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Solutions for humidity and temperature monitoring in the Silicon Tracking System of the CBM experiment

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The Compressed Baryonic Matter (CBM) is one of the core experiments at the future Facility for Anti-proton and Ion Research (FAIR), Darmstadt, Germany. The Silicon Tracking System (STS) is a central detector system of CBM, placed inside a 1T magnet and with an operation temperature of about -10°C to keep low radiation-induced bulk current in the silicon sensors.

Due to the conditions inside the STS an efficient temperature and humidity monitoring and control are required to avoid icing or water condensation on the electronics or silicon sensors. Most important properties of a suitable sensor candidate are resilience to the magnetic field, ionizing radiation tolerance and fairly small size.

In this contribution, we introduce two different approaches to implement relative humidity (RH) and temperature Fiber Bragg Grating Fiber Optic Sensors (FBG FOS). The first approach is based on inscribing both RH and temperature FBG into one fiber and the second one features two separate FBGs arrays. In both cases, the RH-sensitive FBGs are coated with polyimide.

Moreover, the applicability and efficiency of FOS in comparison to dew point transmitters and capacitive RH sensors will be discussed. The focus will also be put on the potential integration of the sensors in different levels of interlocks.

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