# Brillouin-Based Fiber Optic Sensor for Geotechnical Monitoring Applications

Aleksander WOSNIOK*, Katerina KREBBER*, Rainer GLÖTZL**
*BAM, Berlin, Germany (eMail: aleksander.wosniok@bam.de)
**GLÖTZL Gesellschaft für Baumesstechnik mbH, Rheinstetten, Germany

**Abstract**

The Brillouin sensing techniques make use of low-loss single-mode optical fibers as distributed sensors allowing compound strain and temperature measurements even over several tens of kilometers. Thereby, the measured Brillouin frequency shift (BFS) features much stronger dependence on the longitudinal strain in the sensor fiber than on the temperature distribution along the fiber optic sensor. By detection of slight structural changes in monitored structures, such as embankments, tunnels, dikes and levees, the influence of temperature on the measured BFS cannot be neglected.

In search of the optimal sensory solution for temperature-corrected determination of mechanical deformations in geotechnical structures the use of so-called nonzero dispersion-shifted fibers has been investigated in several laboratory tests. In addition, the presentation shows a successful integration of glass optical fibers (GOF) in geogrid materials. The use of such "smart" geogrids facilitates the detection of the mechanical deformations transferred into the sensor fiber in the form of the longitudinal strain.