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## LOW-COST THERMAL TEST AND FLIGHT VALIDATION OF Q-SAT

**Abstract**

Q-SAT, developed by Tsinghua University, is a small satellite dedicated to gravity field and atmospheric density measurement. Different from common cubic satellites, Q-SAT has a unique spherical structure, which is difficult to carry out thermal test with conventional methods such as the infrared heating cage. This paper provides a distributed external heat flow simulation method based on film- type electric heaters for the thermal test of Q-SAT. The method can accurately control the heat input of the satellite during the thermal test, and avoid the complex diffuse reflection of the infrared cage heating method. In order to reduce cost and ensure high reliability, the process of thermal balance and thermal vacuum tests is reasonably simplified according to the thermal simulation of Q-SAT. Q-SAT was successfully launched on August 6, 2020. The flight telemetry data shows that the satellite in-orbit temperature is consistent with results of the thermal test. The effectiveness and reliability of the thermal test provided in this paper are validated.