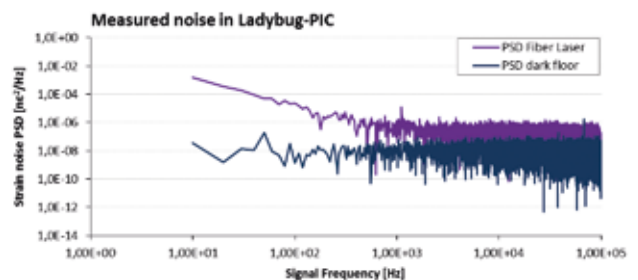


# HIGH DYNAMIC STRAIN RANGE AND -RESOLUTION WITH FIBER LASER SENSOR

*High resolution strain measurements is relevant for high Tech applications like lithography machines, electron microscopes, hydrophone applications. Using a fiber-laser as sensor enables highly sensitive (vibration) measurements.*

An active laser within a fiber is used as a sensor. The laser is a narrow linewidth FBG cavity within an erbium doped fiber. The erbium is stimulated with an external pump source and the cavity starts to lase on its central wavelength. When an external stimulation is present, like strain, the laser cavity changes accordingly. By measuring the output wavelength (shift) with the *PalawanGator* the strain is measured with high precision.

At Technobis a noise floor of  $0.46 \text{ n}\epsilon \text{ } 3\sigma$  with 200 kHz sampling over 0.01 sec was demonstrator, which is equivalent to  $0.5 \text{ }\mu\epsilon/\sqrt{\text{Hz}}$ . The noise performance of the fiber laser remains the same under applied strain of  $\sim 150 \text{ }\mu\epsilon$  and is expected to remain over larger strain ranges. The high frequency noise is mainly limited by the dark noise / shot noise of the electronics, and within the lowfrequencies the thermal behavior of the fiber-laser sensor is measured (1/f). In other configurations the fiberlaser sensor was stimulated with an acoustic signal.



OEM PalawanGator

Michael Haverdings  
Researcher

Michael.Haverdings@technobis.com

