Overview of First Two Years of JWST MIRI Cryocooler On-Orbit Performance

K. Penanen, M. Weilert, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA

Mid-Infrared Instrument (MIRI) is the only actively-cooled instrument on the James Webb Space Telescope (JWST). Following the successful launch of the Observatory on December 25, 2021, and subsequent commissioning period, the instrument has been operating successfully, supporting a diverse program of infrared astronomy investigations. MIRI focal plane and optical bench operate near 6K, with that temperature achieved and maintained by a hybrid four-stage Pulse Tube/Joule Thomson mechanical cryocooler. Apart from its raw cooling performance, the cryocooler meets stringent power, interface temperature and exported vibration requirements.

We briefly review MIRI Cryocooler thermal configuration and design, and present the on-orbit performance data that spans the two-year period following the instrument reaching its operational temperature on April 7, 2022. The cryocooler was one of JPL's MIRI deliverables to NASA, with Northrop Grumman as a key industrial partner responsible for the overall design, build and performance.