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## A Finite Volume Analysis for evaluating the thermal performance of an air-cooling system for the IDEA Vertex Detector at FCC-ee.

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The IDEA detector is one of the concepts under research for the electron-positron Future Circular Collider (FCC-ee). The Vertex Detector, located in the innermost part, and occupying a cylindrical volume of 35 mm radius and 550 mm length, is expected to dissipate about 120 W. To remove this heat, a cooling system based on forced air convection is under development. Such a technical solution would minimize the quantity of material located in the tracking volume, concentrating all the services only in the two endcaps. The sensitive volume would therefore be occupied only by Silicon sensors and their carbon-fibre support structures, which would also act as cooling fins to maximize convective heat exchange. In this scenario, Computational Fluid Dynamics (CFD) and, more widely, Finite Volume Simulations, can offer a useful tool to evaluate the feasibility of this solution and to guide the designers in the optimization of the thermal performance. An example of a calculation model developed with the Ansys simulation suite will be given, showing how thermal performance varies by adopting different construction choices. Furthermore, starting from this model, an approach for exporting the results for a mechanical analysis will be given, to evaluate vibrational effects due to the interaction between the fluid and the lightweight structures.

**Authors:** TURRIONI, Cristiano (INFN - Sezione di Perugia (IT)); BALDINELLI, Giorgio (University and INFN, Perugia); BOSI, Filippo (INFN - Sezione di Pisa); PALLA, Fabrizio (INFN - Sezione di Pisa)

**Presenter:** TURRIONI, Cristiano (INFN - Sezione di Perugia (IT))

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