

Optical-based temperature sensors for future gravitational wave experiments

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High precision temperature measurements are becoming a transversal need in a wide variety of fields that span from applied to fundamental physics. Resistive-based sensors are nowadays the preferred temperature sensors used in space missions, given their reliability and long heritage. In recent years, optical metrology experiments have shown promising results. The use of fiber optic sensors is of particular interest as these are both non-magnetic and also relatively poor conductors, both qualities of particular interest for the LISA mission. Furthermore, Whispering Gallery Mode resonators which are monolithic crystal resonators that can provide narrow resonances that are suitable for high stability and resolution measurements. Our group is currently studying several solutions aiming a noise floor of $1 \text{ uK}/\sqrt{\text{Hz}}$ at 1 mHz, a noise performance that would match the one achieved by a previous activity which is based in resistive technology. In this presentation, I will provide a comprehensive overview of the ongoing work, highlighting key developments and progress made so far. Additionally, I will discuss the challenges and limitations that have emerged as well as strategies being explored to overcome them.

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