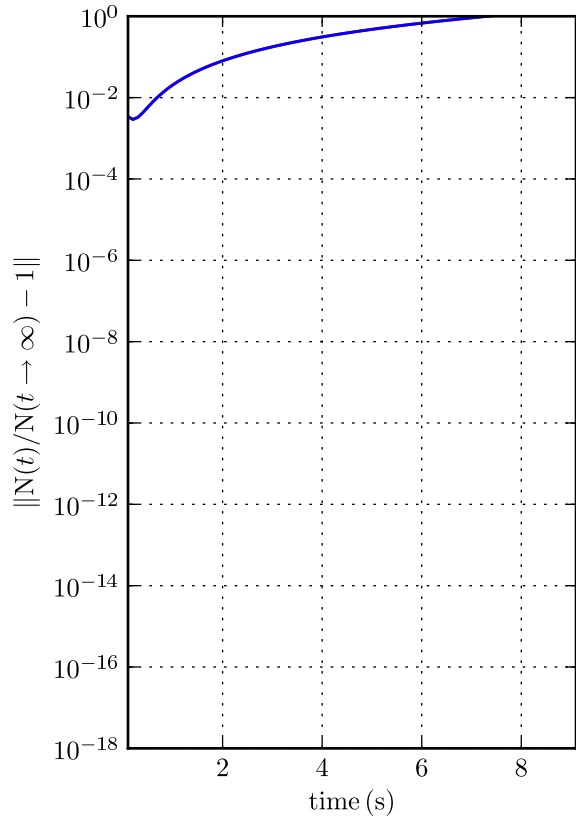


Energy conservation (electrons and ions)



Particle conservation

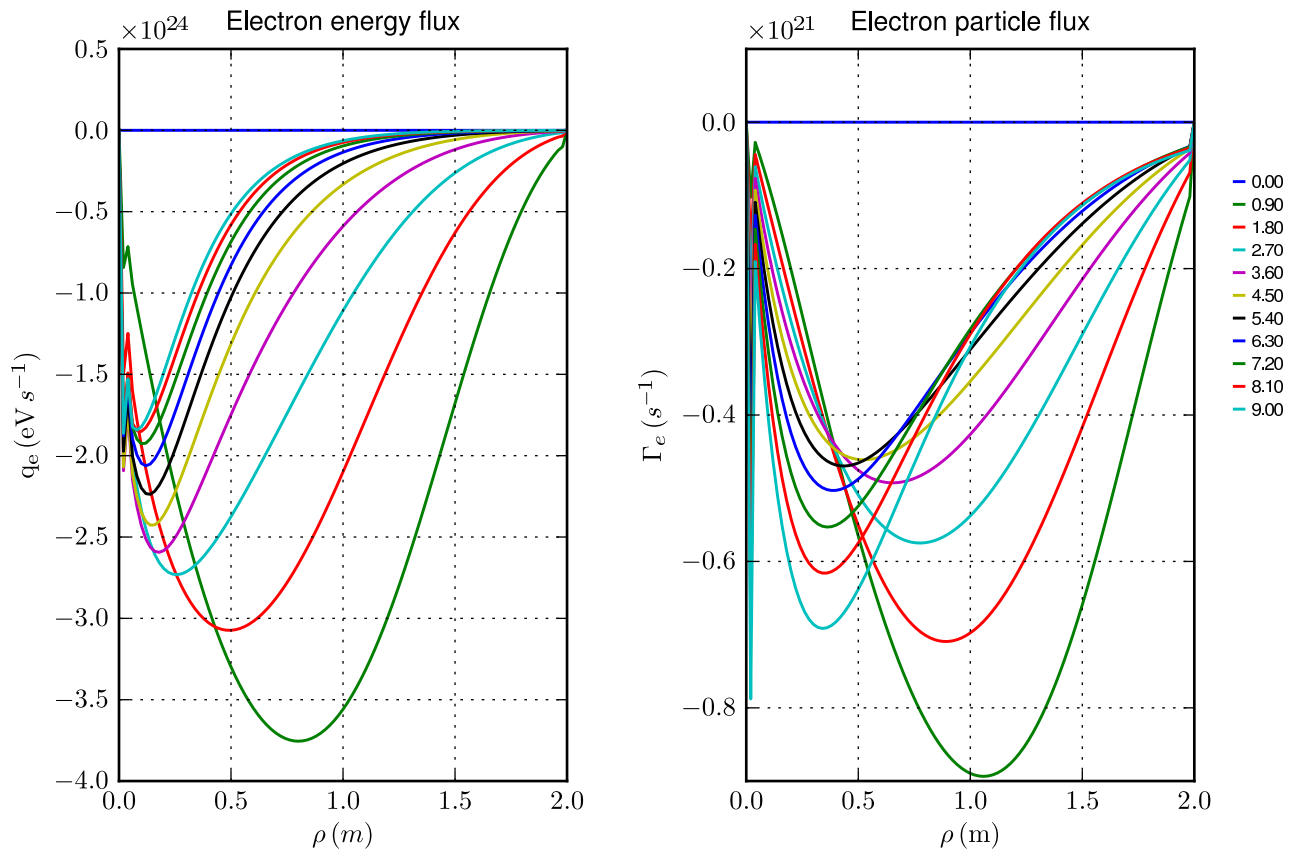
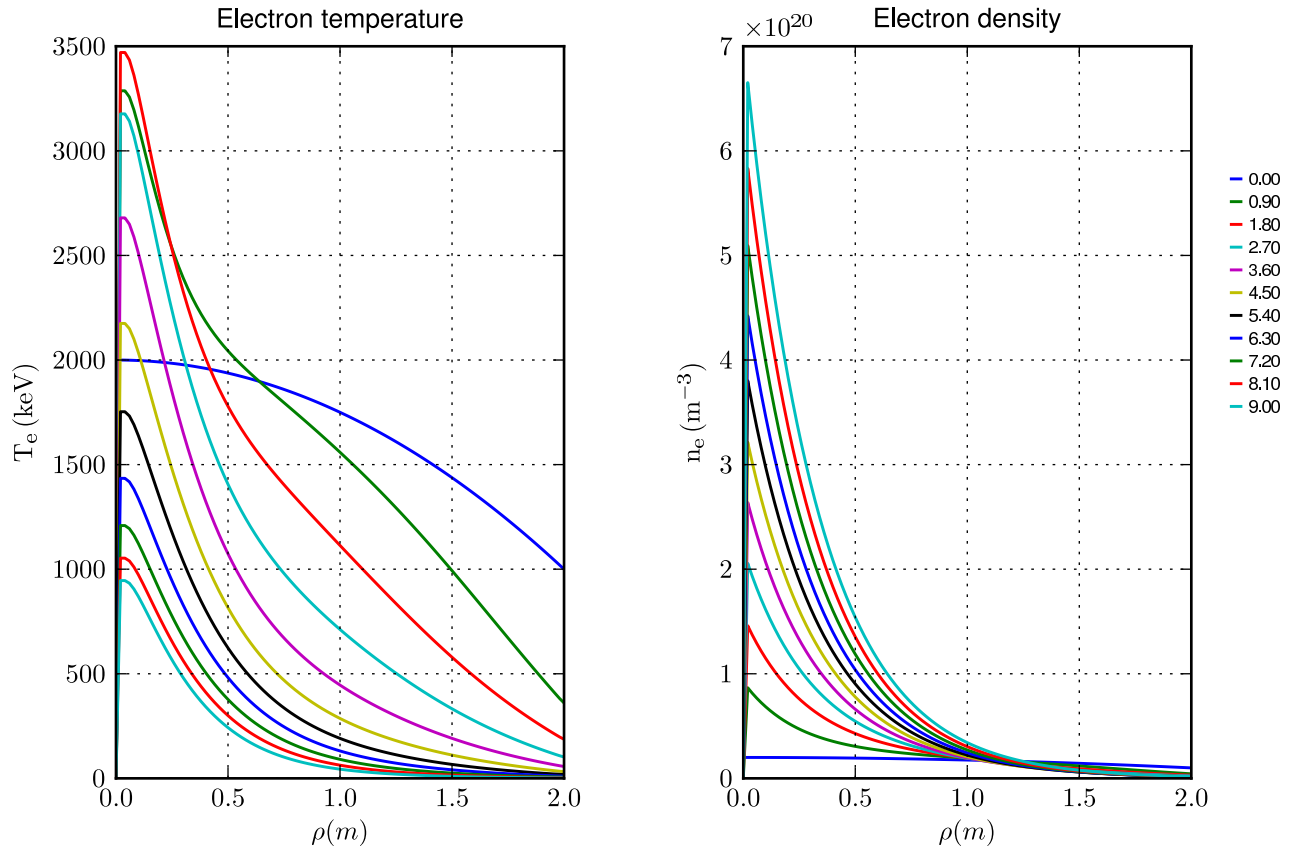
[Case: I.1.5.i, Solver: 7, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]
Comparison with asymptotic solution (electrons and ions); total time and zoom over time



Profiles

[Case: I.1.5.i, Solver: 7, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

Time sampling: total simulation time/10

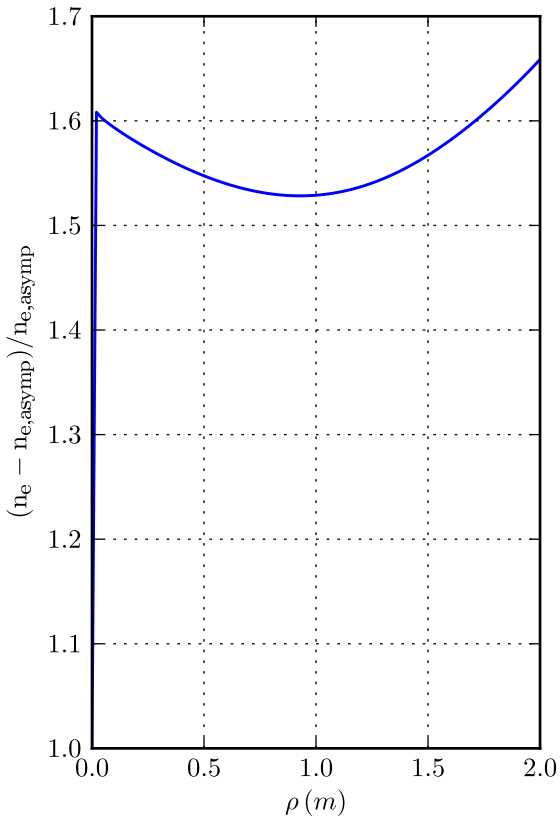


Profiles

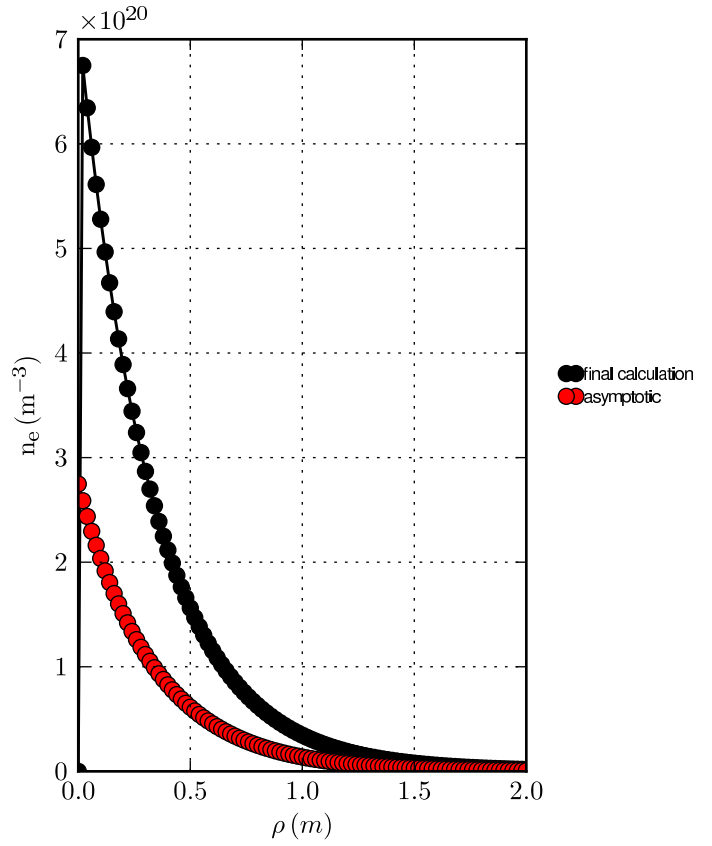
[Case: I.1.5.i, Solver: 7, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

Comparison with asymptotic solution

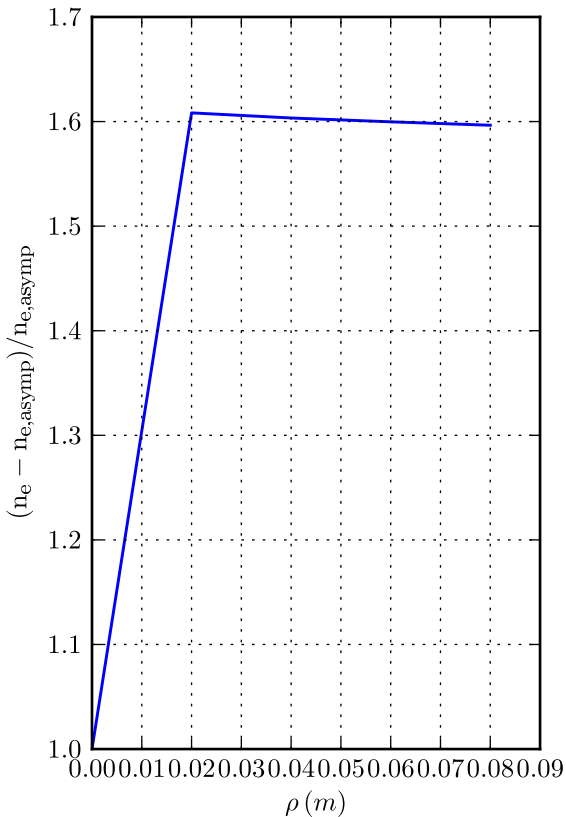
Electron density relative error



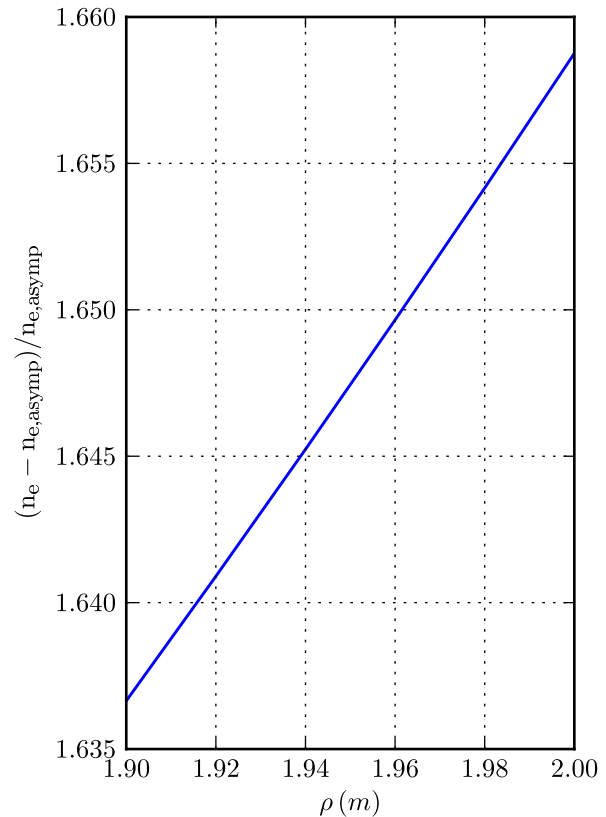
Electron density



Error: zoom over axis



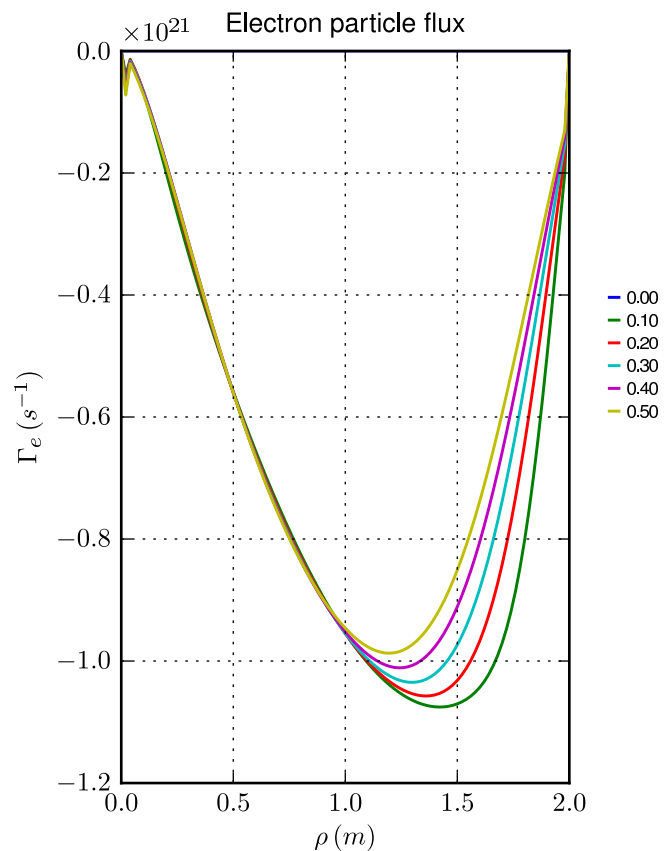
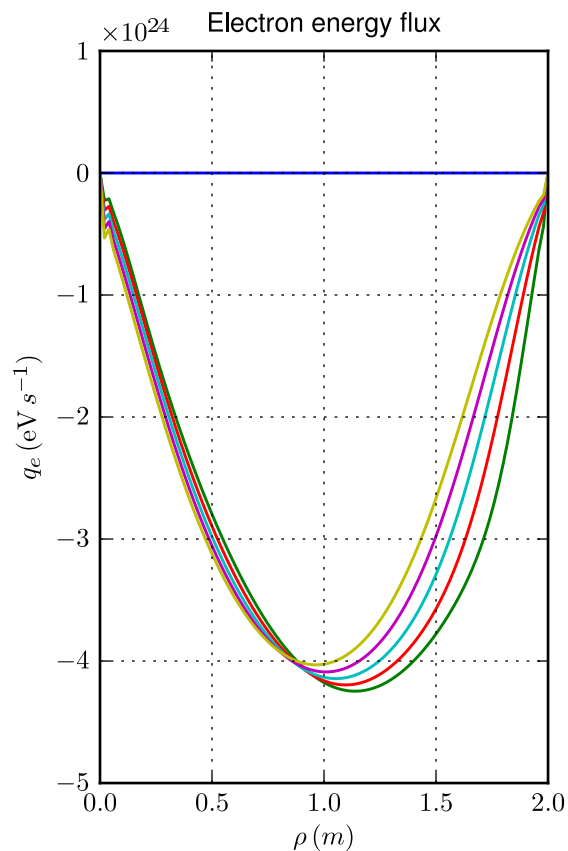
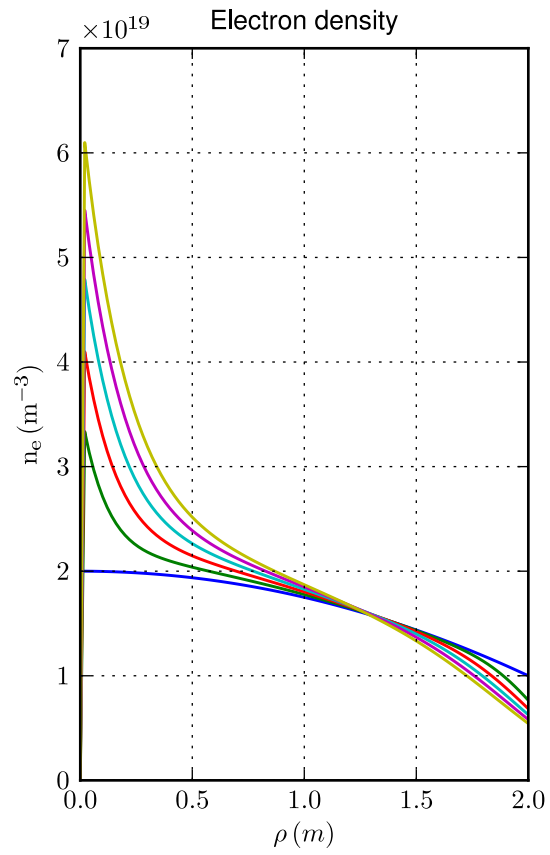
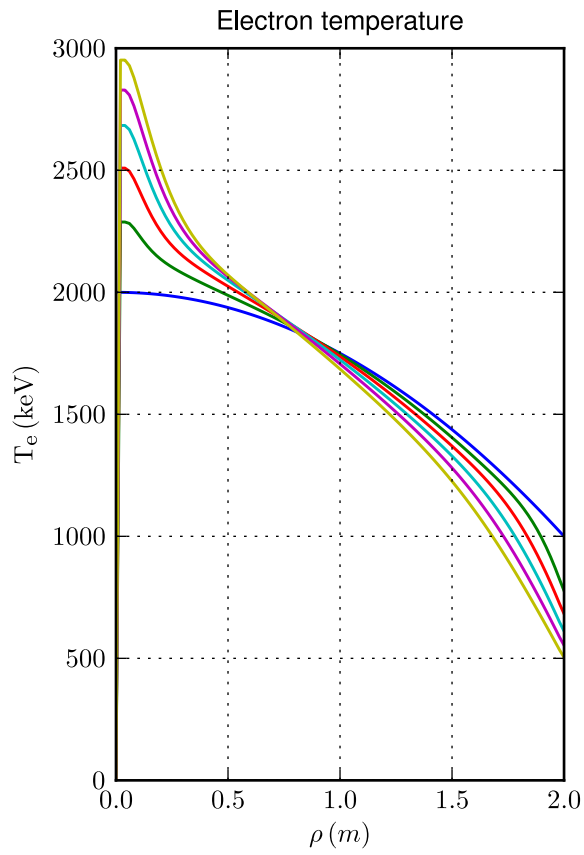
Error: zoom over edge



Profiles

[Case: I.1.5.i, Solver: 7, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

Time sampling: first 10 time slices or zoom over time $0.1 \times (a^2/D)/|1 - (Va/D)| = 0.57 \text{ s}$

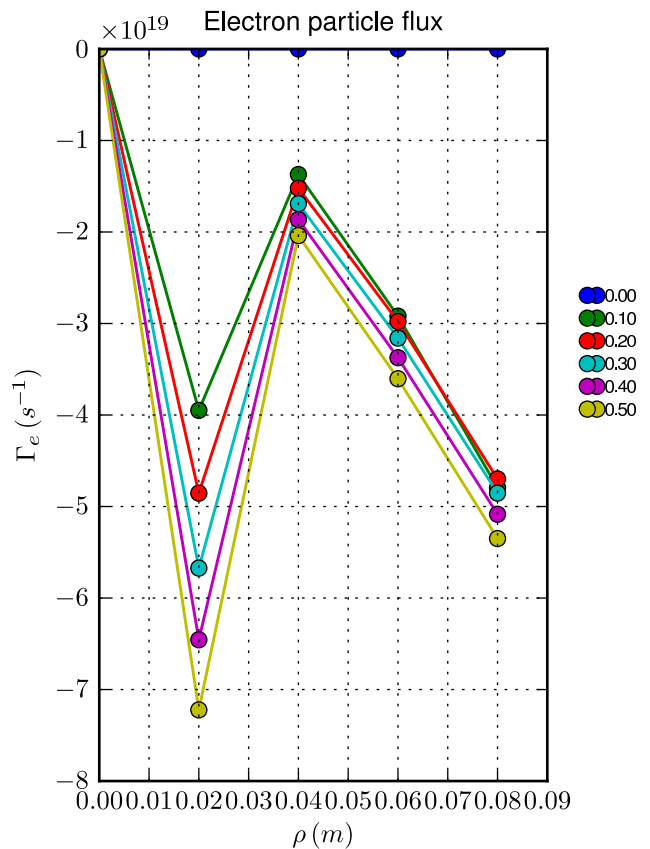
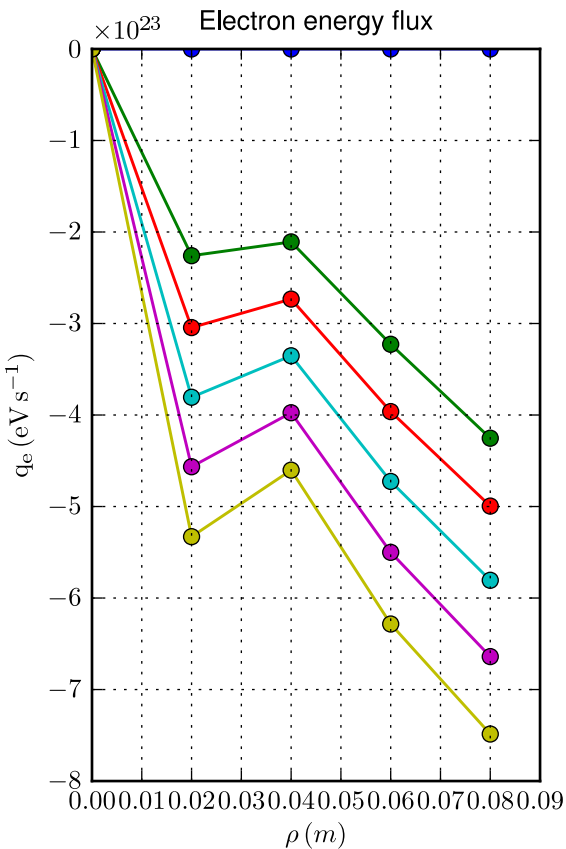
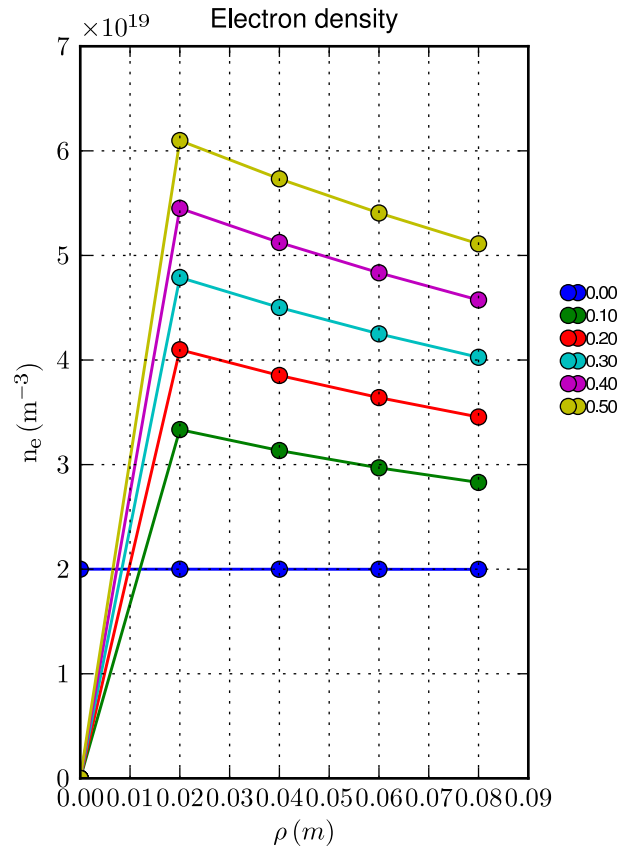
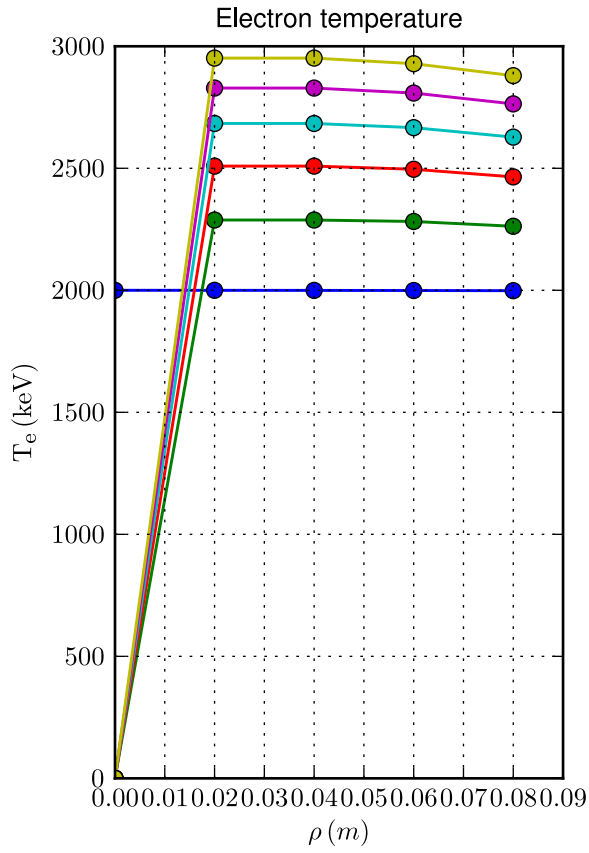


Profiles

[Case: I.1.5.i, Solver: 7, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

Spatial zoom over magnetic axis

Time sampling: first 10 time slices or zoom over time $0.1 \times (a^2/D)/|1 - (Va/D)| = 0.57 \text{ s}$

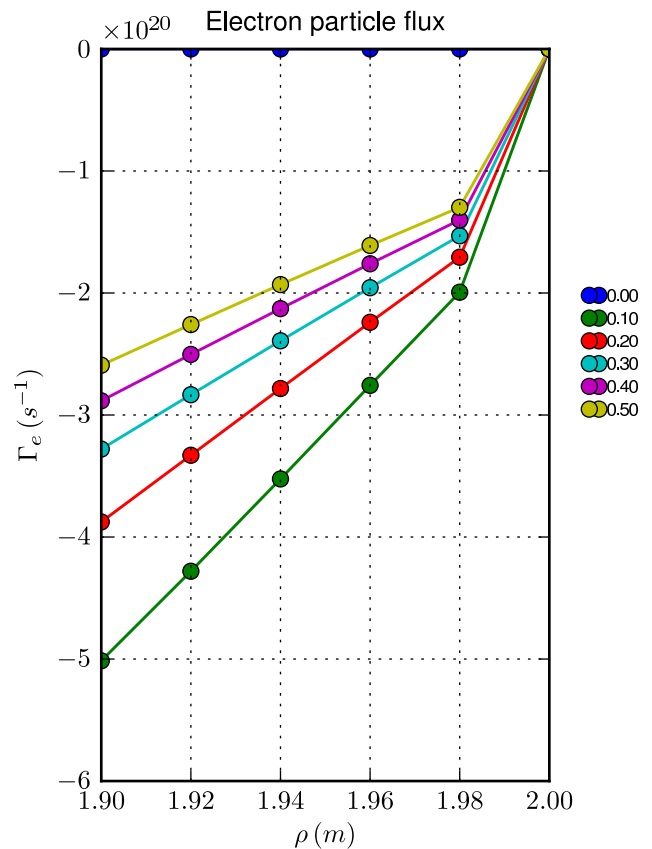
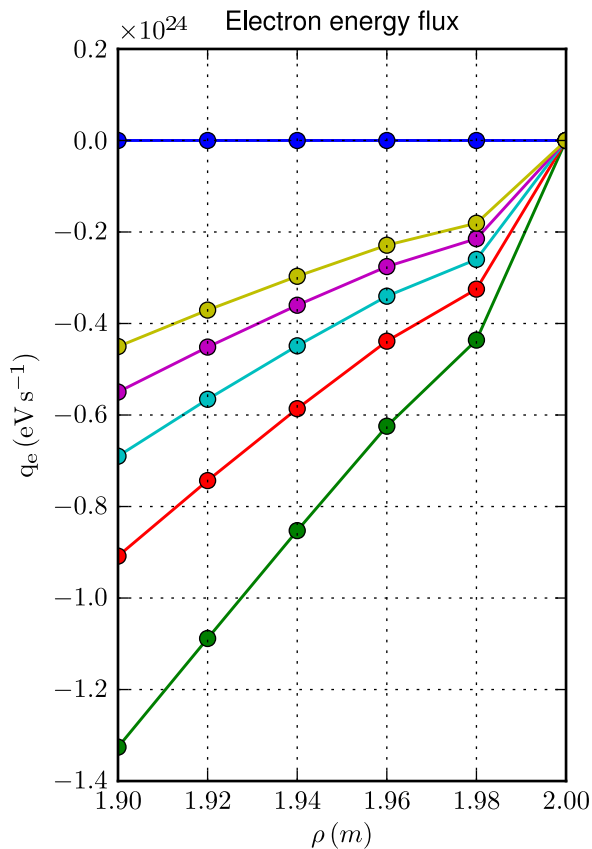
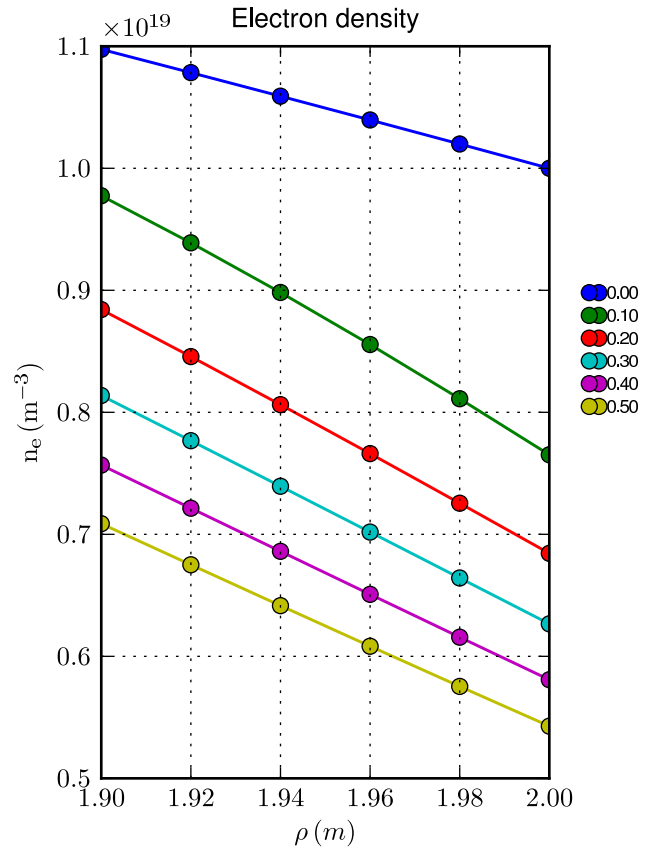
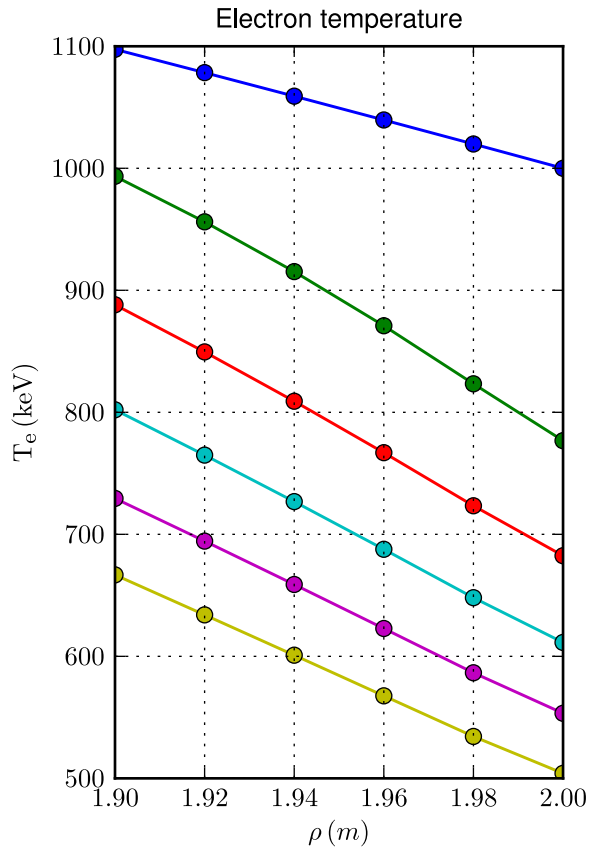


Profiles

[Case: I.1.5.i, Solver: 7, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

Spatial zoom over edge

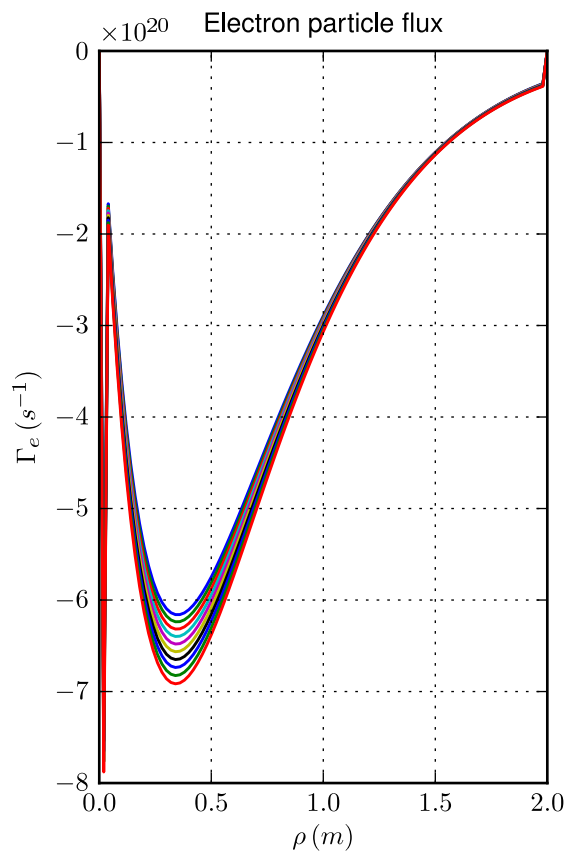
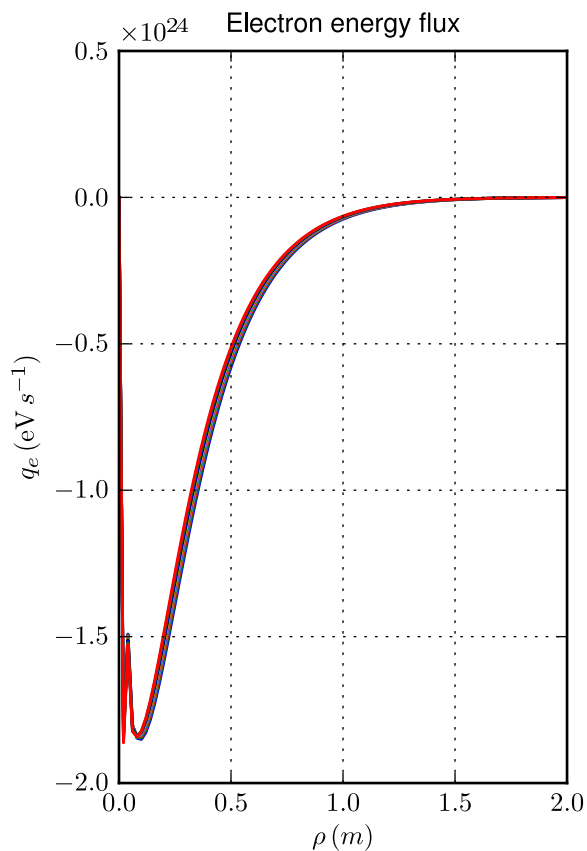
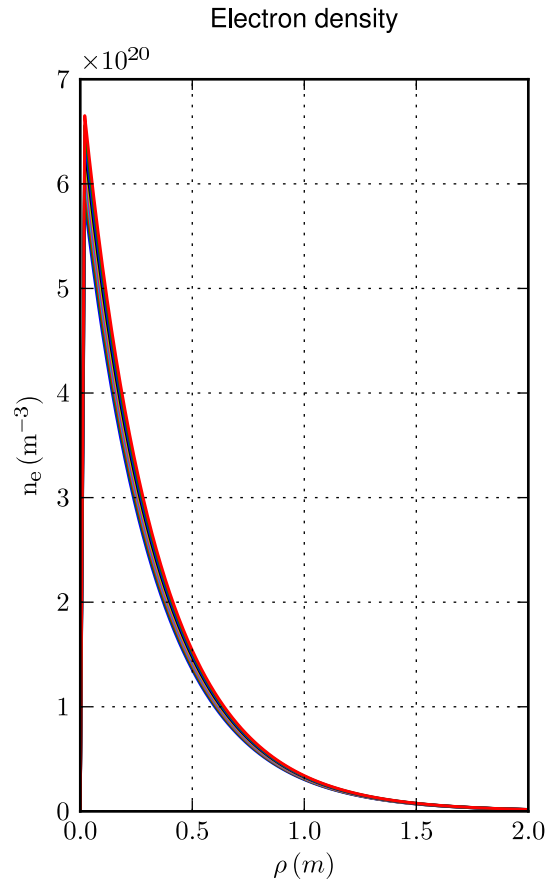
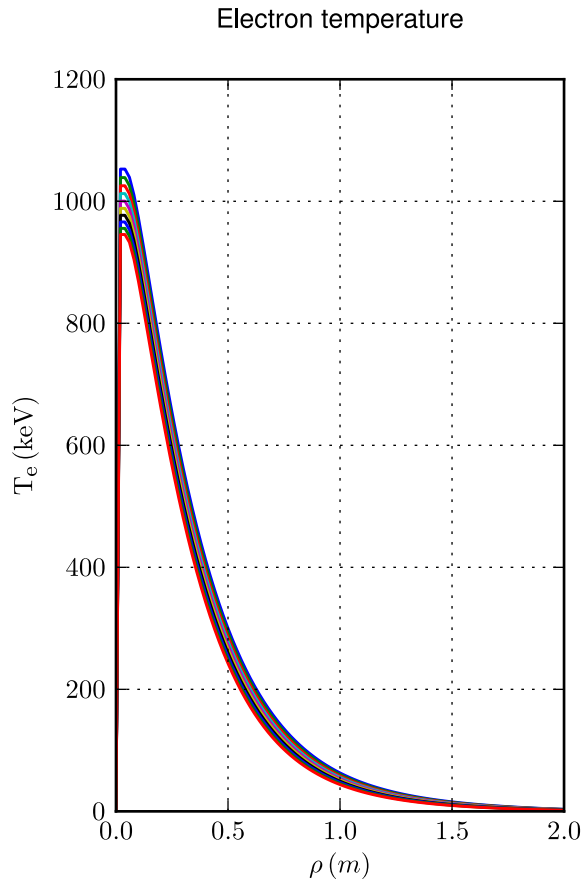
Time sampling: first 10 time slices or zoom over time $0.1 \times (a^2/D)/|1 - (Va/D)| = 0.57 \text{ s}$



Profiles

[Case: I.1.5.i, Solver: 7, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

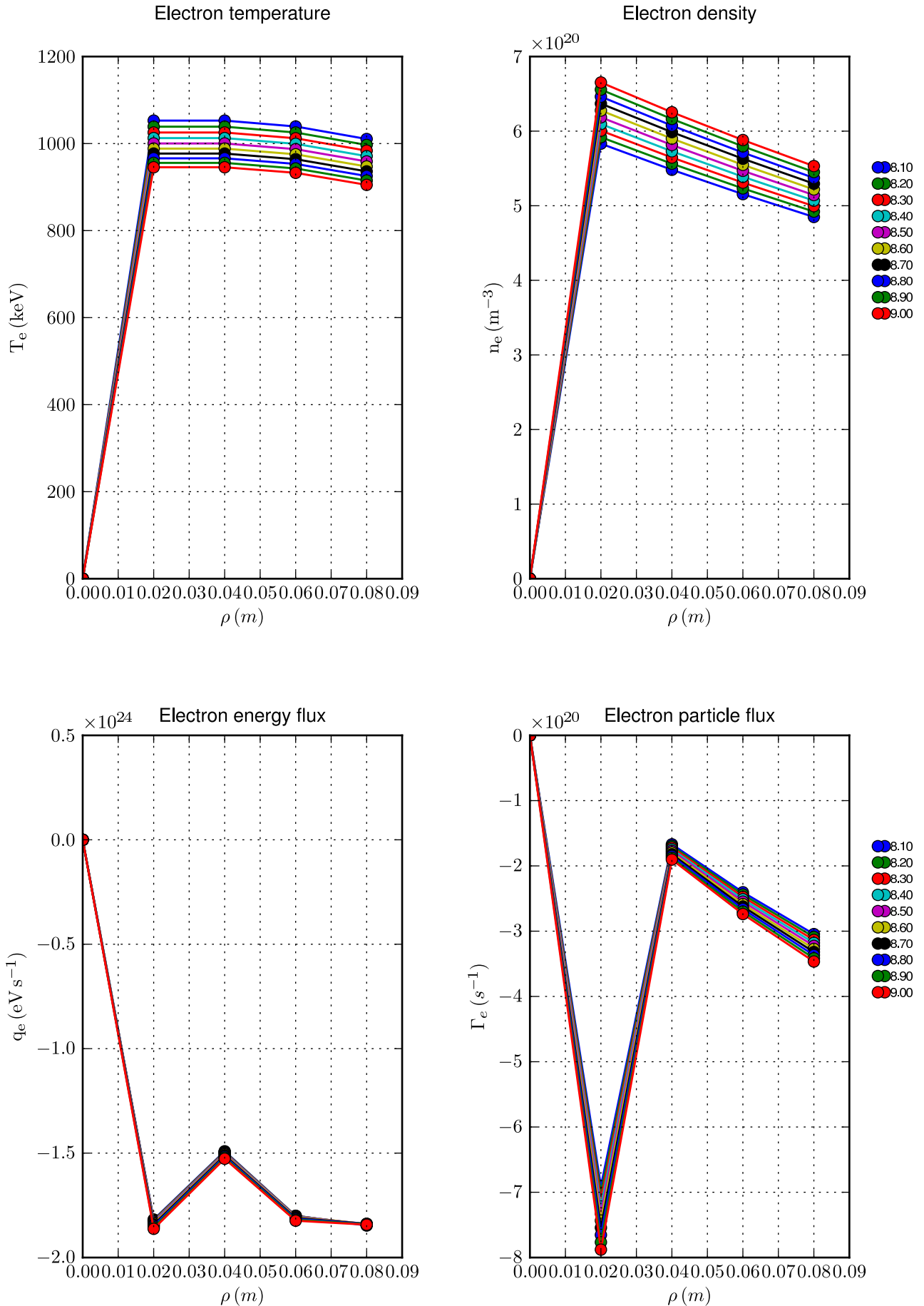
Time sampling: last 10 time slices



Profiles

[Case: I.1.5.i, Solver: 7, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

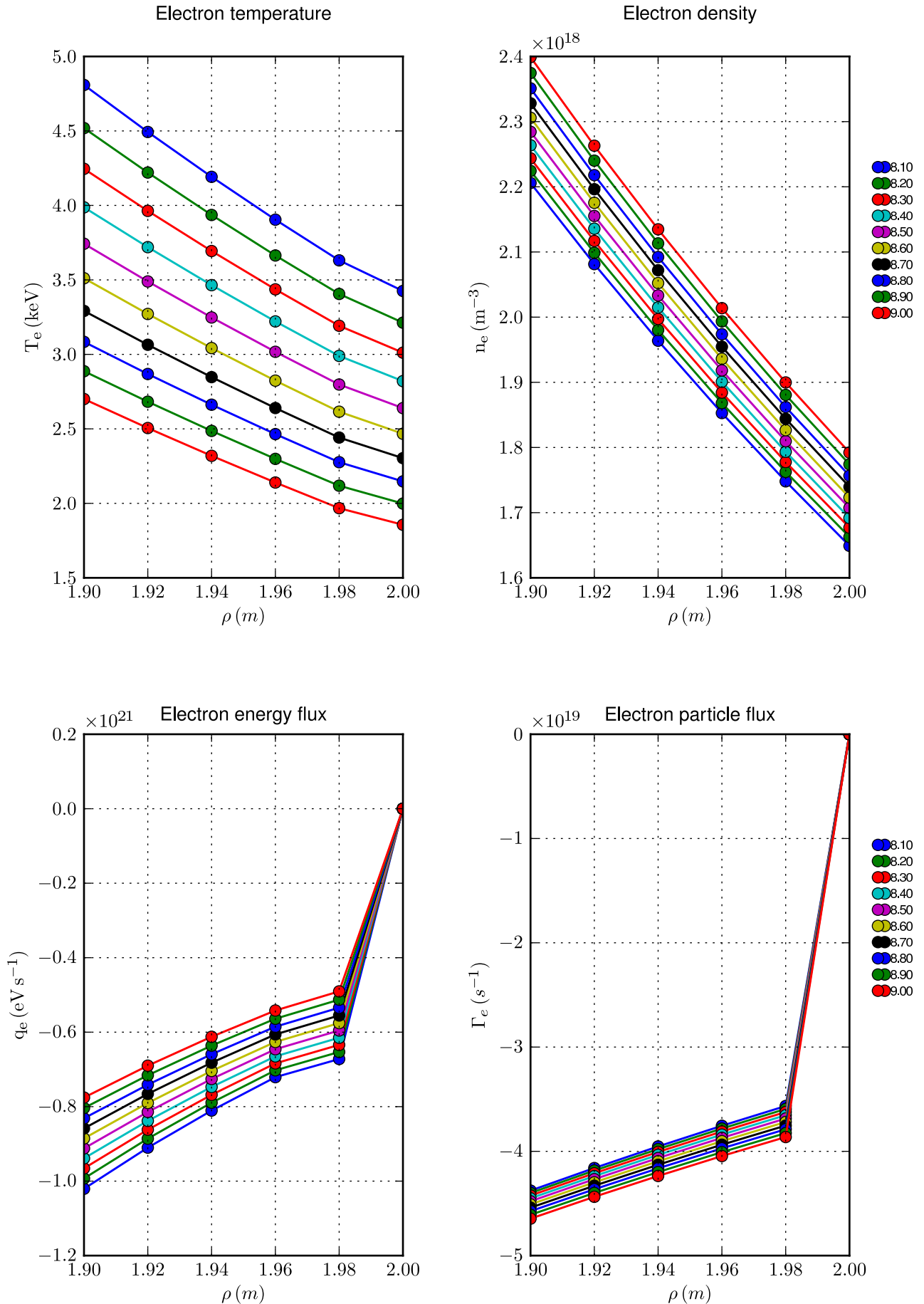
Spatial zoom over magnetic axis; time sampling: last 10 time slices



Profiles

[Case: I.1.5.i, Solver: 7, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

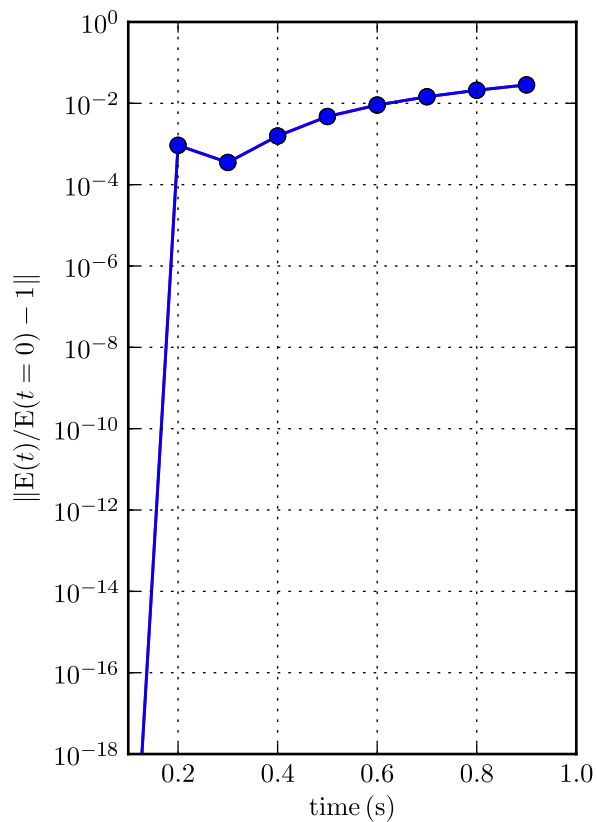
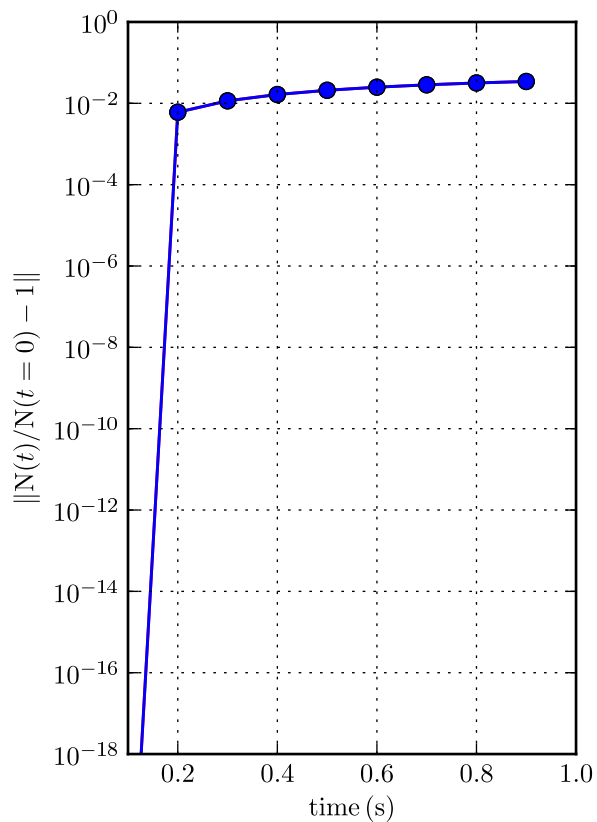
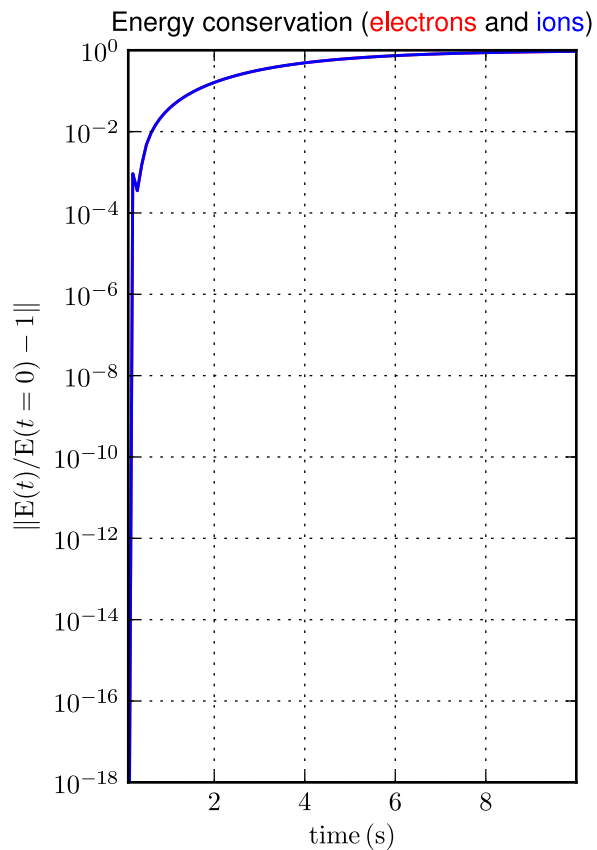
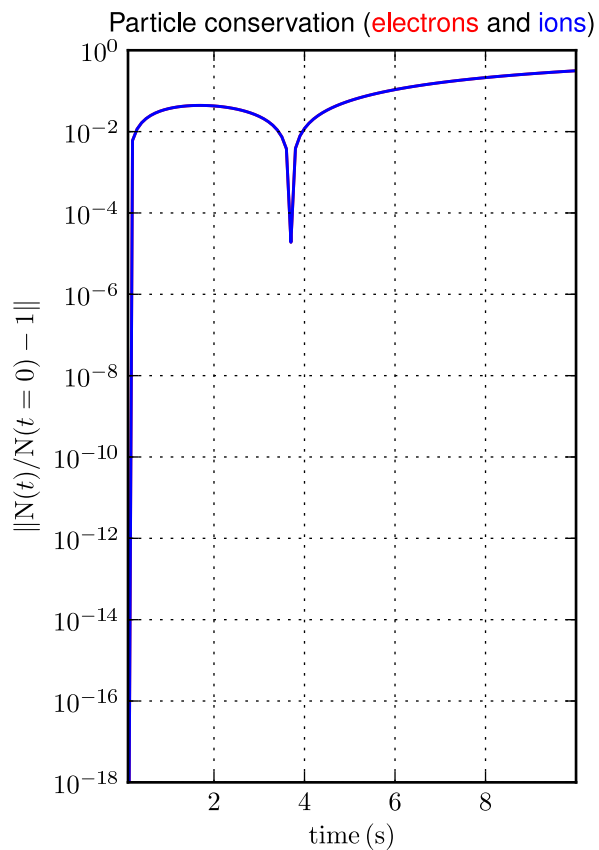
Spatial zoom over edge; time sampling: last 10 time slices



Part. & Energy conservation

[Case: I.1.5.i, Solver: 10, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

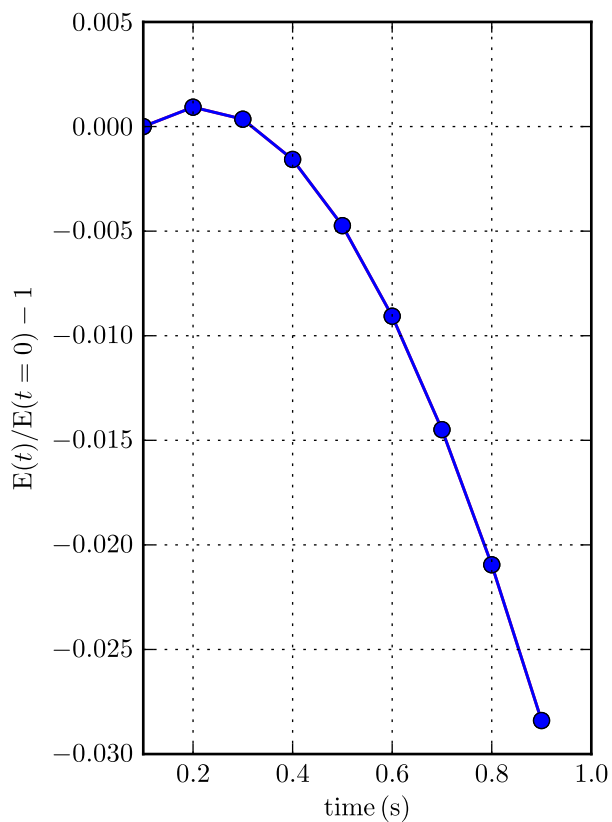
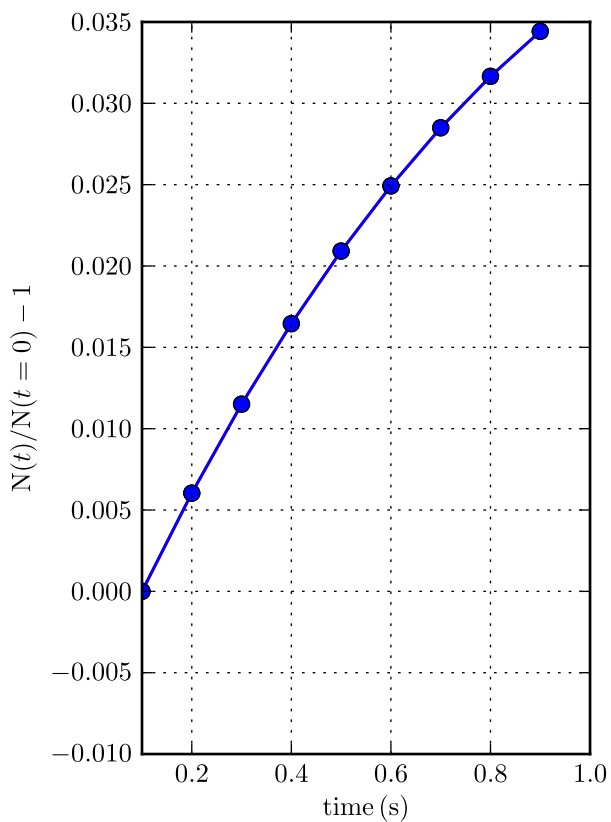
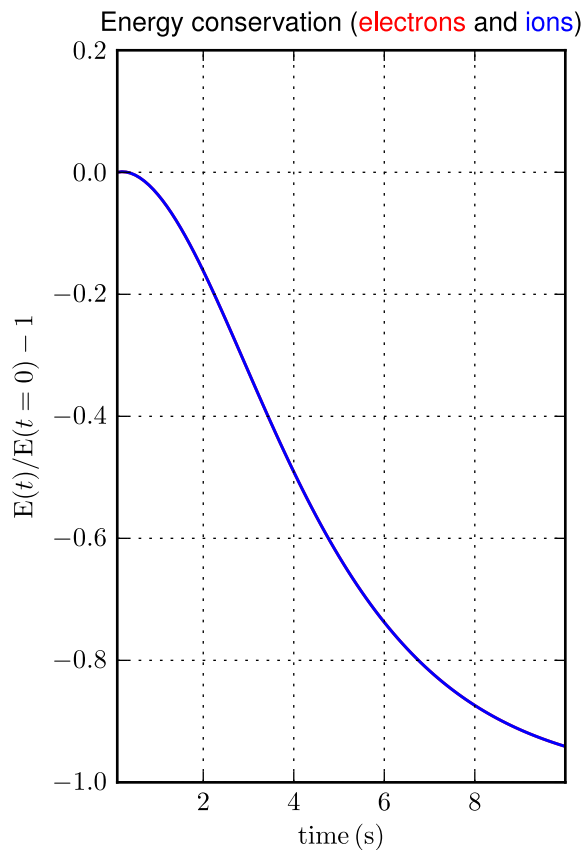
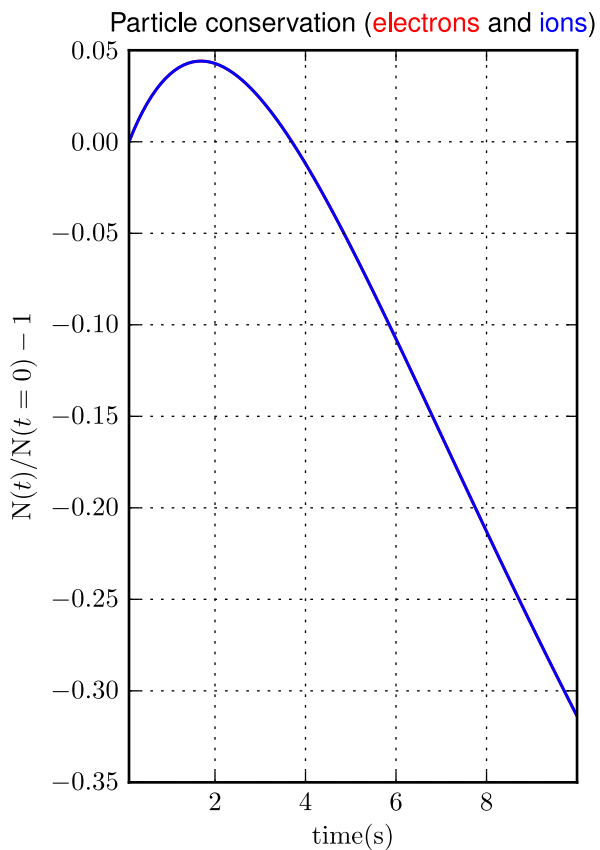
Comparison with initial solution - log scale; total time and zoom over time



Part. & Energy conservation

[Case: I.1.5.i, Solver: 10, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

Comparison with initial solution - linear scale; total time and zoom over time

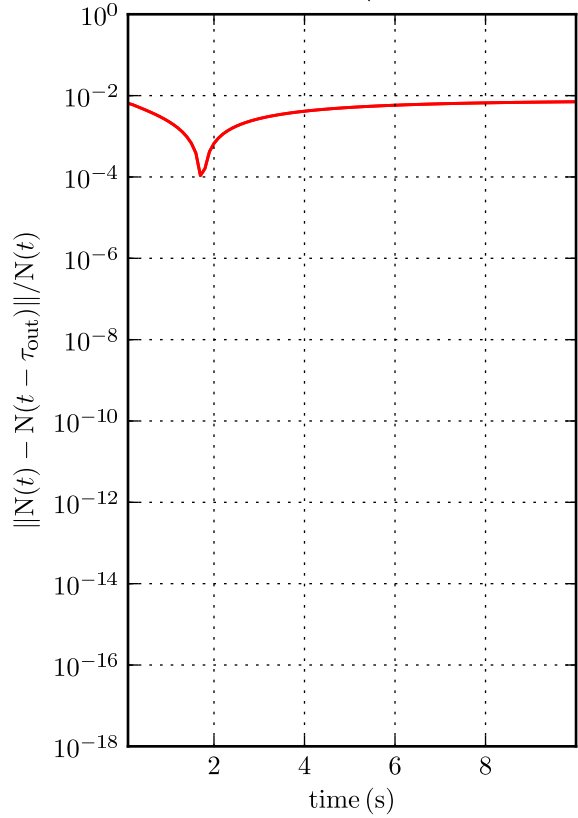


Part. & Energy conservation

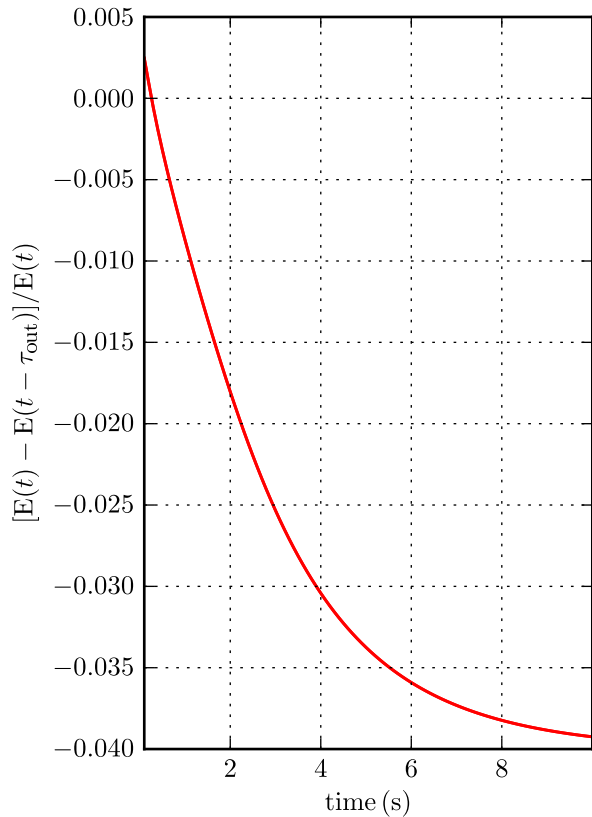
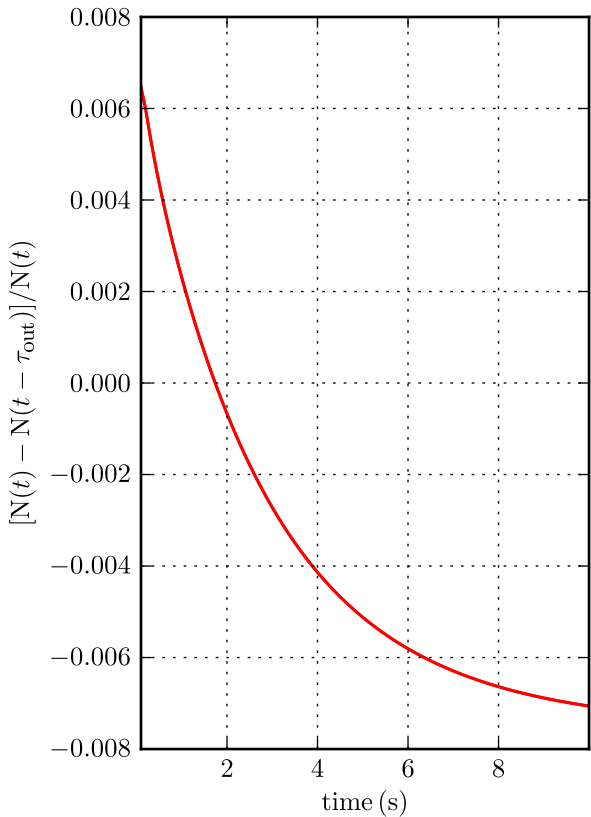
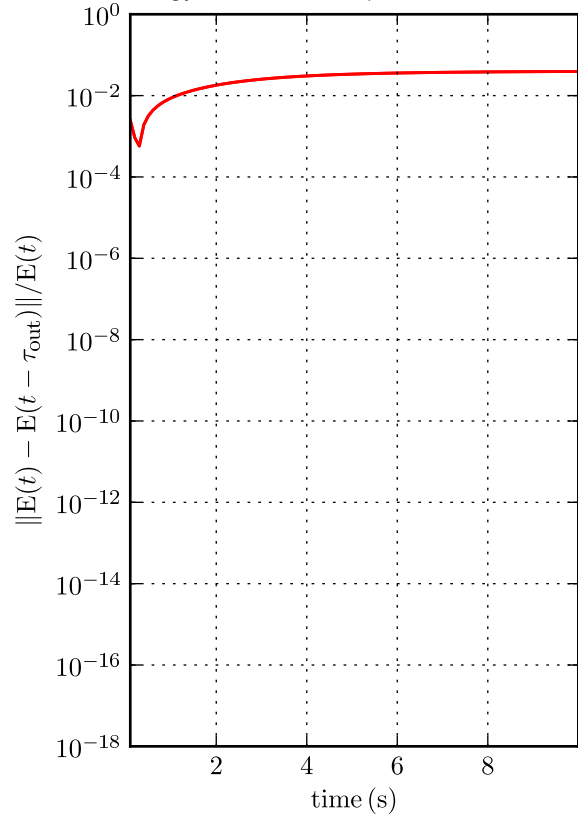
[Case: I.1.5.i, Solver: 10, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

Comparison with previous time-sampled (τ_{out}) solution - log and linear scales

Particle conservation (electrons and ions)



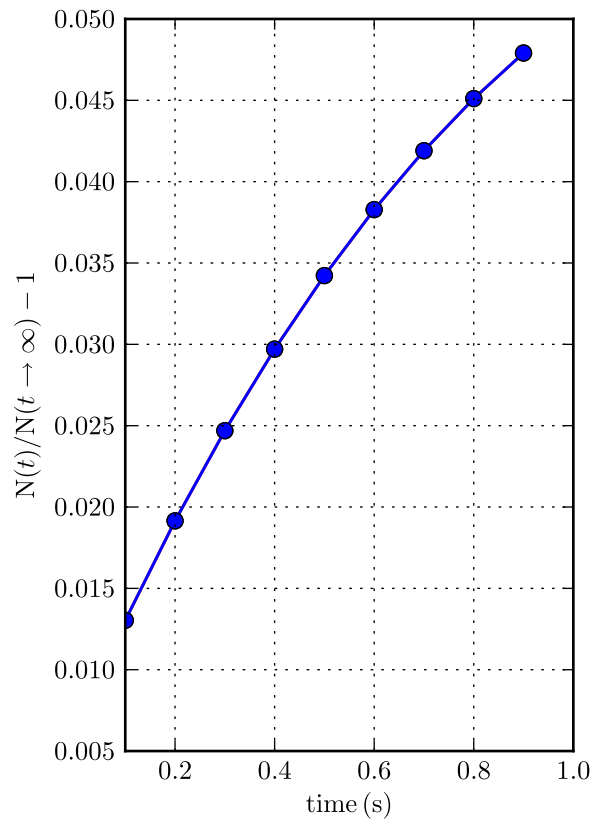
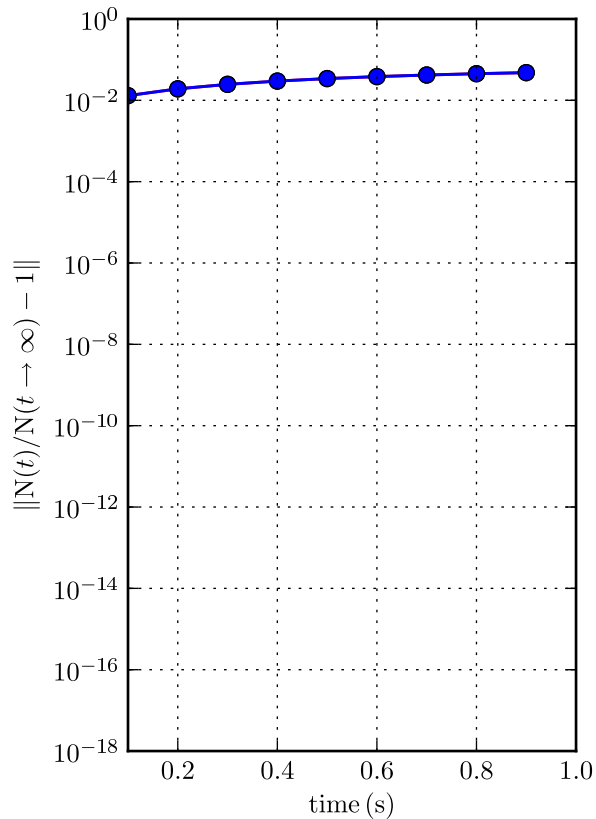
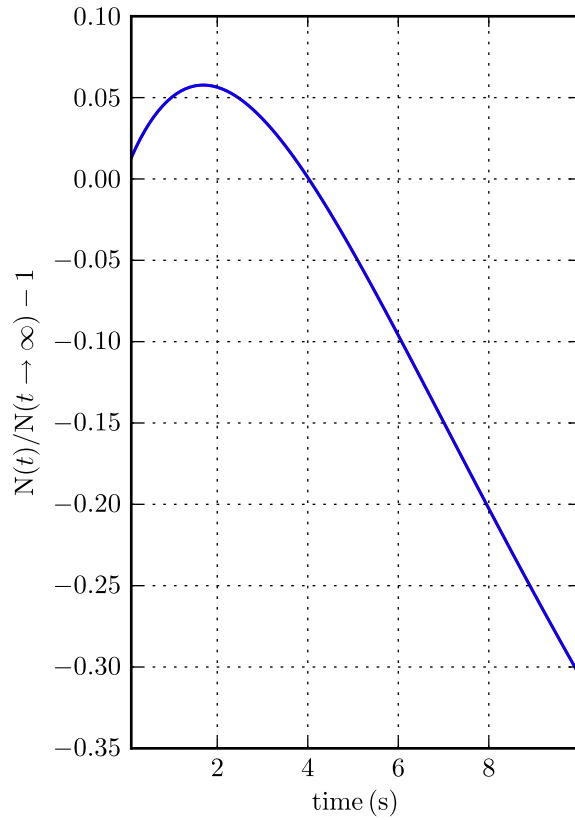
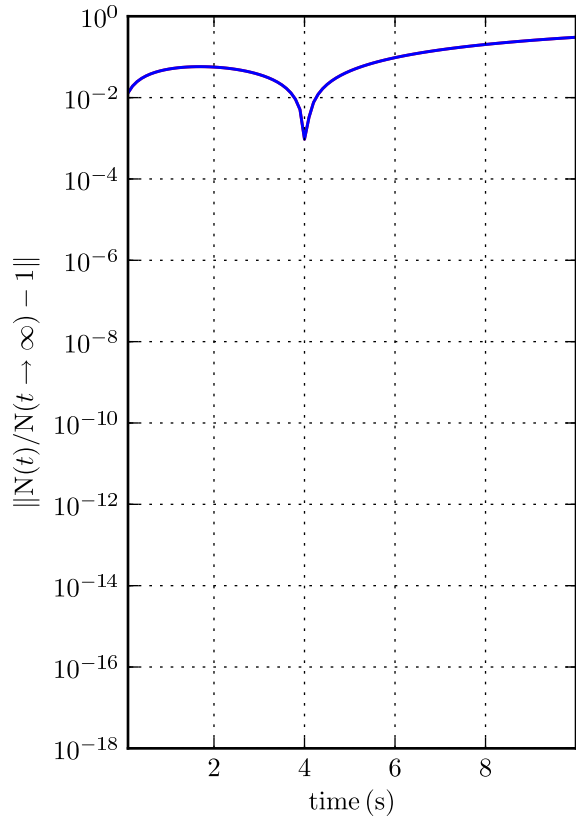
Energy conservation (electrons and ions)



Particle conservation

[Case: I.1.5.i, Solver: 10, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

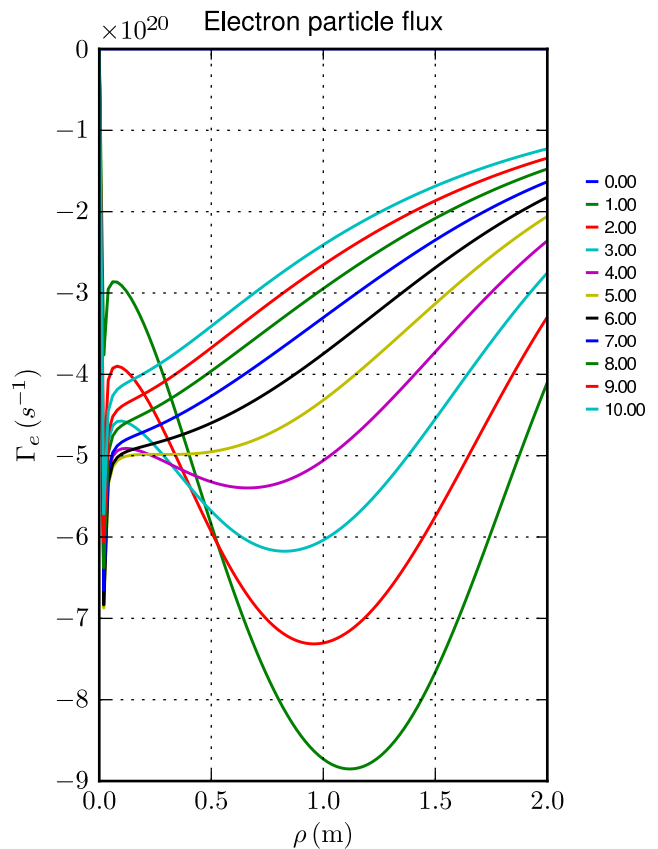
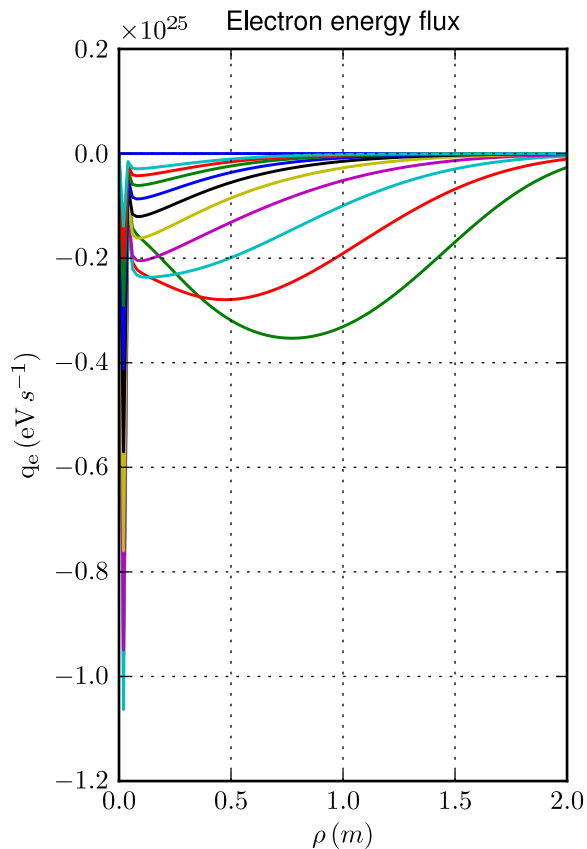
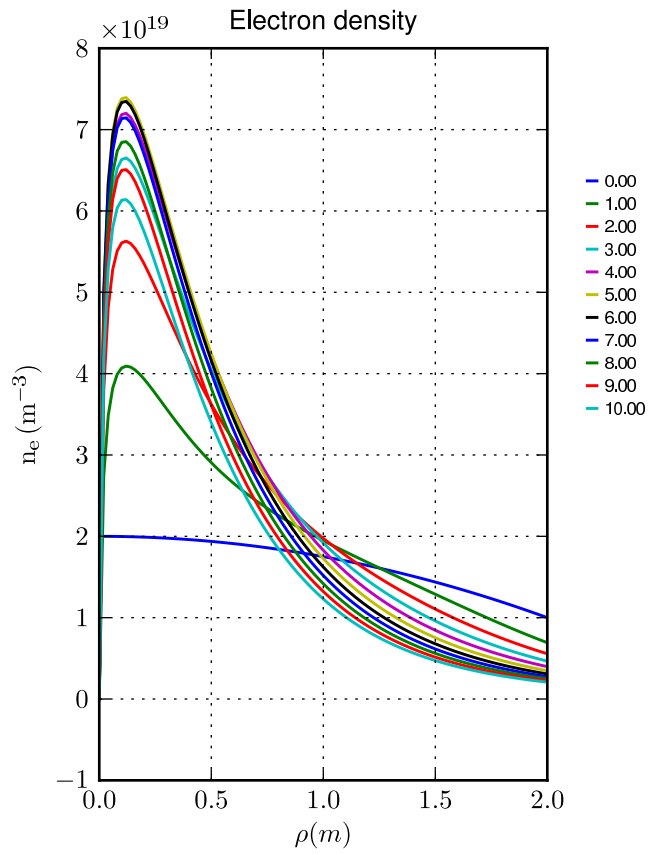
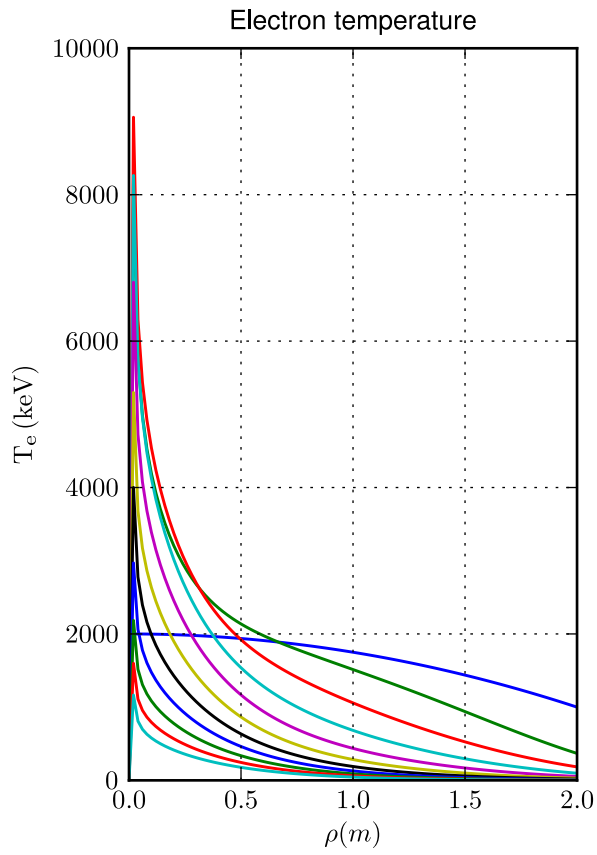
Comparison with asymptotic solution (electrons and ions); total time and zoom over time



Profiles

[Case: I.1.5.i, Solver: 10, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

Time sampling: total simulation time/10

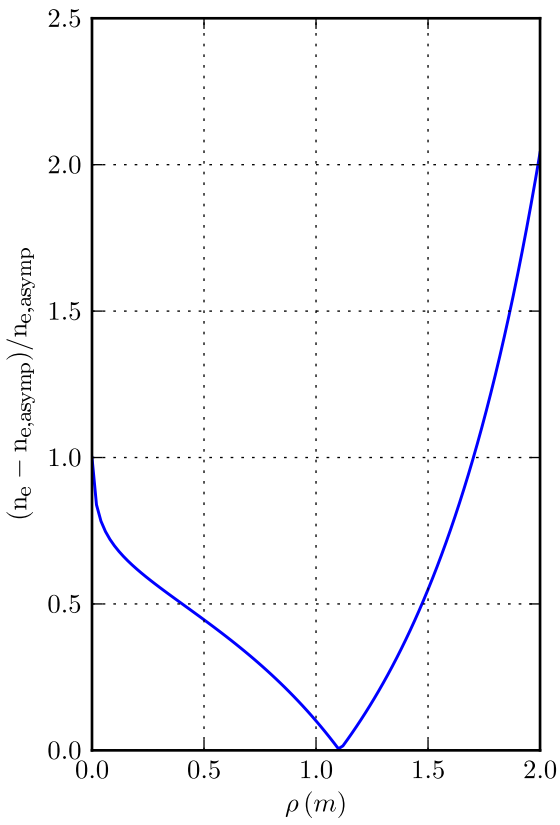


Profiles

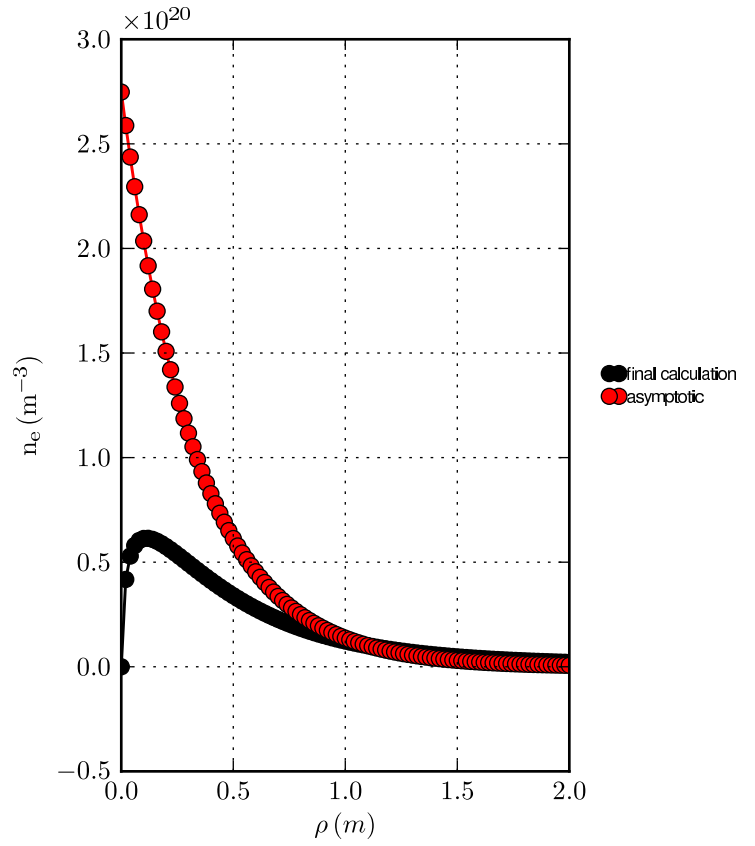
[Case: I.1.5.i, Solver: 10, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

Comparison with asymptotic solution

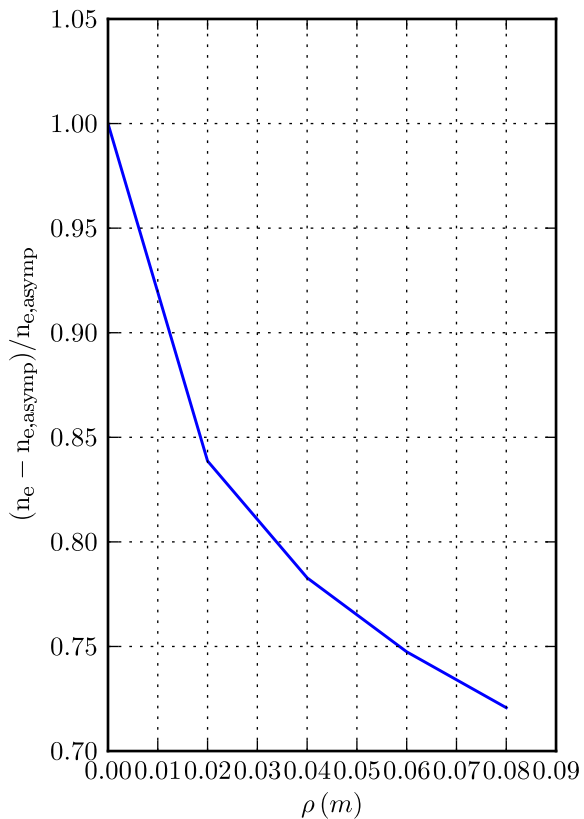
Electron density relative error



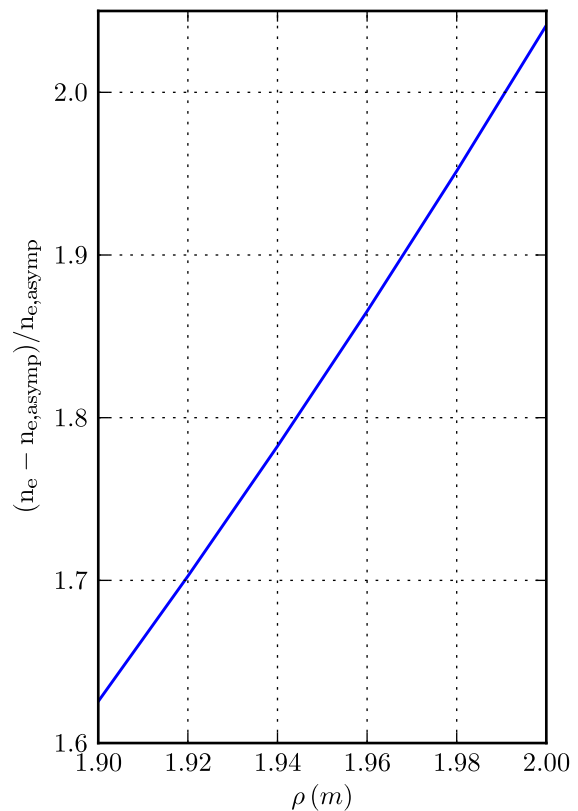
Electron density



Error: zoom over axis



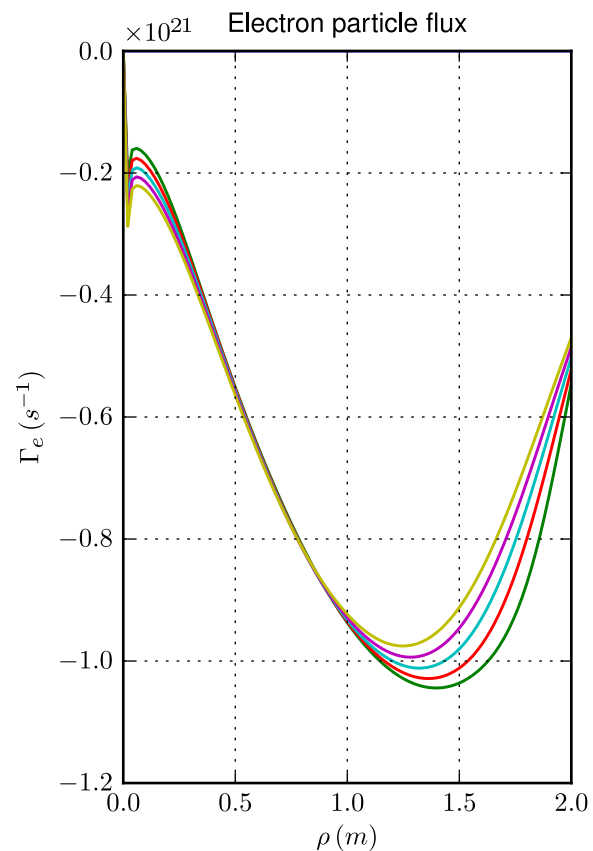
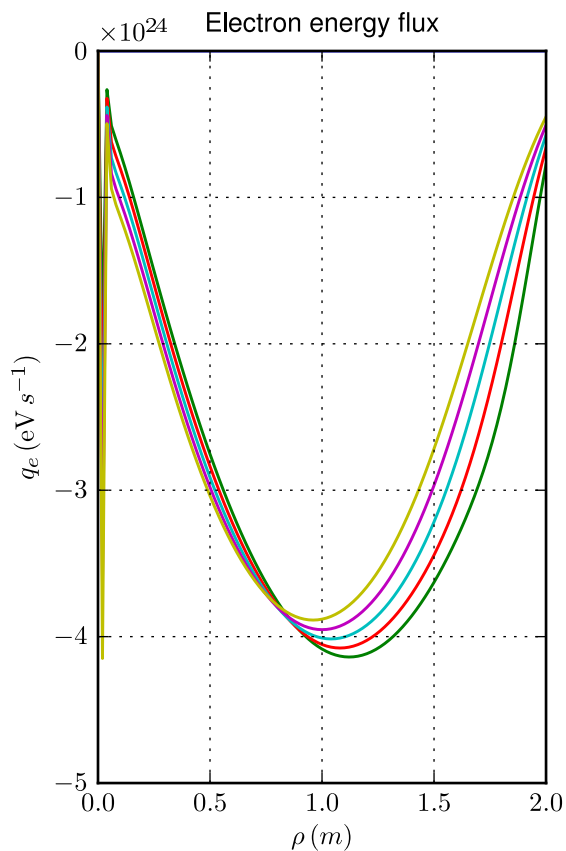
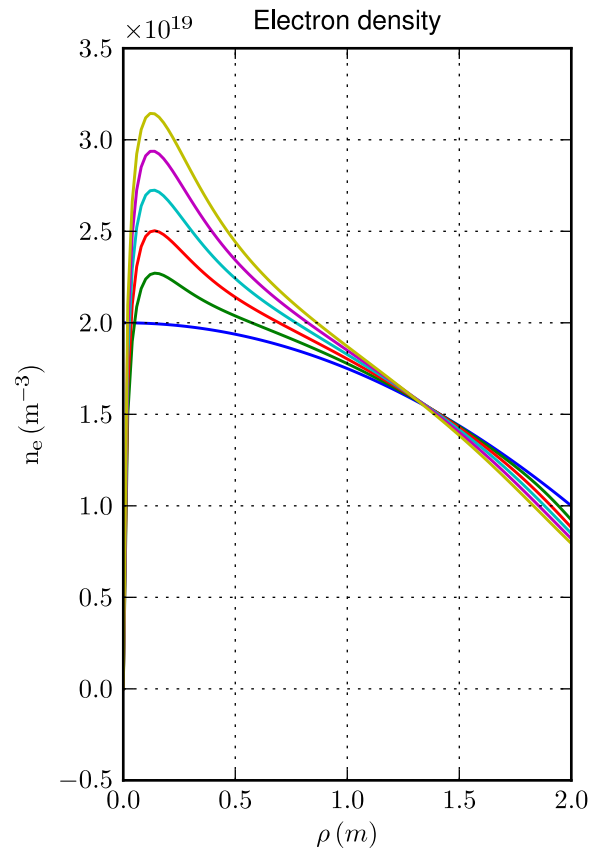
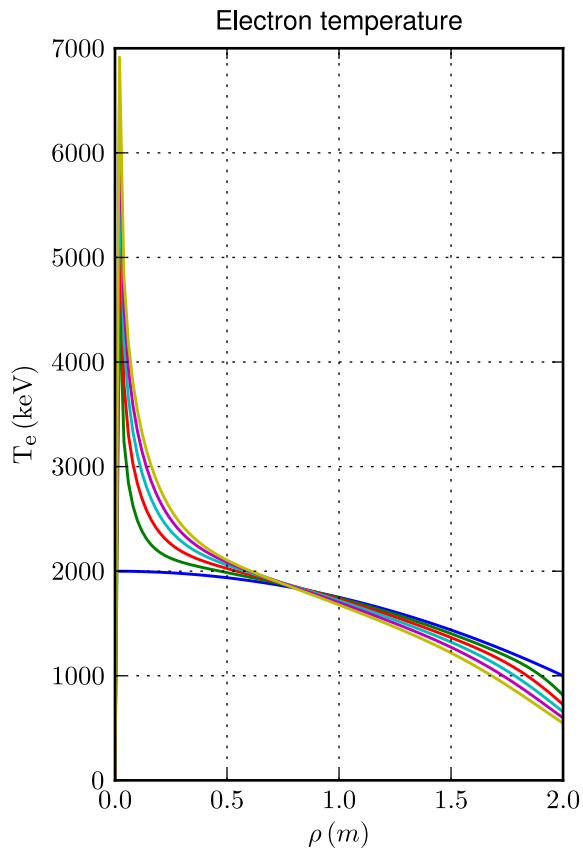
Error: zoom over edge



Profiles

[Case: I.1.5.i, Solver: 10, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

Time sampling: first 10 time slices or zoom over time $0.1 \times (a^2/D)/|1 - (Va/D)| = 0.57 \text{ s}$

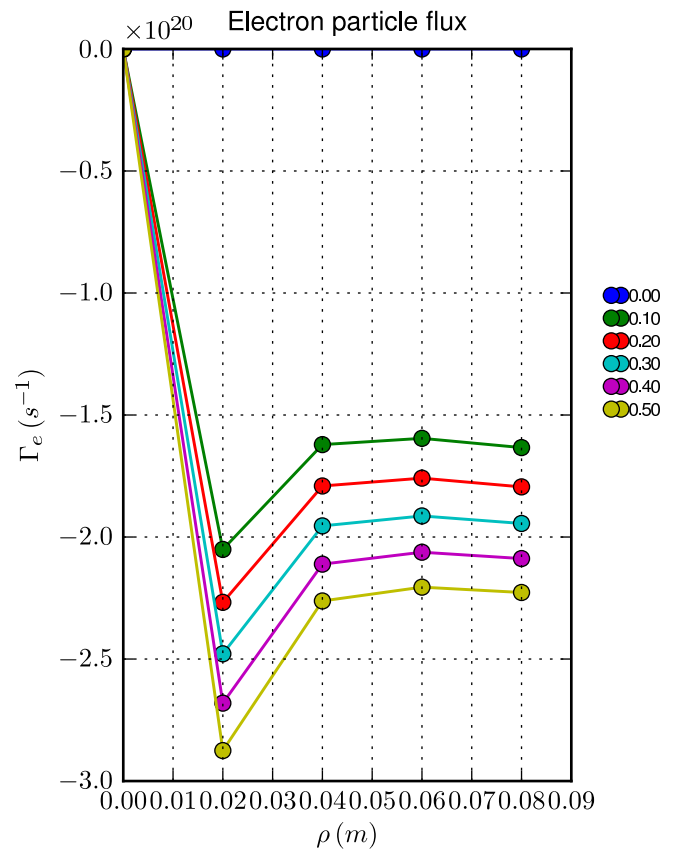
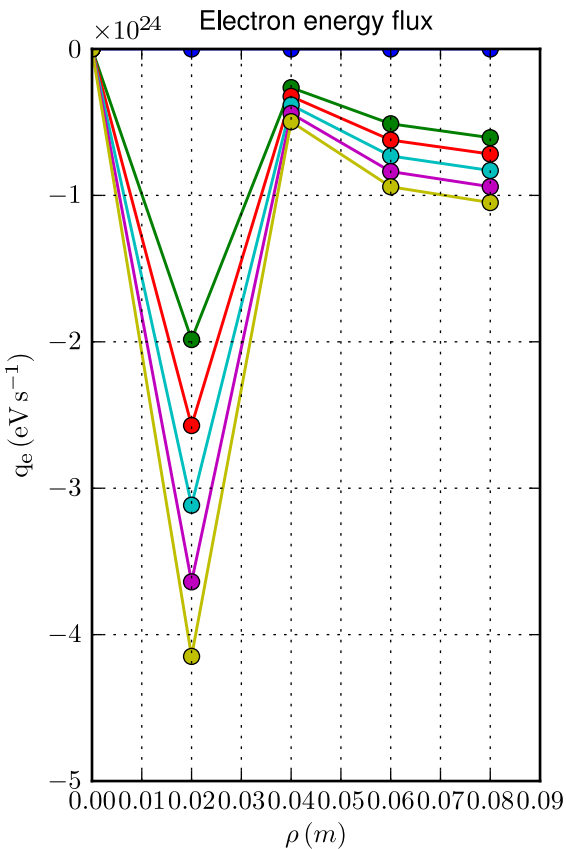
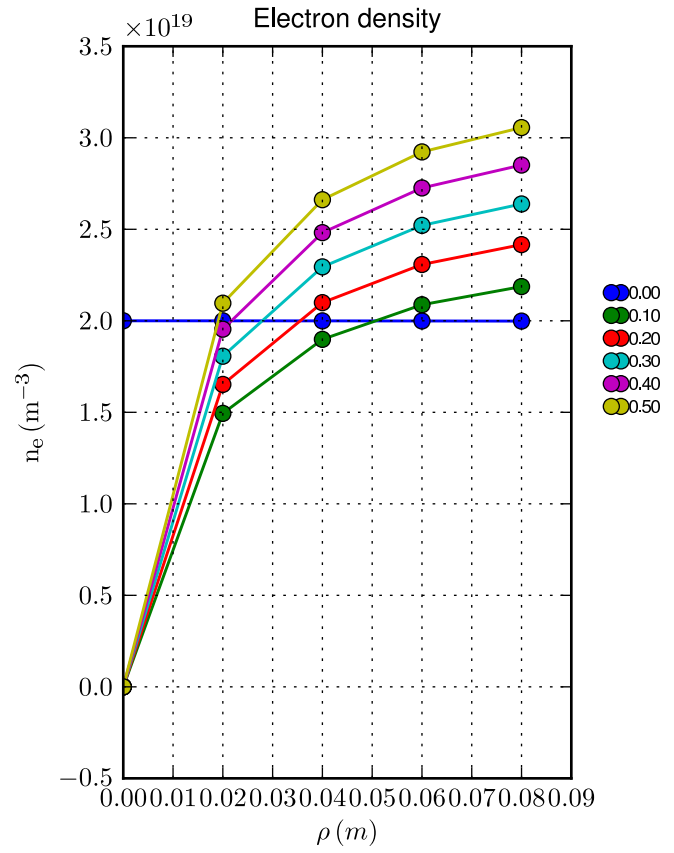
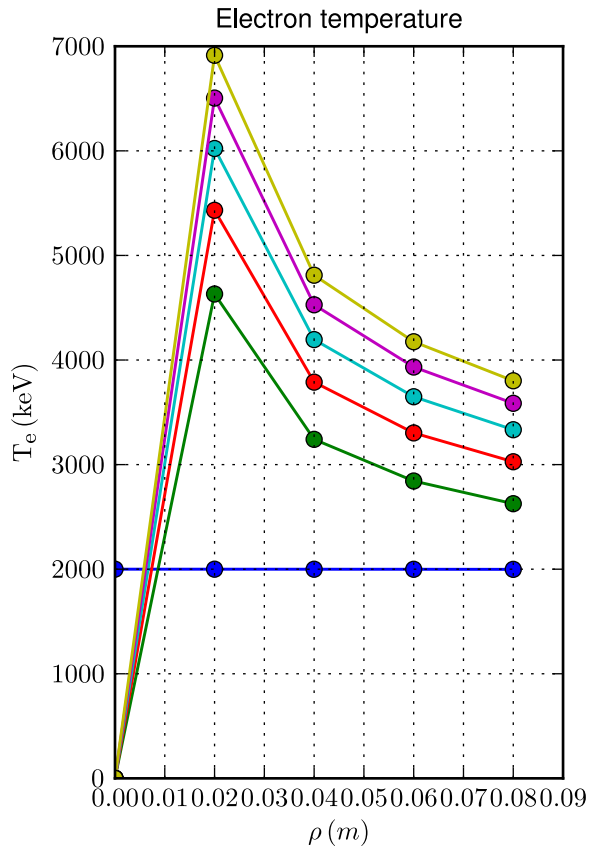


Profiles

[Case: I.1.5.i, Solver: 10, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

Spatial zoom over magnetic axis

Time sampling: first 10 time slices or zoom over time $0.1 \times (a^2/D)/|1 - (Va/D)| = 0.57 \text{ s}$

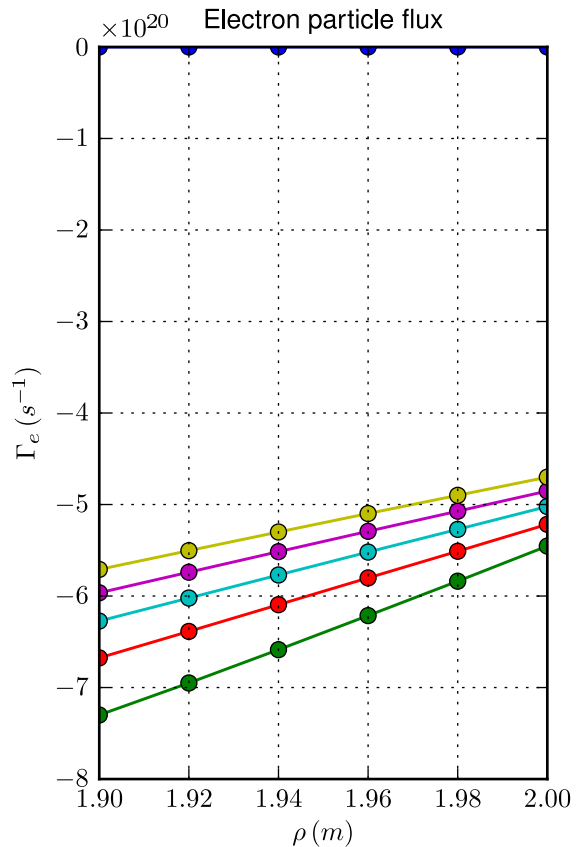
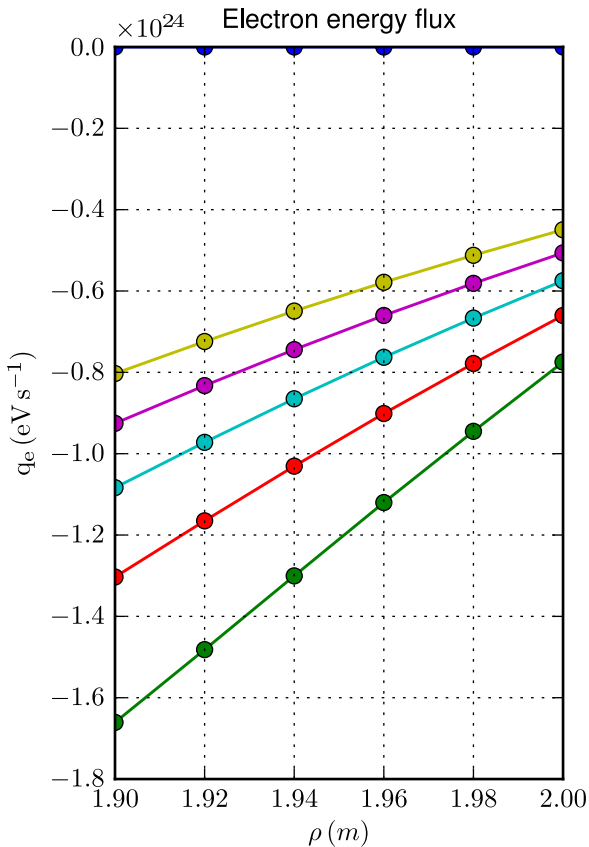
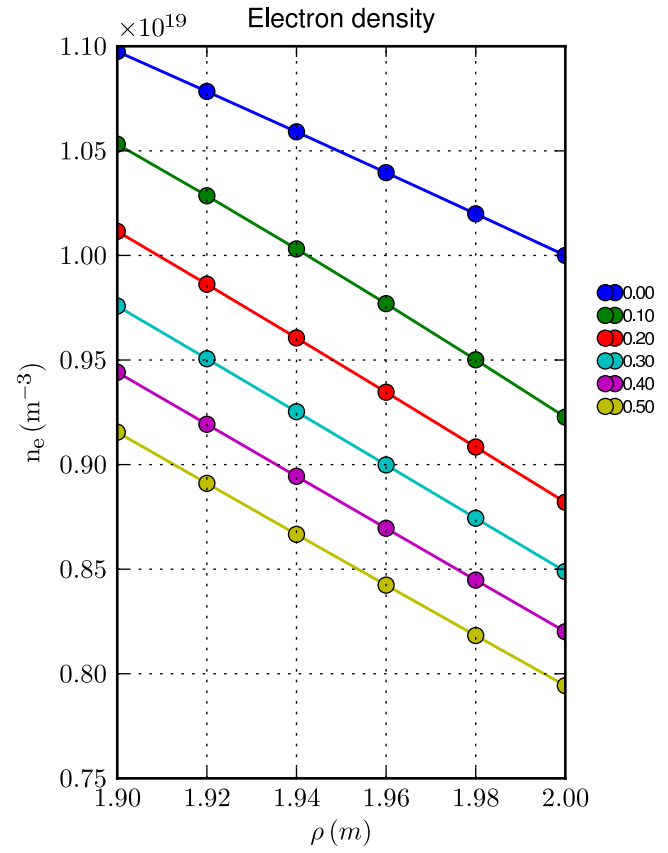
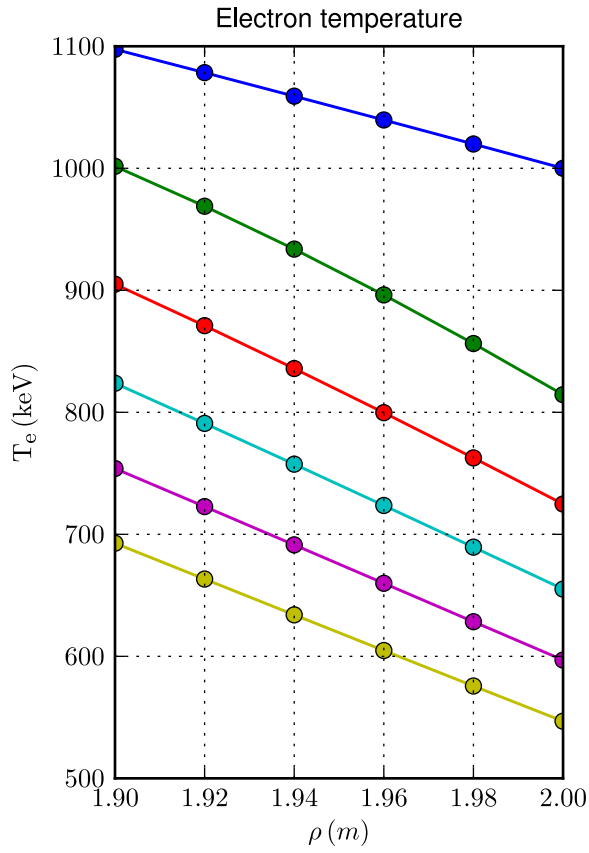


Profiles

[Case: I.1.5.i, Solver: 10, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

Spatial zoom over edge

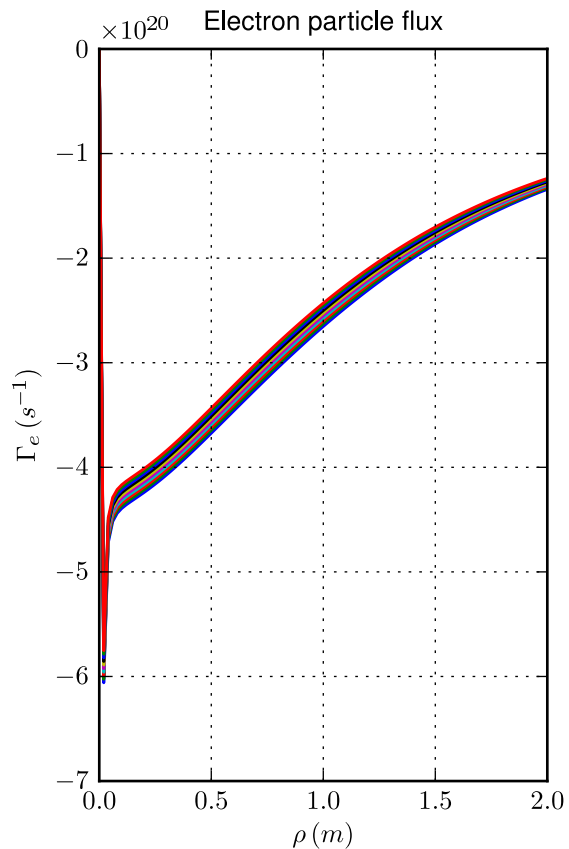
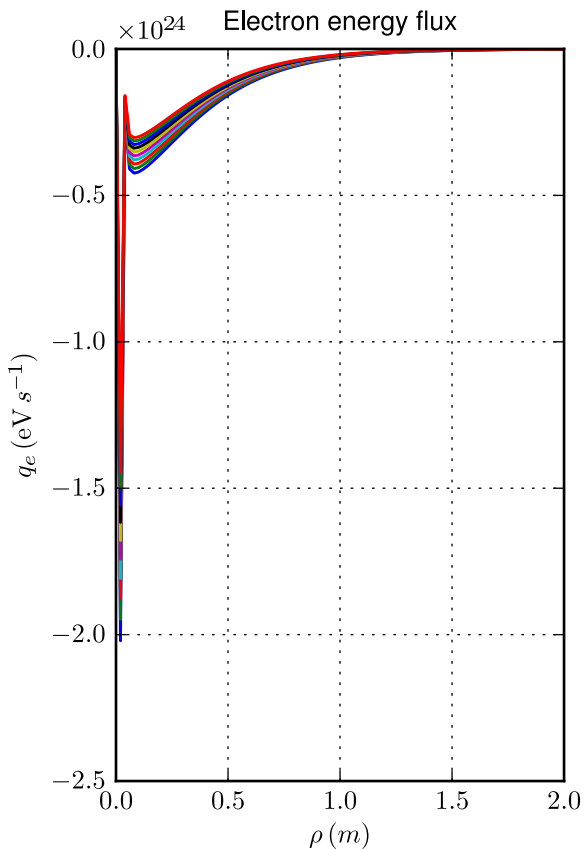
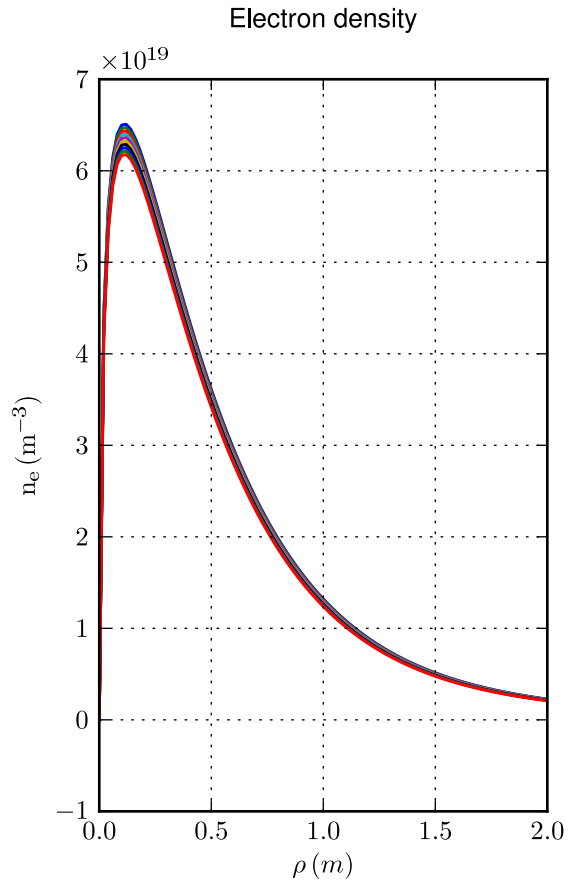
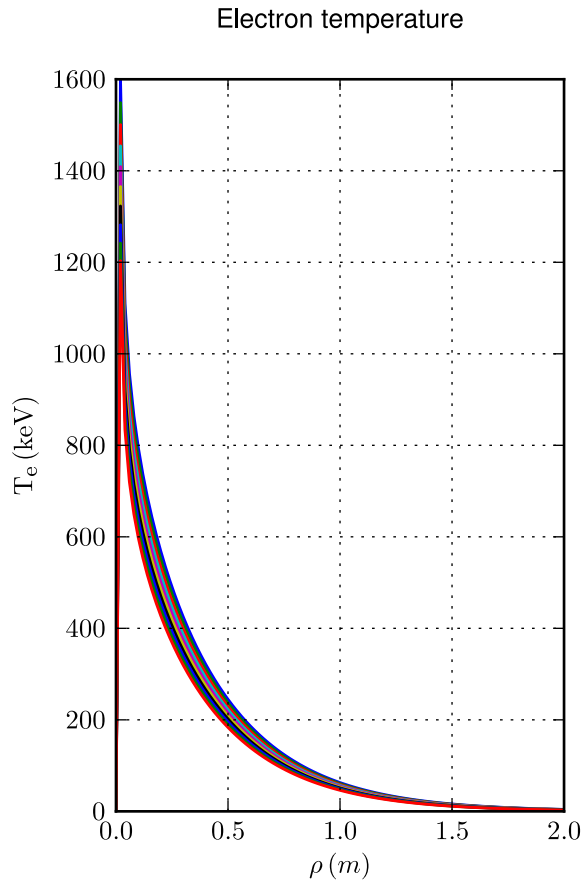
Time sampling: first 10 time slices or zoom over time $0.1 \times (a^2/D)/|1 - (Va/D)| = 0.57 \text{ s}$



Profiles

[Case: I.1.5.i, Solver: 10, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

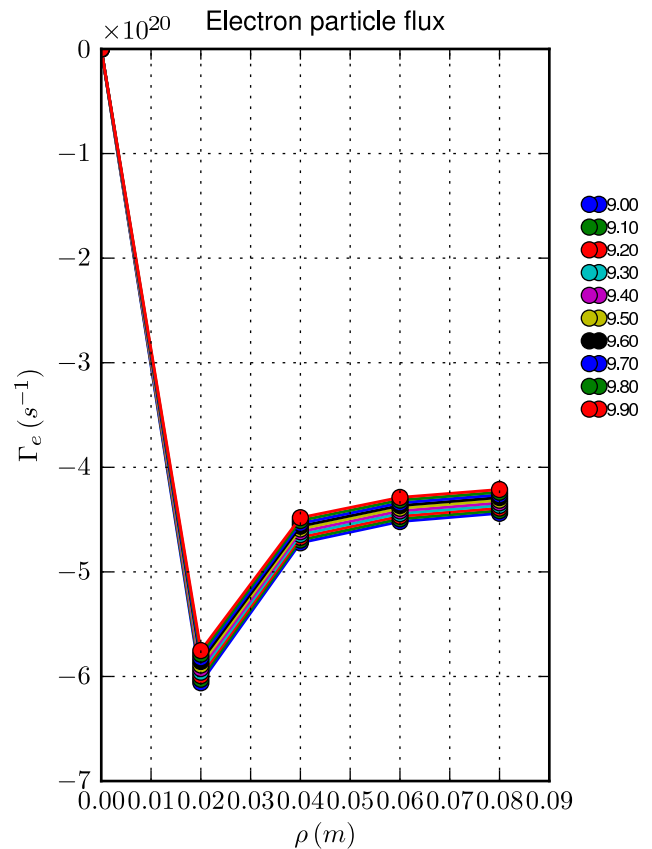
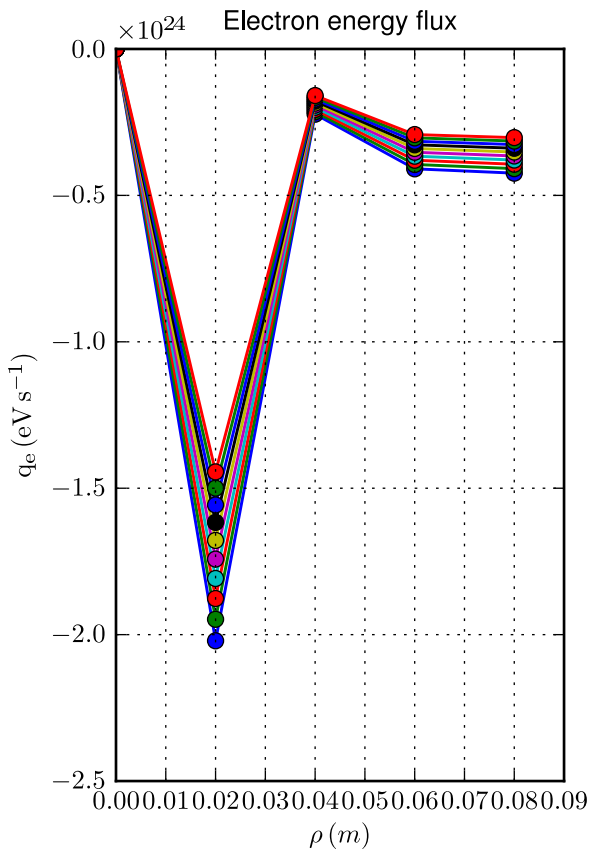
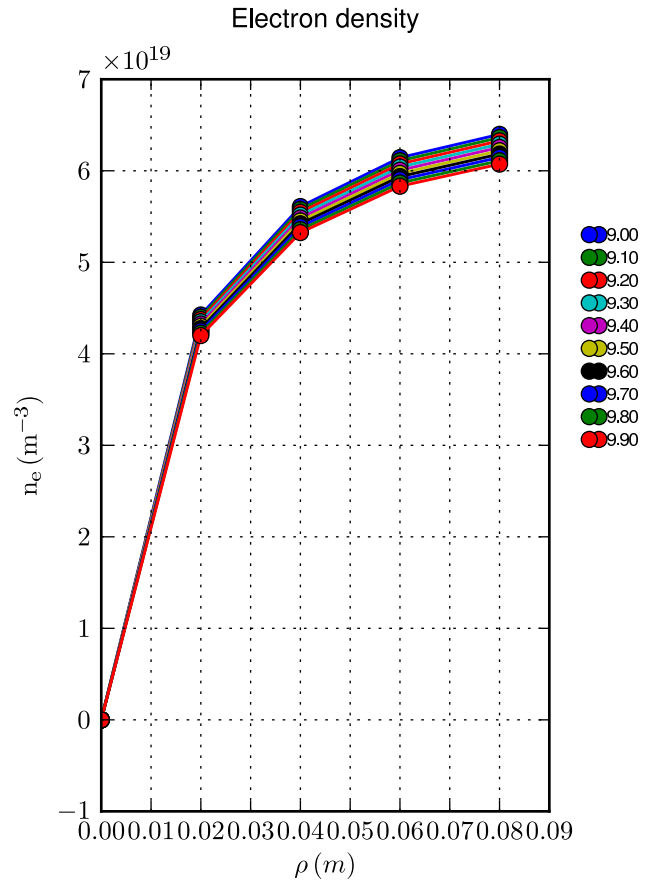
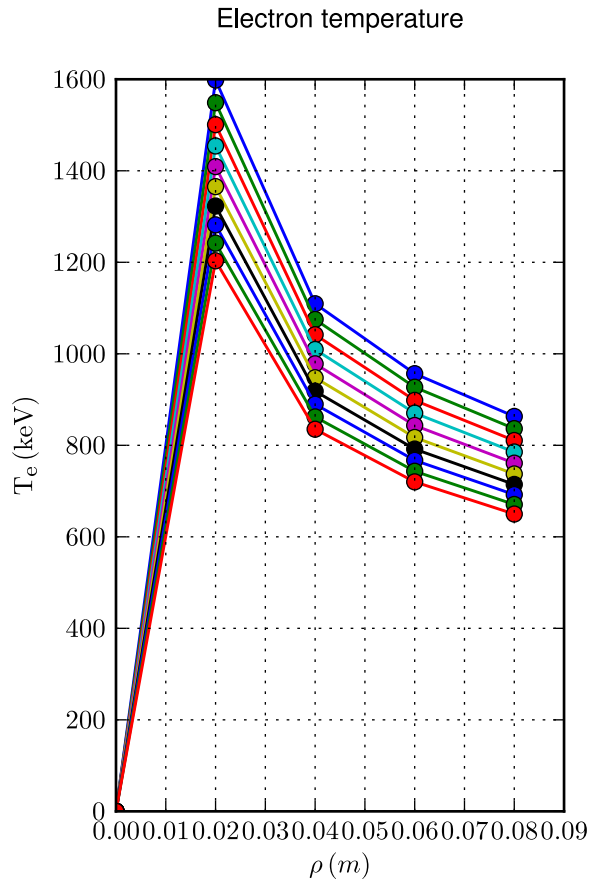
Time sampling: last 10 time slices



Profiles

[Case: I.1.5.i, Solver: 10, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

Spatial zoom over magnetic axis; time sampling: last 10 time slices



Profiles

[Case: I.1.5.i, Solver: 10, $D = 0.1 \text{ m}^2/\text{s}$, $v = -0.30 \text{ m/s}$, $\Delta t = 10.00$, $\tau = 1.0 \times 10^{-3} \text{ s}$, $N_\rho = 101$]

Spatial zoom over edge; time sampling: last 10 time slices

