Contribution ID: **112** Type: **Poster Presentation (120m)**

Computational Fluid Dynamic Studies of Miniature Pulse Tube Cryocoolers

Tuesday 23 July 2024 14:00 (2 hours)

Conventionally cryocoolers are defined as devices that are capable of reaching temperatures of 120 K or below. Among various types of cryocoolers, pulse tube cryocoolers (PTCC) have developed rapidly over the past decades. PTCC are advantageous due to the absence of moving parts at the cold end, and their miniaturization aspects. Computational fluid dynamic (CFD) studies are nowadays necessary to capture the multi-dimensional effects and complex transport phenomena occurring in PTCC. The current work focuses on the miniaturization aspects of PTCC with increasing frequencies. A distributed parameter model is developed for PTCC and validated against the published result from the open literature. The discrepancy in the obtained results is attributed to the use of different thermophysical properties of the fluid and solid used in the simulation. 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.

Acknowledgement: Funded by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) – SFB 1527/1 –project-ID 454252029.

Submitters Country

Germany

Author: KUMAR, Rajendra (Karlsruhe Institute of Technology)

Co-authors: Prof. KORVINK, Jan G (Karlsruhe Institute of Technology); Prof. BRANDNER, Jürgen J (Karlsruhe Institute of Technology)

Presenter: KUMAR, Rajendra (Karlsruhe Institute of Technology)

Session Classification: Tue-Po-1.2

Track Classification: Tracks ICEC 29 Geneva 2024: ICEC 02: Cryocoolers, magnetic coolers and other coolers