Dispersion Calculator

**Description of the software**

An OPEN SOURCE software for calculating dispersion curves & more.

What is the Dispersion Calculator?

The MATLAB-based Dispersion Calculator (DC) is an interactive software for calculating dispersion curves of guided waves in isotropic and multilayered anisotropic specimen. DC is continuously improved and validated by using DISPERSE. DC was first released in 2018. It is used worldwide today.

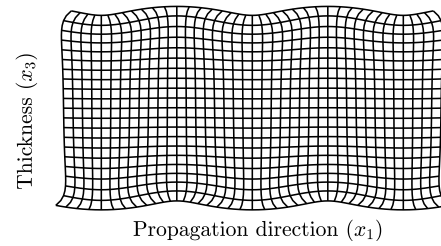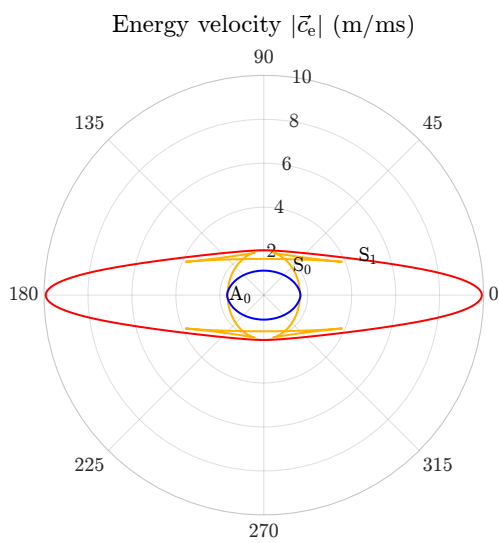## With the Dispersion Calculator you can...

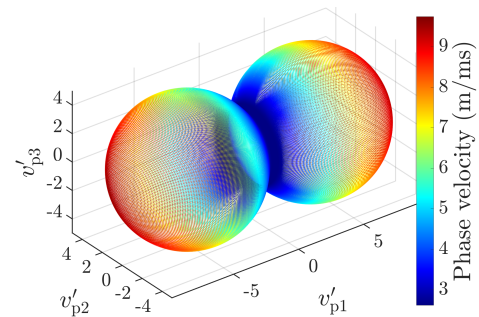- Obtain your results by using the graphical user interface.
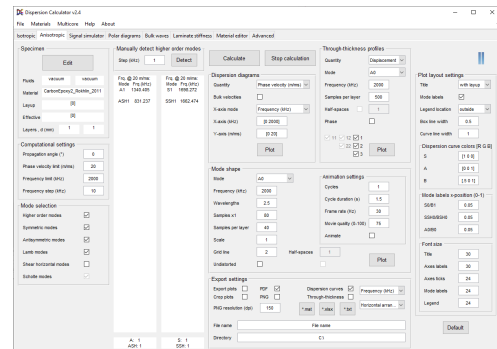
- Calculate dispersion diagrams for flat isotropic plates and anisotropic laminates (phase & energy velocity, propagation time, coincidence angle, wavelength, wavenumber, and attenuation vs. frequency). Fluid-immersion is possible.
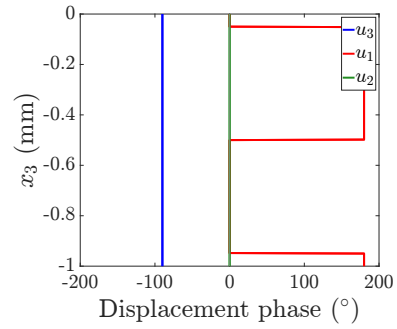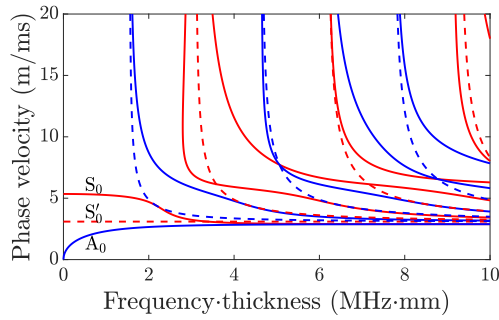
- Calculate polar dispersion diagrams (phase & energy velocity, propagation time, coincidence angle, wavelength, and wavenumber vs. propagation direction).

Energy velocity $|\vec{c}_e|$ (m/ms)

- Calculate through-thickness displacement, stress, strain, energy density, and power flow density amplitude and phase, as well as mode shape animations.

- Investigate the propagation of bulk waves in anisotropic media (phase velocity, group velocity, slowness, polarization and energy skew angle).
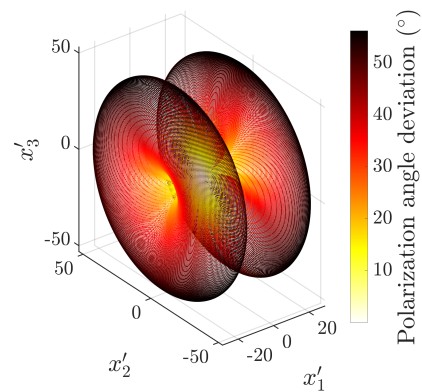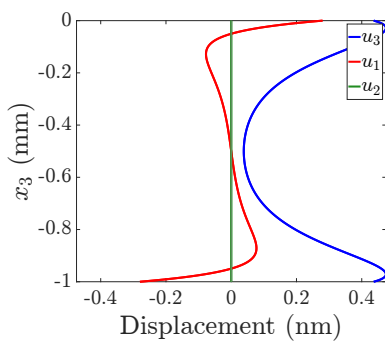
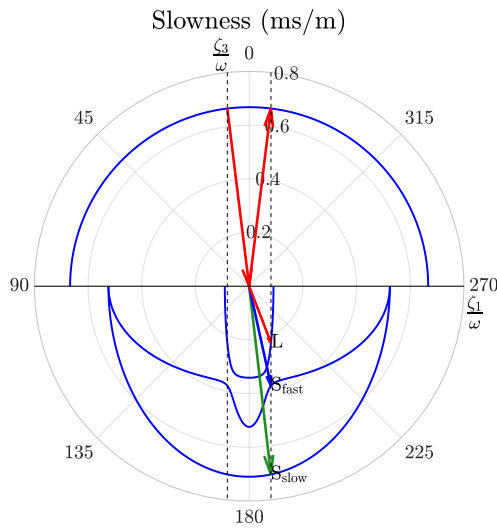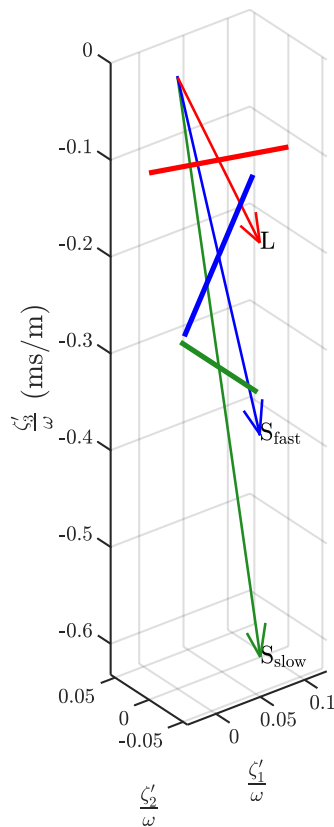- Model the generation of bulk waves in isotropic and anisotropic media through plane wave incidence from a fluid.

- Calculate the homogenized stiffness tensor components of a laminate.
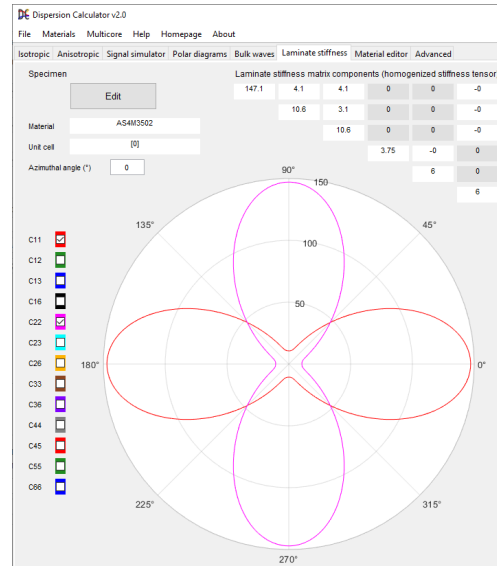
- Enter your material parameters (real and complex engineering constants and stiffness matrix components of isotropic and anisotropic materials).
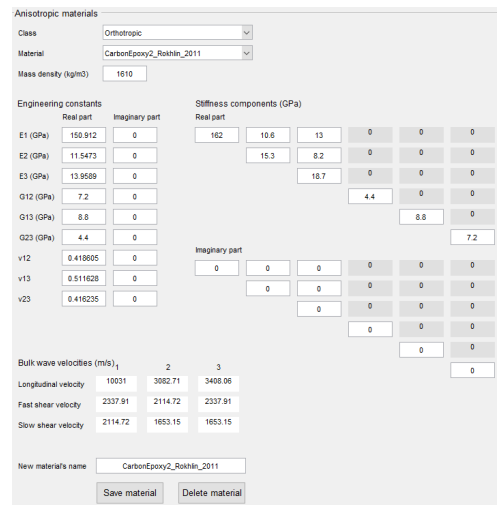
- Plot and export results in many ways, including export of raw data to Excel, txt, and MATLAB-files for further processing with other software.

- Simulate the temporal and frequency responses of single and multiple guided wave modes after propagating a certain distance in a specimen.

Special features

- DC is able to calculate laminates containing several hundreds of layers, covering even the thickest specimens.

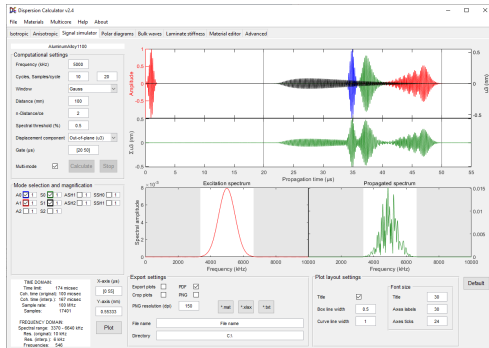- DC is able to distinguish the different mode families, like symmetric, antisymmetric, and nonysmmetric (leaky) Lamb, shear horizontal, and Scholte waves.

- Several years of continuous refinement enable fast and robust tracing of dispersion curves.

Installation

Just download and execute the installer from the link given below[1]. A MATLAB runtime will be downloaded and installed automatically. This will take some time, but once it is installed, starting DC will take only some seconds. In case the MATLAB runtime is not downloaded and installed automatically, download[2] and in-

stall it manually. The required runtime version number can be found in the change log file, which comes together with the installer. If you have MATLAB and the Curve Fitting Toolbox, you can use the provided code. Check Requirements.txt for the MATLAB-requirements.

About the author

DC has been developed by Dr. Armin Huber since 2016. Armin Huber is researcher at the Center for Lightweight Production Technology (ZLP) of the German Aerospace Center (DLR), located in Augsburg, Germany. Here, production processes for large-scale aerospace vehicle components made of carbon composites are developed. Such components, like rocket booster pressure vessels for the future Ariane 6 launcher, can consist of up to 400 layers with thicknesses of up to 50 mm. Armin Huber works on the production process integrated quality assurance by using the method of air-coupled ultrasonic testing. The single-sided inspection mode is based on the excitation of Lamb waves, which requires the adjustment of the correct coincidence angle. Since commercial software failed to calculate Lamb wave dispersion curves for thick laminates, Armin Huber has written DC.

Contact

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[1] https://github.com/ArminHuber/
   Dispersion-Calculator

[2] https://www.mathworks.com/products/
   compiler/matlab-runtime.html