

Reliability Enhancement of the Double-Stage Stirling Cooler for Space Science Missions

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Mechanical coolers for space applications are crucial technologies in space science missions aimed at achieving extremely low temperatures for telescope assemblies and scientific instruments. The two-stage Stirling cryocoolers (2ST), especially in the 20 K class are essential for pre-cooling the Joule-Thomson coolers to achieve the low temperature range of 1K to 4K. The 2ST has been operated in space missions such as Akari, SMILES, Hitomi and XRISM. Furthermore, the 2ST is also proposed to use in LiteBIRD planned for the early 2030s. This paper introduces the development status of the 2ST in JAXA, including investigations on outgas, lifetime evaluation tests, operational status on XRISM and development to upgrade the compressor design.