Poster Session (P)
Poster Lunch (1)

Author: Dr. Dong La
Shanghai Institute of Satellite Engineering, China

Dr. Zaiteng Zhai
China
Prof. Han Chen
China
Mr. Zhengping Yao
China
Prof. Shichen Jiang
China

TECHNICAL DEVELOPMENT OF HIGH-PRECISION TEMPERATURE CONTROL TECHNOLOGY FOR SPACECRAFT

Abstract

Temperature impacts directly on the measurement accuracy and imaging precision of the payload such as large optical payload, super bore synthetic aperture radar (SAR), large bore thin-film SAR. Therefore, it even determines the success or failure and the development direction of spacecraft. Currently, about half root-mean-square wave phase error of the high resolution space telescope has been attributed to the thermal control system. Besides, more and more spacecraft raise requirements of high-precision and high-stability temperature control. The temperature of the Space Solar Telescope is required to be stabilized in 0.1 K per hour. The rubidium clock on the Gravity Recovery and Climate Experiment satellite requires an operating temperature stability of 0.1 K per orbit. The temperature control precision of the optical system of the interferometer mission is 0.001 K. The temperature fluctuation of the far-infrared optical system of the Herschel and Planck satellite is required to be lower than 0.03 K per 100 s. The temperature of the tube of the CCD camera of a solar stationary orbit developed by China is required to be between 17.5 oC and 20.5 oC, and the requirement of temperature fluctuation is 0.3 oC per orbit. For the purpose of providing an overview of recent efforts on these issues and showing how high-precision temperature control technology can be applied to spacecraft, this paper presents and analyzes the status in the following four aspects: high-accuracy temperature measurement, high-precision and high-stability temperature control, high-precision thermal simulation, high-precision thermal experiment. Some key problems to further push forward the research and development of this technology are also summarized.