Planned Contribution of TU-Darmstadt to FCC-hh

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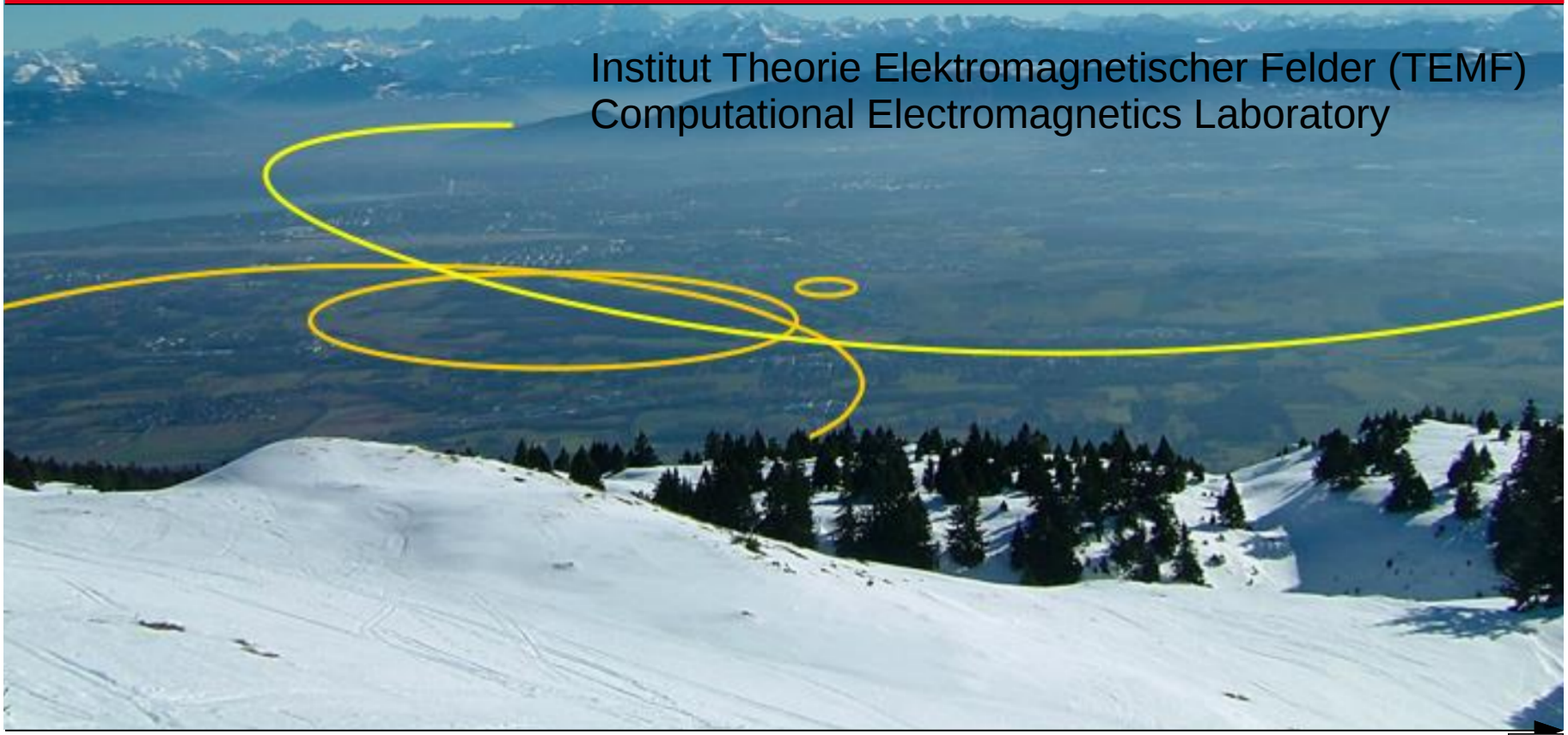

Outline

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Work units:

- **TUD-HH-1: Impedance calculations for FCC-hh**
- **TUD-HH-2: Studies of instability thresholds and other single-beam collective effects for FCC-hh**

01.01.2015-01.09.2018
84 man*month

TUD-HH-1: Impedance calculations for FCC-hh

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Determining the impedances of critical beam-line components, in particular of the beam screen and collimation system

Study of the impact of the ring impedance on the beam and of potential mitigation with feedback

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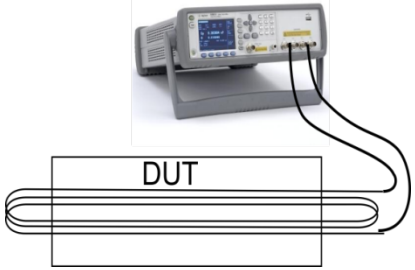
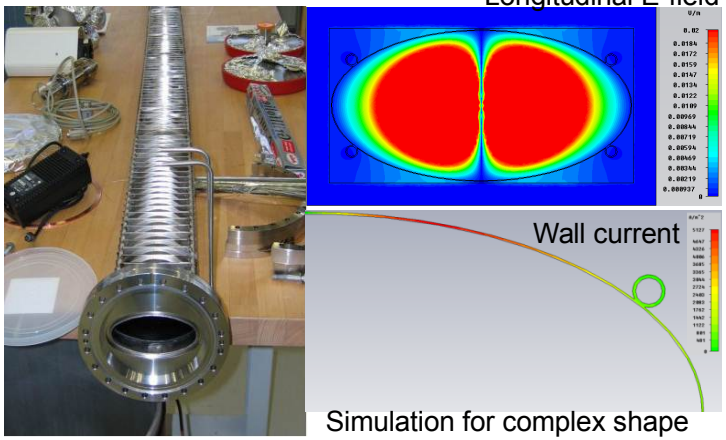
Recent examples of impedance studies

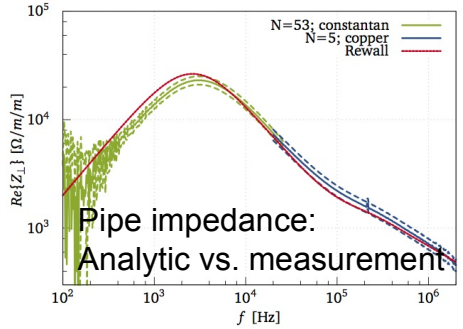
Low frequency set-up



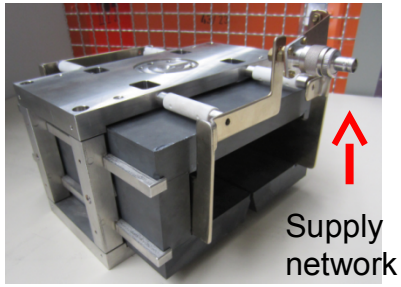
$50\ \text{kHz} < f \lesssim 5\ \text{MHz}$

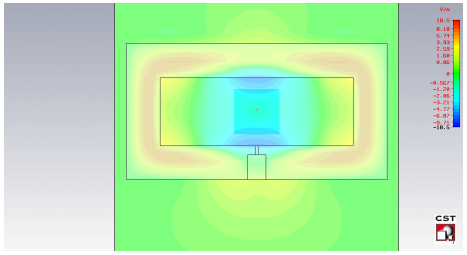


U. Niedermayer, L. Eidam



SIS-18 Kicker Magnet





TUD-HH-2: Studies of instability thresholds and other single-beam collective effects

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- **Simulating the impacts of the impedances computed in TUD-HH-1 on the CC-hh beam and the associated instability thresholds.**
- **Investigating beam instability mitigation methods, such as bunch-to-bunch feedback.**
- **Exploring the consequences of other single-beam collective effects, such as space charge, intrabeam scattering and Touschek scattering, on, e.g., loss rates, beam lifetime, and emittance growth.**

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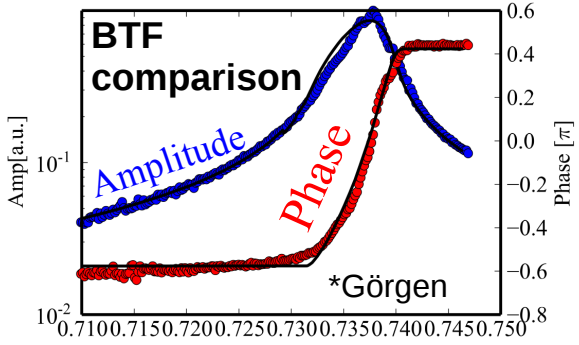
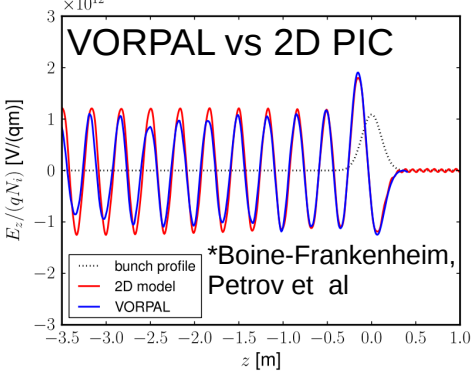
Currently there are several projects at TEMF related to instabilities, feedback and particle tracking.

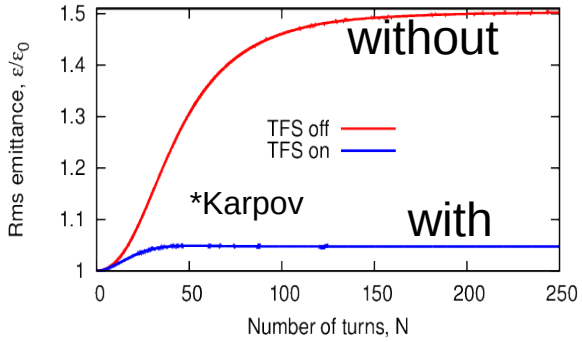
Beam-beam in RHIC



Ecloud wakefields in LHC/SPS



Transverse feedback for FAIR



Conclusions and Outlook

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TU-Darmstadt is responsible for the coordination of the FCC-hh impedance, single bunch instabilities and feedback studies.

Institute TEMF of TU-Darmstadt in particular has expertize in numerical field calculations as well as in particle-in-cell tracking.

This expertize is supported by the advanced computer cluster infrastructure.

We are looking forward to working on the proposed FCC-hh topics.