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A radiation-resistant distributed temperature sensor for CERN's accelerators

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Optical Fibre Sensors (OFS) possess unique features, such as high sensitivity, versatility, and the ability to operate in harsh radiation environments. Distributed OFS are notable for enabling real-time monitoring over large-scale facilities, making them ideal for applications in particle accelerators. Their distributed measurement capabilities provide comprehensive monitoring while offering a cost-effective alternative to conventional pointwise technologies. As part of the Innovation work package of CERN's Personnel Safety System Consolidation program, an experimental study was conducted to characterize the performance of a radiation-hard Distributed Temperature Sensor (DTS) to complement CERN's safety systems, addressing cryogenic leaks and fire risks. Several fire tests were performed to assess the sensor's accuracy and temporal response under emergency-like conditions. A phenomenological model was derived from these tests to predict the system's behaviour in real-world scenarios. The obtained results are key to the first deployment and operation of a dedicated DTS demonstrator in a part of the LHC in 2025.

Footnotes

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