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## The air-cooling system for the IDEA Vertex Detector at FCC-ee: thermal performance and vibrational effects

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The IDEA detector is one of the concepts under research for the Future Circular Collider (FCC). For its innermost part, the Vertex Detector, which would occupy a cylindrical volume of 50 mm radius and 550 mm length, a power dissipation of about 120 W is foreseen. For the removal of 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 sensors and related 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 and the structural analysis of the system, the evaluation of the vibrational effect due to the interaction between the fluid and the lightweight structure is implemented.

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