

# COMSOL and FLUKA simulations of heat loads to PFC caused by Runaway Electrons

Jakub Caloud

Institute of Plasma Physics of CAS, Prague, Czech Republic

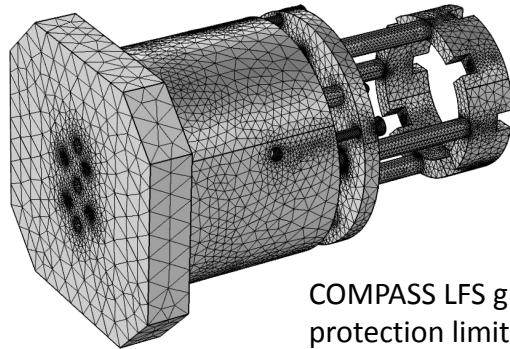
[caloud@ipp.cas.cz](mailto:caloud@ipp.cas.cz)

## COMSOL

- General-purpose simulation software
- Heat transfer solved by FEM
- Imported CAD geometry

## Simulations of heat propagation in COMPASS LFS protection limiter

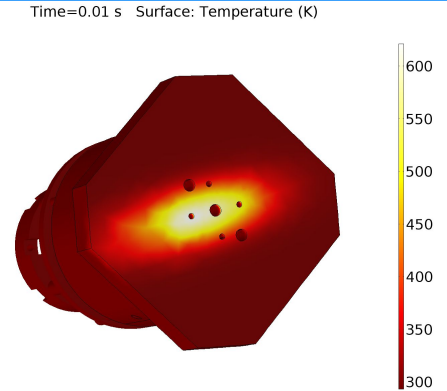
- Comparisons with IR camera and RTD temperature measurements
- Temperature measurements used for estimation of RE impact energy and the incident power [Master thesis J. Caloud 2020] - deposited energy up to 15 kJ



COMPASS LFS graphite protection limiter

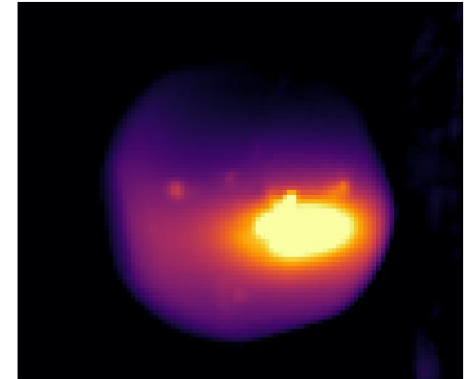
## COMSOL simulation of heat propagation in LFS protection limiter

- Deposited energy 1 kJ during 10 ms



#18837, t = 1500 ms

IR camera image of RE beam impact on LFS limiter equipped with 10 Pt100 sensors

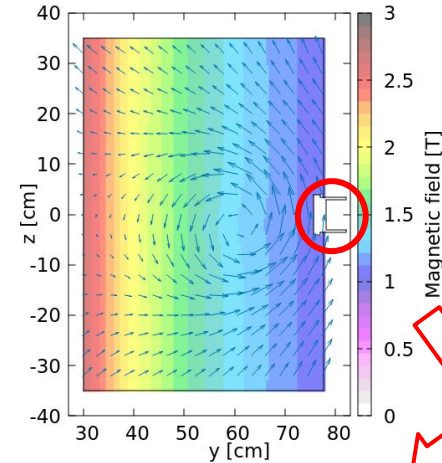


## FLUKA

- Monte Carlo code for interaction and transport of high energetic particles
- Runaway electrons from 1 keV with arbitrary energy distribution
- Transport in complex magnetic fields
  - Import of magnetic field estimated from EFIT tested
  - Implementation of realistic magnetic field configuration under development
- Import of CAD geometry to be tested
- Simulations of energy deposited by REs in COMPASS LFS limiter ongoing

Magnetic field in poloidal cross section with simplified geometry and boundary conditions

- 3D simulations with toroidally symmetric magnetic field



Deposited energy density in the graphite limiter with simplified geometry

- 3D simulation
- 8 MeV monoenergetic RE beam

