

# Wakefield Simulations of a Beam Collimator Using CST Studio Suite



TECHNISCHE  
UNIVERSITÄT  
DARMSTADT

Proposal for a Bachelor's Thesis, Master's Thesis or HiWi Job  
Study field: Computational Engineering | Electrical Engineering  
26. Januar 2026

## Description

Collimators are beamline components used to define the beam aperture and intercept halo particles in order to protect downstream equipment and reduce uncontrolled losses. In this project, electromagnetic wakefields in an existing beam collimator geometry will be studied using CST Studio Suite. The geometry is already available and will be imported into CST for numerical wakefield simulations. The focus is on extracting and analyzing key wakefield quantities such as longitudinal and transverse impedances, extract loss and kick factors, shunt impedances, quality factors and resonance frequencies. The simulation outputs will be post-processed using the provided post-processing software in MATLAB.

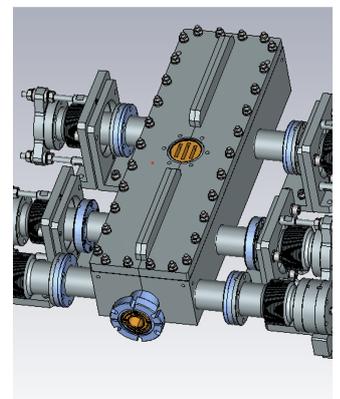
## Contact

M.Sc. Pascal Reinhart

pascal.reinhart@  
tu-darmstadt.de  
Office: S2|17 217

## Task

- Import and verification of the existing collimator geometry in CST
- Setup of the CST Wakefield Solver for the given model
- Definition of beam parameters (bunch length, charge, optional transverse offset)
- Simulation of longitudinal (optionally transverse) wake potentials
- Limited parameter variations
- Post-processing, visualization, and documentation of results



## References

- Chao, A. W. (1993). Physics of collective beam instabilities in high energy accelerators. Wiley-VCH.
- Zotter, B. W., Kheifets, S. A. (1998). Impedances and wakes in high-energy particle accelerators. World Scientific.
- CST Studio Suite, Eigenmode / Wakefield Solver Documentation.