

# Radiation-hydrodynamic simulations of backlighter options for FAIR

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At GSI and at the upcoming FAIR accelerator facility [1] the radiation-hydrodynamics code RALEF-2D [2] and the equation-of-state code FEOS [3] have become indispensable tools for the design and the analysis of experiments as well as for the understanding of physical phenomena at high energy density, and development is still in progress [4]. In the past, RALEF-2D simulations of hohlraum X-ray spectra and of plasma column densities were essential for understanding the measurements of the heavy-ion stopping in laser-generated dense plasmas at high temperatures [5]. Now, current research for planned warm dense matter experiments at GSI and FAIR focusses on the design of diagnostical options, especially of backlighter sources for opacity measurements.

For ion-beam heated foils, an intense VUV-backlighter ( $\sim 10\text{-}15$  eV) will be needed. Fig. 1 shows three simulations of a helium plasma accelerated by a plasma gun to 20 km/s and compressed inside conically shaped glass targets which are initially filled with helium gas at room temperature and 60 mbar pressure. The configuration which allows for maximum compression and heating might be a promising VUV-backlighter option and further spectral measurements and simulations with thermal radiation transport are planned. For opacity measurements of expanding laser-heated plasmas a second backlighter option is needed. Here, Fig. 2 shows a simulation of a gold hohlraum backlighter target heated by the PHELIX laser short pulse (10 ps pulse duration, 50 J deposited energy) at GSI with a peak maximum of the simulated hohlraum spectra at 100-120 eV.

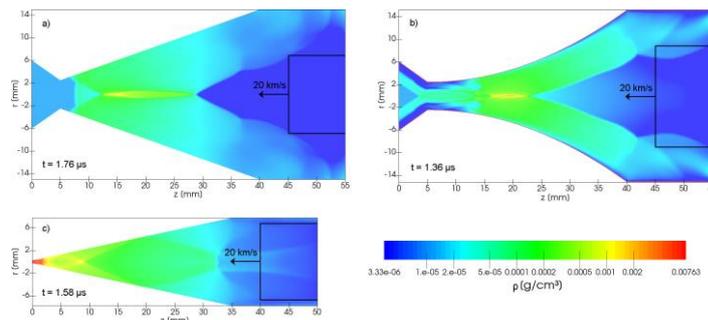


Figure 1: Helium plasma shot in a) open cone, b) open trumpet, and c) closed cone glass targets

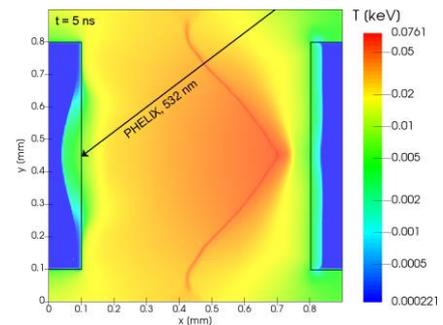


Figure 2: Gold hohlraum cavity shot by PHELIX laser short pulse

## References

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