

Starting new MSCA-IF project for breakthrough technology in thermal management

University of Parma started a new research project "POTPLOS" (Performance Optimization of Two-phase Passive Loop System) supported by Horizon 2020 Marie Skłodowska-Curie Actions Individual Fellowship. The fellow, Dr. Naoko Iwata, will have carried out the project under the supervision of Prof. Fabio Bozzoli until end of September 2022.

This project focuses on a promising heat transport device, pulsating heat pipe (PHP). Innovative heat transport devices are needed to break-through the increasing need for smaller, faster and lighter microelectronic apparatus. A PHP is a promising two-phase passive loop device that has many advantages such as high heat transfer capacity, construction simplicity, lightweight, and low-cost. It consists of capillary tube meandering between two sections and is partially filled with a fluid that exists as a two-phase (mixture of liquid and vapor). Once the heat is input to one section, the self-excited oscillation of vapors and liquids occur between the two sections, which transfers the heat from the heated section to the other. Despite its advantages, the practical use of PHP has been limited due to insufficiency of design tools. The project aims to establish a predictive model of PHP operation and provide an optimal

design solution that maximize PHP heat transport capability. An innovative approach using advanced measurements with high-resolution and high-speed infrared cameras and inverse heat conduction problem techniques will be taken to reveal the phenomena.

Dr. Iwata is a Japanese thermal engineer interested in two-phase fluid and thermal control system of spacecrafts. After her master thesis in aerospace engineering, she started working at Japan Aerospace Exploration Agency (JAXA) from 2007. She joined development of uncrewed spacecraft including BepiColombo mission and was also involved the operation of International Space Station. She obtained her PhD in two-phase flow device in 2016.

Prof. Fabio Bozzoli has been an Associate Professor of Applied Physics at University of Parma since 2006. He is a world leader in the field of the thermal tomography and inverse heat conduction problem. He was awarded "Top researcher - Inverse Problems in Science and Engineering" assigned by National Institute of Pure and Applied Mathematics in Rio de Janeiro 2017.



Naoko Iwata's photo



Fabio Bozzoli's photo

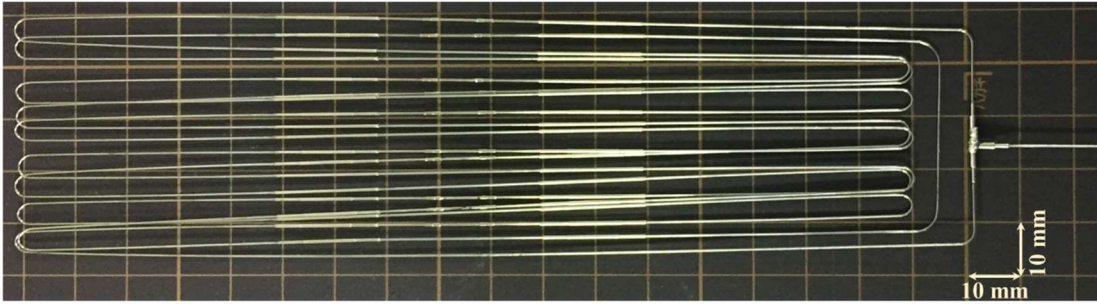
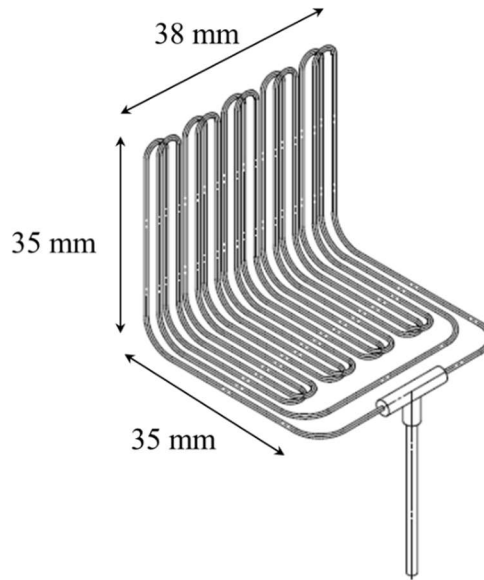


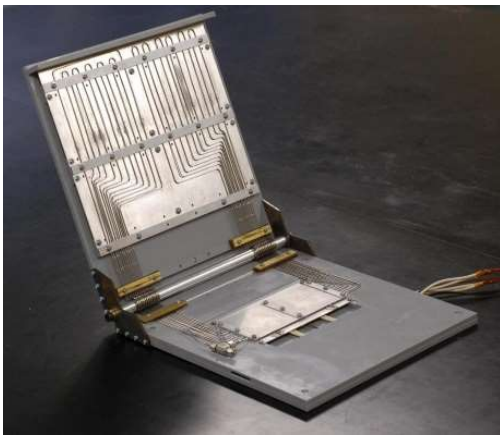
Photo of a micro PHP



Photo of a glass PHP



miniature PHP for heat transfer of micro-computer



Test model of mobile PC with flexible PHPs

(Provided by Prof. Yoshiro Miyazaki)