

# Sonderforschungsbereich 611

## Singuläre Phänomene und Skalierung in mathematischen Modellen

Einladung zu einem Vortrag im SFB-Seminar

### Prof. Dr. Johannes Tausch

Southern Methodist University, Dallas, Texas, USA

spricht zum Thema

#### Mathematical and numerical techniques for open periodic waveguides

**Zeit:** Dienstag, den 13. Oktober 2009, 15.30 Uhr

**Ort:** Kleiner Hörsaal, Wegelerstr. 10

**Kaffee/Tee:** 16.30 Uhr

gez. Helmut Harbrecht

**Abstract:** The propagation of electromagnetic waves in dielectric slab waveguides with periodic corrugations is described by the spectrum of the Helmholtz operator on an infinite strip with quasiperiodic boundary conditions. This talk reviews the basic properties of this spectrum, which typically consists of guided modes, radiation modes and leaky modes. To motivate the periodic case a great deal of attention will be devoted to planar waveguides which share some of the important features of the periodic case.

To compute the eigenmodes and the associated propagation constants numerically, one usually truncates the domain that contains the grating and imposes certain radiation conditions on the artificial boundary. An alternative is to decompose the infinite strip into a rectangle, which contains the grating, and two semi-infinite domains. The guided and leaky modes can be computed by matching the Dirichlet-to-Neumann (DtN) operator on the interfaces of these three domains. While the exterior (DtN) map can be found analytically, the interior (DtN) map must be computed numerically. To that end, a symmetric boundary integral formulation is introduced.

The discretized problem is a nonlinear eigenvalue problem, which is solved by numerical continuation. The talk concludes with numerical results for single- and double periodic structures.