# Computational Fluid Dynamic Simulations of Miniature Pulse Tube Cryocoolers

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Cryocoolers are devices that are capable of reaching temperatures of 120 K or below. According to the heat exchangers used in cryocoolers, they are categorized as recuperative and regenerative. Among regenerative cryocoolers, pulse tube cryocoolers (PTCC) have rapidly developed. PTCC are advantageous as they do not have any moving parts at the cold end. There has been a continuous push towards manufacturing PTCC that work efficiently at high frequencies; since, at high frequencies the size of PTCC tends to decrease. Computational fluid dynamics (CFD) studies are nowadays a necessity to capture the multi-dimensional effects and complex transport phenomena that occur in PTCC. The current work presents a CFD model to assess the performance of cryocoolers under high-frequency operations. The model is validated against the result published in the open literature. The discrepancy in the result is attributed to the different sources of thermophysical properties of the fluid and solids used in the simulations. Further, the governing equations are non-dimensionalized to generalize the simulation results. Furthermore, some parametric studies on the aspect ratio and high-frequency operations of PTCC are carried out.