

## Multipoint fibre-optic temperature probe for a gas turbine of Siemens Energy

The company 'Siemens Energy' manufactures gas turbines with a nominal powers of up to 62 MW in Finspang, Sweden. A key parameter for controlling gas turbines is the temperature distribution in the exhaust-gas diffusor. By this measures, the combustion can be regulated to achieve preferably homogeneous temperatures within the turbine, which increases both the efficiency and lifetime of the machine. Although it is desirable to measure the temperature profiles with a high spatial resolution, the number of sensors is limited when using standard thermocouples because of their size and associated cabling efforts.

The Photonics Laboratory at Munich University of Applied Sciences (PL-MUAS) conducts research in the field of fibre-optic sensing with special emphasis on high-temperature multipoint sensor networks based on regenerated fibre Bragg gratings (RFBG-array). With this technology, several sensor elements can be integrated in a single cable, enabling multipoint temperature sensors with diameters of less than 1mm.

For the measurements in a gas turbine, a temperature probe ensuring high mechanical stability was necessary. Siemens Energy supplied a standard probe, which we modified and equipped with a fibre-optic temperature sensor comprising six sensor elements. The prepared temperature probe was then installed in the gas turbine.



The measurement campaign took place from 11 August 2020 to 12 August 2020 in Finspang, Sweden during test runs of a SGT-800 gas turbine. Depending on the load, the radial temperatures measured by the RFBG-array showed characteristic profiles with maximum temperatures of up to 600°C.