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FLIGHT TESTS OF 3D-PRINTED HIGH THERMAL CONDUCTIVITY PARTS DUE TO THE  
PHASE-CHANGES HEAT PIPE SIMILAR STRUCTURES IN THE INNER CAVITIES

**Abstract**

On September 28, 2020, two 1,5U CubeSats "Yarilo" designed in Bauman University (Moscow) were launched from the Plesetsk cosmodrome, Russia. The satellites are equipped with 3D-printed parts designed in Skoltech University, Moscow. On the first satellite, a thermal bridge is installed. It removes extra heat from the payload. The second satellite has a 3d-printed body of the payload, which reduces the amplitude of the device's temperature oscillation. Both parts have cavities inside, with a hermetically sealed working fluid and air. This gives the effect of a heat pipe. In this case, it is more accurate to talk about a two-phase heat exchanger because the tubes for this device are a special case. 3D-printed parts are covered with thermal sensors.

This paper shows the experience of conducting such an experiment, flight data processing. The thermal models of the devices were created using parts similar to the flight ones. A thermal vacuum chamber and heat load imitators were used. Under laboratory conditions, the heat exchange cavities showed worse thermal conductivity than the orbital experiment's data. The probable reason for this is the influence of gravity.

Based on the results of the processed data, conclusions are drawn about the applicability of this technology. The experience gained will allow you to move from an experiment to a real-world application.