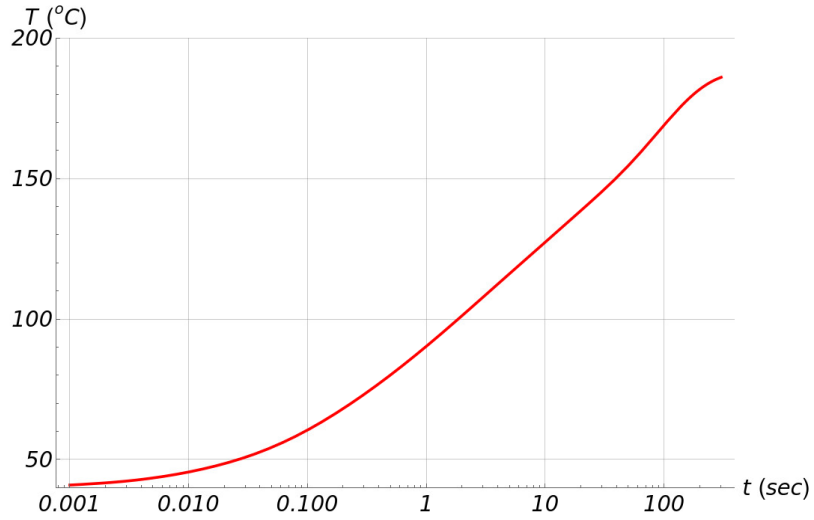
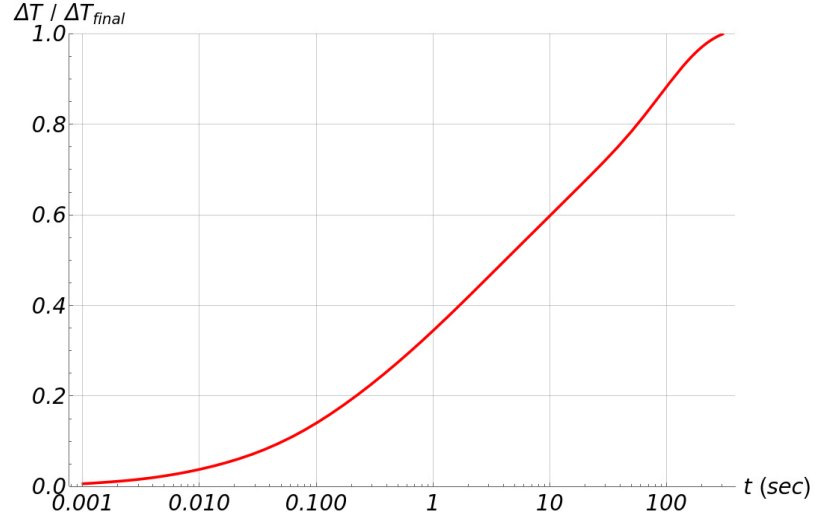
Time Dependence of the Absorber Temperature Rise

Hovanes Egiyan

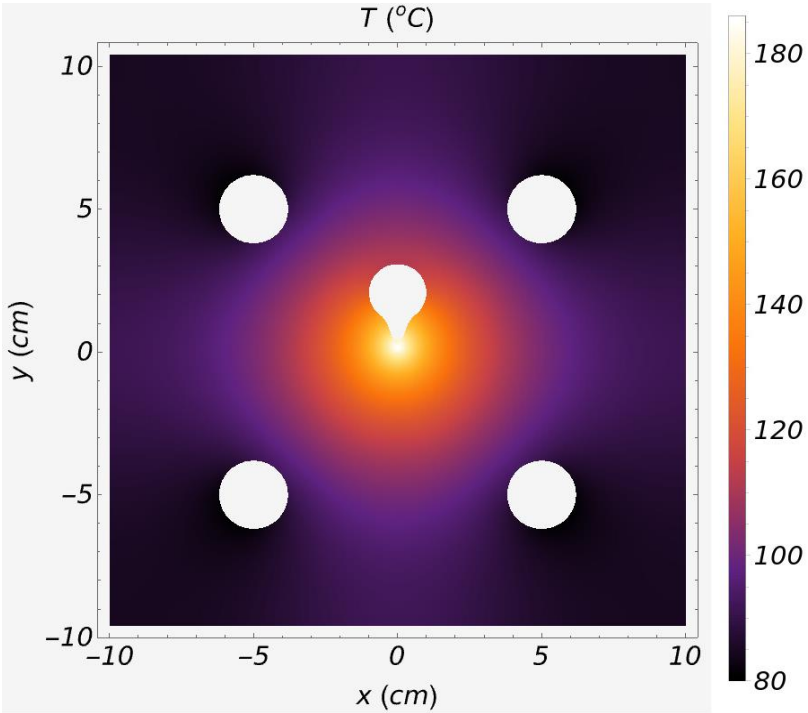
Nominal Beam Conditions

At the hotspot location

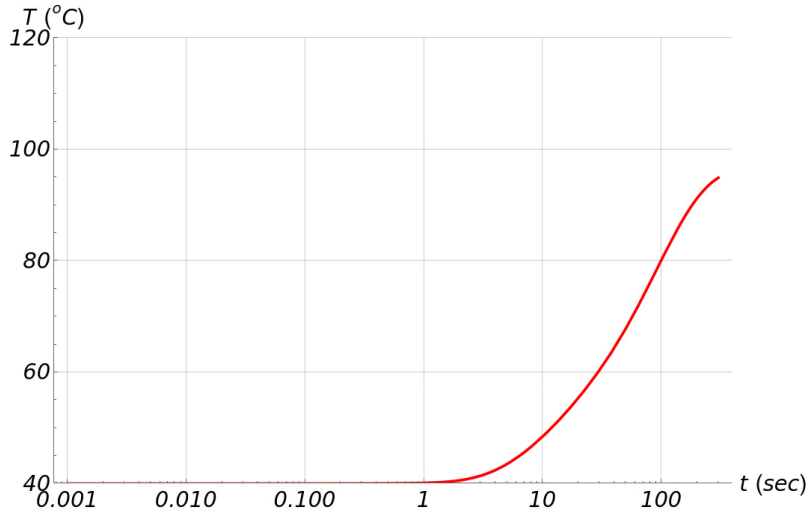


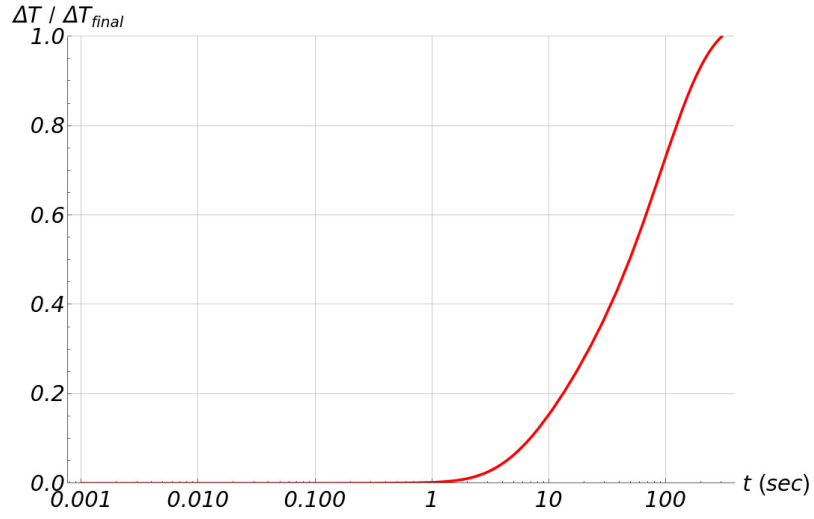


Z = 33 cm

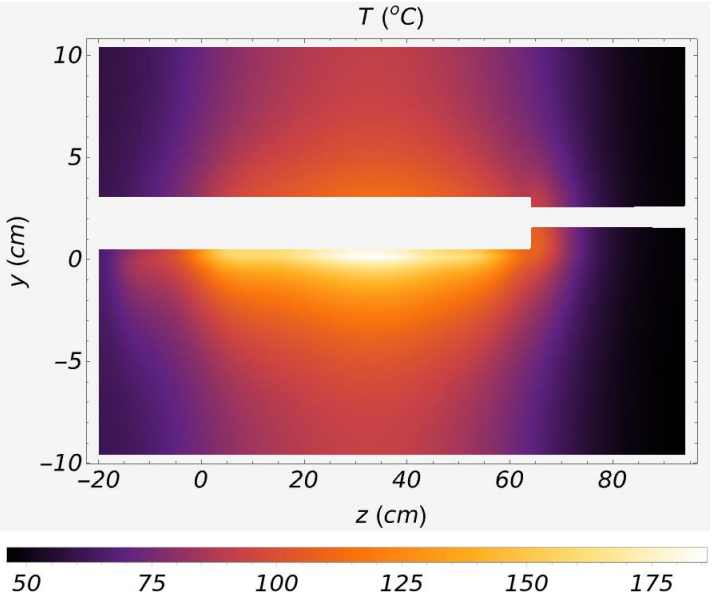


At the cooling pipe with z-value of the hotspot

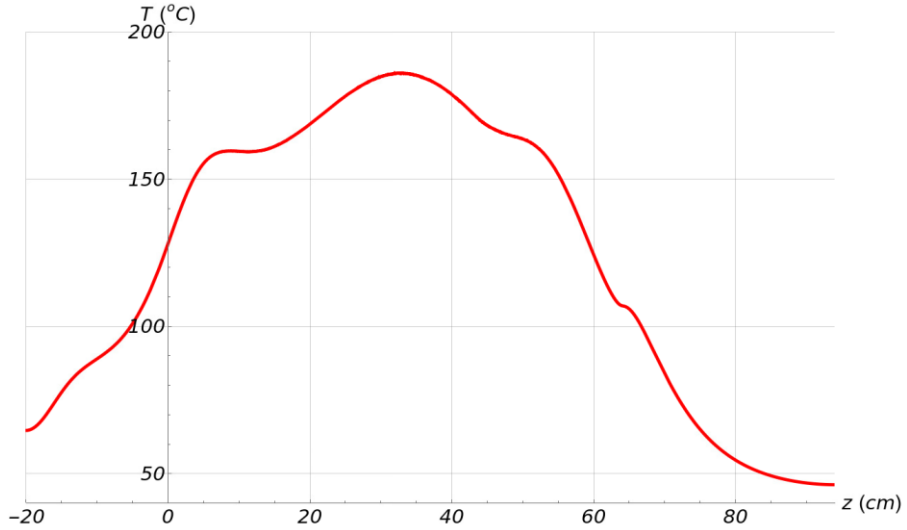


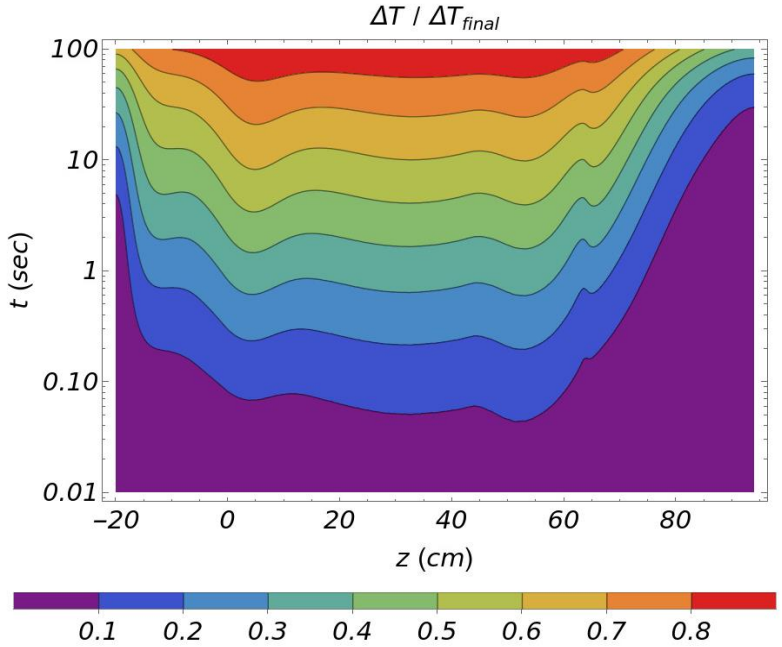


On x=0 plane

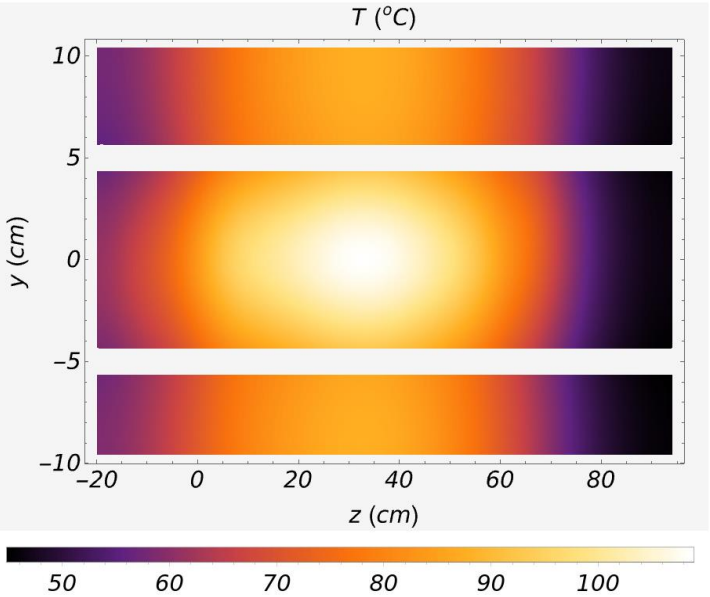


Along z at (x,y) of the hotspot location

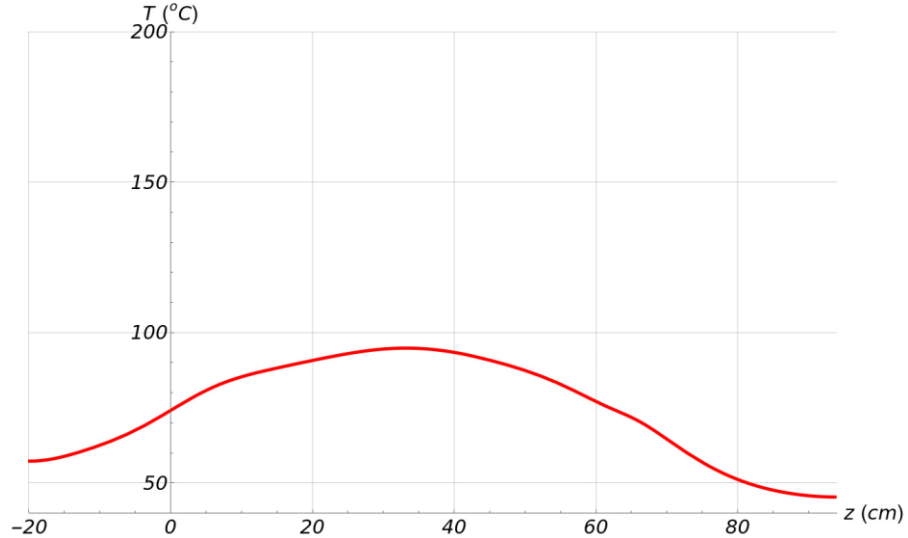


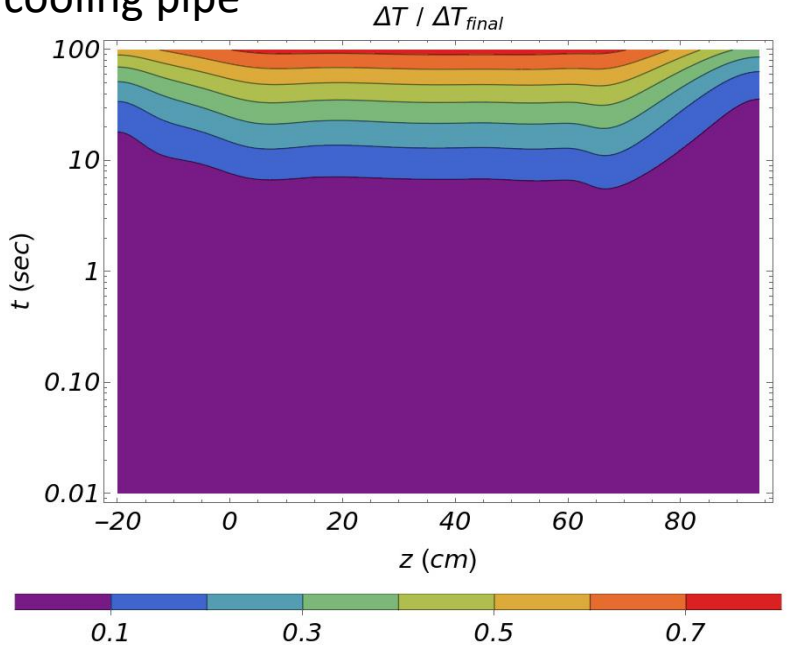


On x=4cm plane



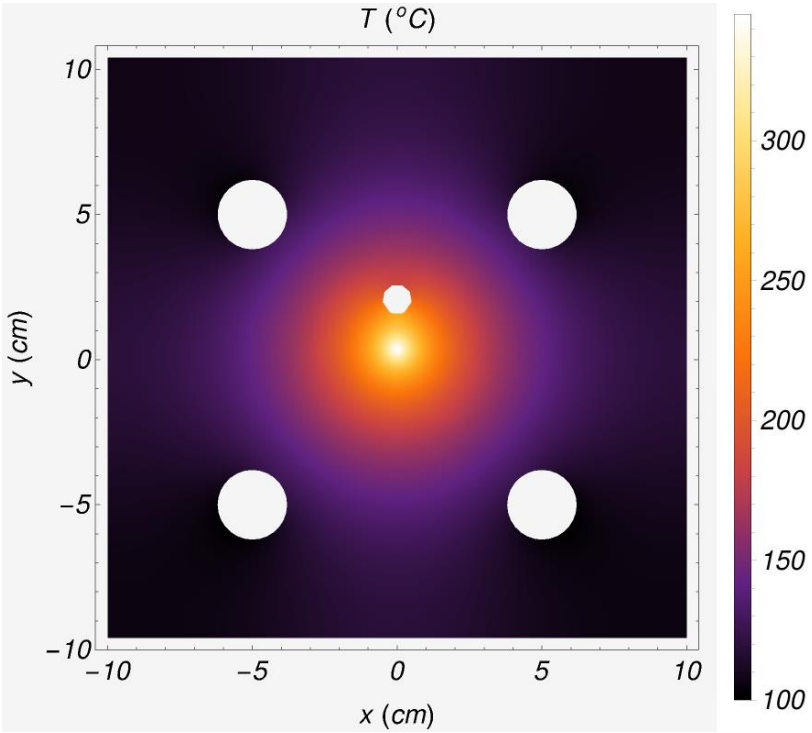
Along z at (x,y) of near the cooling pipe



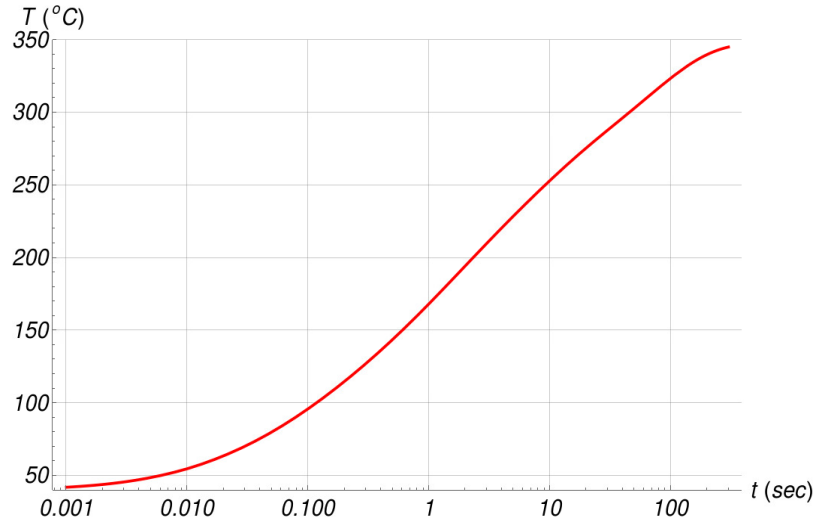


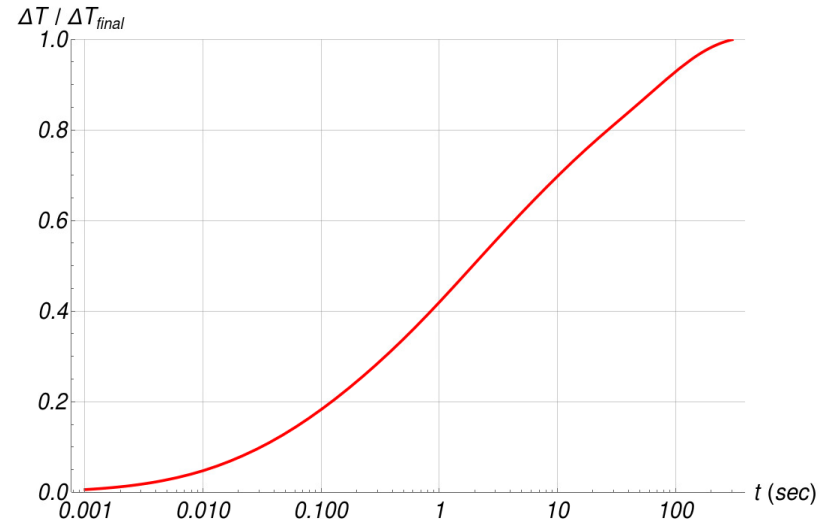
20% Lower B-field Condition (extreme)

Z = 70 cm

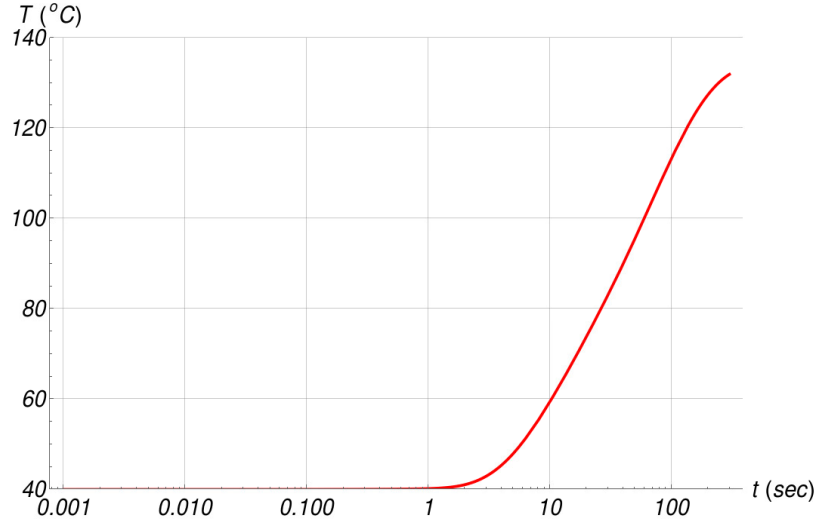


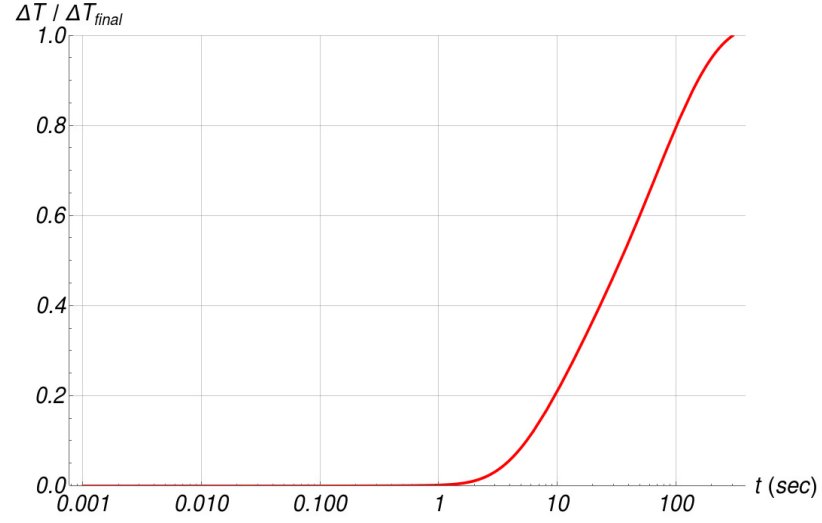
At the hotspot location



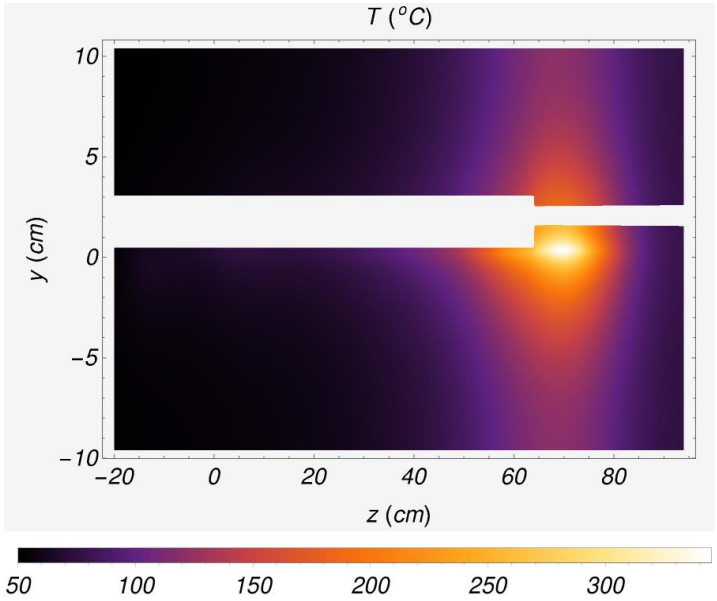


At the cooling pipe with z-value of the hotspot

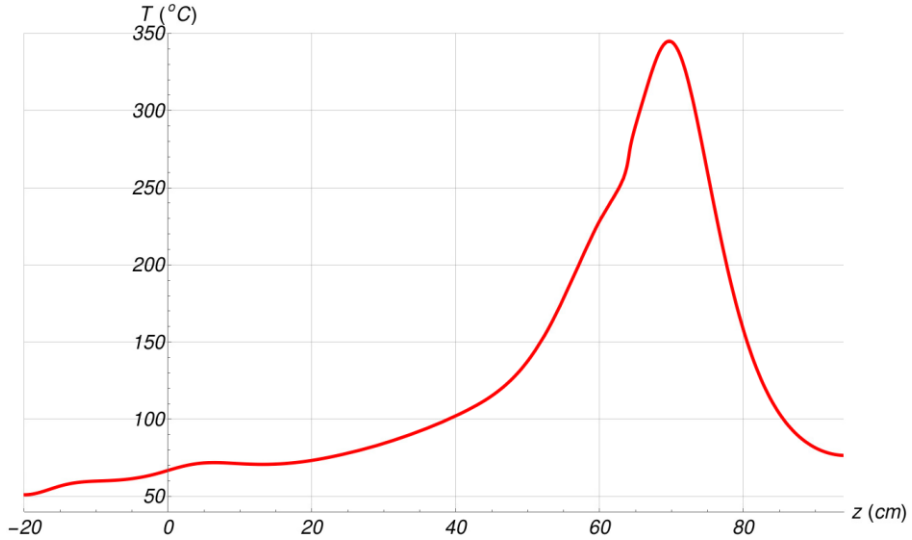


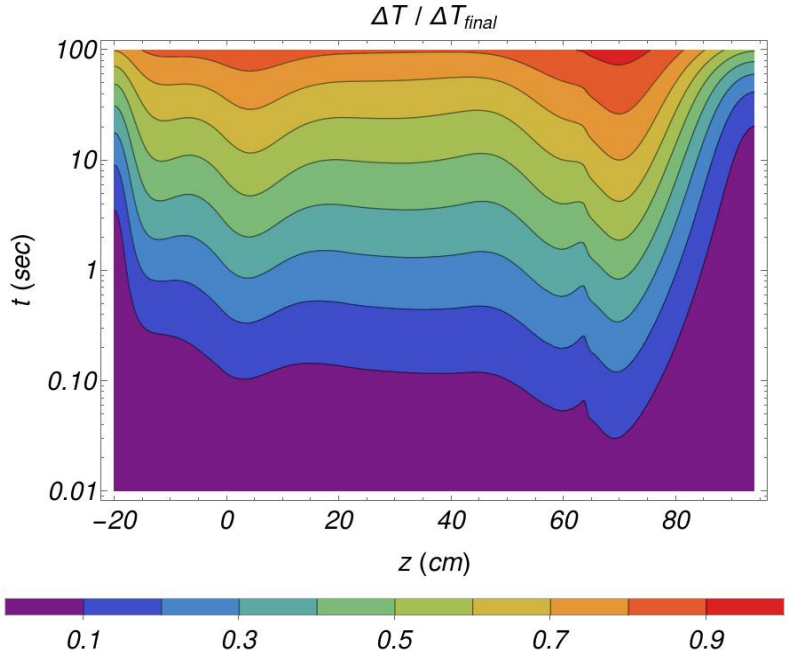


On x=0 plane

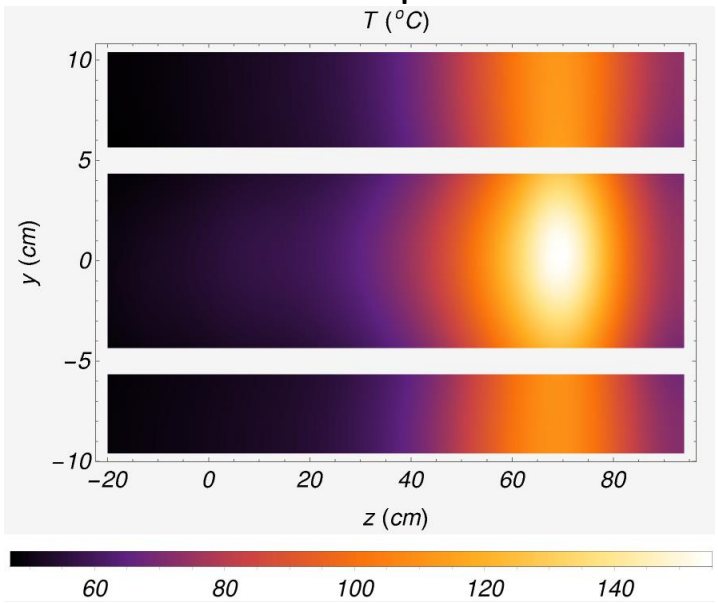


Along z at (x,y) of the hotspot location

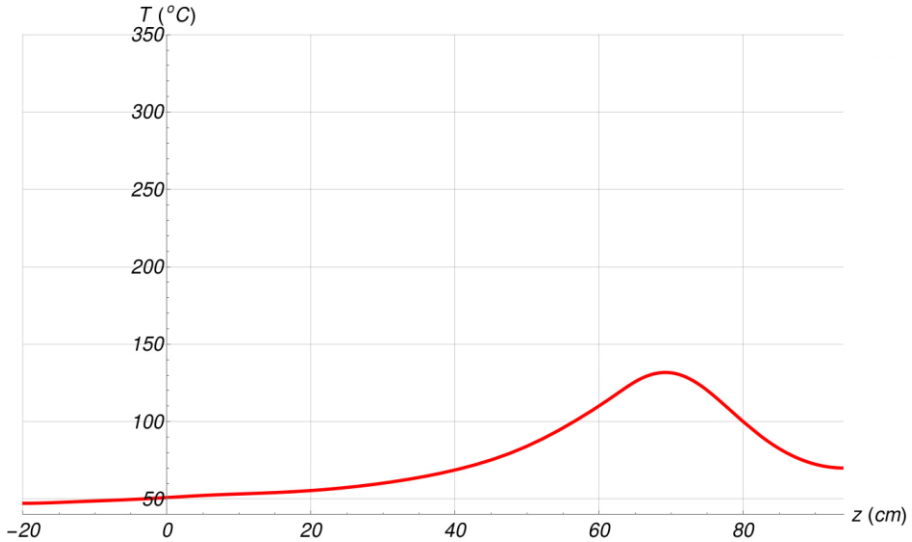


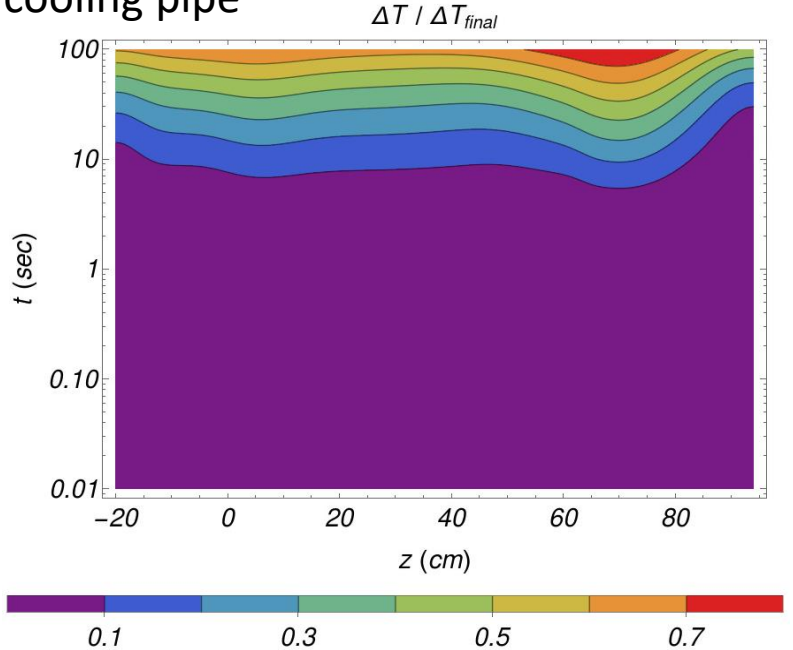


On x=4cm plane



Along z at (x,y) of near the cooling pipe





Conclusions

- It takes a couple of seconds for the absorber temperature at the hotspot to increase by one half of the total temperature rise.
- It takes half a minute for the absorber temperature at the cold surfaces to increase by one half of the total temperature rise.
  - There is about one second delay with respect to the hot spot temperature rise.
- The faster relative increase in temperature seems to be at the hotter locations.
- We need the Fast Shutdown implemented to turn the beam off in time to prevent high temperatures in the absorber.
  - FSD on magnet power supply
  - FSD on Electron beam excursions (Beam Offset Monitor (?), Ion Chambers)
  - FSD Photon beam excursions (Active Collimator)
- Slower software interlocks implemented in EPICS (~3 seconds) would be useful as a backup protection.