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Impact of air cooling on mechanical stability of silicon sensors in CBM-STS

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The Silicon Tracking System (STS) is the primary tracking detector of the fixed-target heavy-ion CBM experiment at the future FAIR facility, Darmstadt. It is designed to reconstruct the trajectory of charged particles within a 1 Tm magnetic field, with the goal of achieving a momentum resolution of better than 2%. STS is comprised of 890 low-mass detector modules, utilizing double-sided silicon micro-strip sensors. These modules are distributed across 8 tracking stations, each consisting of mechanical half units that support 106 ultra-light carbon fiber structures holding the sensors.
During the detector operation in harsh radiation fields, it is expected to experience Non-Ionizing Energy Loss (NIEL) damage, which will cause the innermost sensors to dissipate up to 6 mW/cm^2 at a temperature of -10°C. To mitigate the effects of irradiation, it is critical to maintain the temperature of the silicon sensors and front-end electronics at or near -10°C during operation. To maintain this temperature the inner most sensors are planned to be cooled down using carbon-fiber perforated tube which will blow cold air on the sensors. The air flow may lead to the vibrations produced in the sensors.
This contribution aims to provide an overview on the setup designed to optimize the vibrations resulting from air cooling for fully assembled ladder for different airflows. Along with the effect of vibrations on the track-based alignment softwares and the particle tracking, thus providing the overall impact of the setup on the system's performance.

Author: MEHTA, Shaifali (University of Tübingen)

Presenter: MEHTA, Shaifali (University of Tübingen)

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