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ULTRASONIC GUIDED WAVES DATA IN SHM DESIGN

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Over the last years a lot of scientific work has been done in the field of structural health monitoring (SHM) systems. Instead of checking structures at regular intervals during a maintenance, future structures will be equipped with online monitoring systems. SHM also offers the possibility of saving weights going along with other advantages, e.g., decreasing fuel consumption in vehicle applications. In the case of thin-walled lightweight structures as they are commonly used for aerospace applications, SHM concepts based on ultrasonic guided waves are very promising. But large experimental efforts are needed to bring SHM systems into application.

The large experimental effort of designing SHM systems can be significantly reduced by accompanying simulations. Bringing together experimental and numerical data is important by two reasons. At first, test data is needed to validate numerical simulation methods. Subsequently, these simulation methods can be used to investigate the performance of proposed SHM configurations.

To show a suitable modelling strategy, ultrasonic guided waves simulations using the finite element method (FEM) are presented. As a reference model the measurement data coming from the Open Guided Waves Project (http://openguidedwaves.de) is taken into account. Experimental data of ultrasonic guided waves propagation in carbon fiber composite plates with an additional omega stringer is provided here.

The finite element data standard VMAP and its extension to sensor data handling can be introduced to SHM design purposes. Hence, the comparison of theoretical and experimental data is simplified. This is also of great importance regarding post processing procedures like visualization, KPI estimation or any other data transformation in general.