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## Large-Scale Comprehensive Thermal Simulation of the CBM Silicon Tracking System (STS) on the Virgo Cluster at GSI

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A thermal simulation of the STS detector in the CBM experiment using open-source computational fluid dynamics (CFD) software package OpenFOAM(R) is presented. The interactions of various detector components such as silicon sensors, heat sinks and electronics are simulated. The effects of radiation damage on power dissipation and the resultant electrical noise in silicon sensors are included in the model. This feature facilitates the analysis of how well the detector performs under different irradiation scenarios and over time. The choice of open-source software for simulations, post and pre-processing allows to share results within the wider group of researches participating in model buildup and its parametrization.

The project uses the computational power of the Virgo cluster (Green IT Cube) at GSI/FAIR with up to 4096 processors and 18 Tb of RAM on a single user's disposal. This data center is one of the most powerful for high-energy physics experiments and CFD analysis of large-scale models.

The thermal model's accuracy is improved by comparing its results with experimental data from the Thermal Demonstrator, which is a prototype of the detector cooling system. It is used to minimize discrepancies between experimental and simulated results by refining the model for better predictive performance.

**Author:** ELIZAROV, Ilya (GSI Helmholtzzentrum für Schwerionenforschung GmbH)

**Co-authors:** Dr RODRIGUEZ, Adrian (GSI Helmholtzzentrum für Schwerionenforschung); Prof. SCHMIDT, Hans Rudolf (Eberhards Karls University Tübingen (DE)); Dr SELYUZHENKOV, Ilya (GSI, Darmstadt); THAUVELDER, Jens (GSI Helmholtzzentrum für Schwerionenforschung); AGARWAL, Kshitij (Eberhard Karls Universität Tübingen (DE)); Dr TEKLISHYN, Maksym (GSI Helmholtzzentrum für Schwerionenforschung); VASYLYEV, Oleg (GSI Helmholtzzentrum für Schwerionenforschung); Dr ZHARKO, Sergei (GSI Helmholtzzentrum für Schwerionenforschung)

**Presenter:** ELIZAROV, Ilya (GSI Helmholtzzentrum für Schwerionenforschung GmbH)

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