Brillouin optical correlation domain analysis in composite material beams - DTU Orbit (04/12/2018)

**Brillouin optical correlation domain analysis in composite material beams**

Structural health monitoring is a critical requirement in many composites. Numerous monitoring strategies rely on measurements of temperature or strain (or both), however these are often restricted to point-sensing or to the coverage of small areas. Spatially-continuous data can be obtained with optical fiber sensors. In this work, we report high-resolution distributed Brillouin sensing over standard fibers that are embedded in composite structures. A phase-coded, Brillouin optical correlation domain analysis (B-OCDA) protocol was employed, with spatial resolution of 2 cm and sensitivity of 1 °K or 20 micro-strain. A portable measurement setup was designed and assembled on the premises of a composite structures manufacturer. The setup was successfully utilized in several structural health monitoring scenarios: (a) monitoring the production and curing of a composite beam over 60 h; (b) estimating the stiffness and Young's modulus of a composite beam; and (c) distributed strain measurements across the surfaces of a model wing of an unmanned aerial vehicle. The measurements are supported by the predictions of structural analysis calculations. The results illustrate the potential added values of high-resolution, distributed Brillouin sensing in the structural health monitoring of composites.

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