



Research Center MATHEON

Mathematics for Key Technologies

MATHEON Multiscale Seminar*

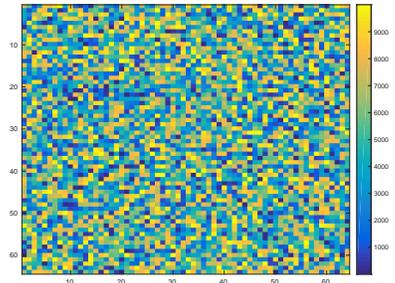
organised by R. Klein (FU), S. Nesenenko (TU), K. Schmidt (TU) and B. Wagner (TU)

TU Berlin, MA 313, **Friday, December 11th, 2015, 9.15 a.m.**

Ralf Kornhuber (FU Berlin, 9.15 a.m.)

Direct and Iterative Methods for Numerical Homogenization

We present a novel approach to the finite element discretization of elliptic problems with oscillating coefficients based on basic concepts of frequency spitting and subspace decomposition. In this framework, we derive and analyze a class of new discretization schemes and contribute to the analysis of existing methods as described, *e.g.*, Efendiev & Hou [1] or Malquist & Peterseim [2].



[1] Y. Efendiev & T. Hou: Multiscale Finite Elements, Springer, 2009.

[2] A. Malquist & D. Peterseim: Localization of Elliptic Multiscale Problems. *Math. Comp.* 83, pp. 2583–2603, 2014.

— Coffee break —

Dirk Pauly (Universität Duisburg-Essen, 10.35 a.m.)

Low-Frequency Asymptotics for Time-Harmonic Maxwell Equations in Exterior Domains

We will prove the complete low-frequency asymptotics for time-harmonic Maxwell equations in exterior domains. We start with introducing the solution theory for time-harmonic electro-magnetic scattering problems via a generalized Fredholm alternative using the limiting absorption principle and continue with proving an adequate corresponding electro-magneto static solution theory providing also special so-called towers of static solutions. In both cases we will work in polynomially weighted Sobolev spaces. Then a comparison with the whole space solution shows that a generalized asymptotic Neumann series gives the desired asymptotics for low frequencies up to a finite sum of degenerate operators, which can be described explicitly by strongly growing towers. Finally we compare these time-harmonic Maxwell radiation solutions with the corresponding solutions provided by the eddy-current model for low frequencies.

* The MATHEON Multiscale Seminar takes place one to two times per term with two talks about recent work on partial differential equations with multiple scales. Please contact one of the organisers if you want to be invited by e-mail or if you would like to contribute a talk.

Webpage: <http://www.tu-berlin.de/?multiscale-seminar>