Modeling ultrasonic guided waves in embedded structures using the Scaled Boundary Finite Element Method

***H. Gravenkamp[1], C. Birk[2], and C. Song[2]**

[1]Federal Institute for Materials Research and Testing, Berlin, Germany
[2]University of New South Wales Sydney, Australia

*Corresponding author: hauke.gravenkamp@bam.de

Ultrasonic guided waves offer a wide range of applications in fields such as non-destructive testing, structural health monitoring or material characterization. Due to the complex dispersive behavior of guided waves, numerical modeling plays an important role for the development of new testing techniques. Particularly, the computation of dispersion curves is crucial for all practical applications. In this contribution, the concept of the Scaled Boundary Finite Element Method is applied to the simulation of guided waves. The cross-section of a waveguide is discretized in the finite element sense while the direction of propagation is described analytically. The wavenumbers of propagating modes are obtained from the solution of a Hamiltonian eigenvalue problem. In the case of embedded structures, where the waveguide's surface is coupled to a quasi-infinite medium, we propose to utilize a simple dashpot boundary condition to account for the influence of the surrounding medium.

Keywords: Guided waves, Scaled Boundary Finite Element Method, infinite media