
ESTEWS 2022 Abstract Submission

E-TEST Prototype - Ultra-cold vibration control

LE VAN Bao Long, JACQUES Lionel, LENAERTS Cédric

Centre Spatial de Liège (CSL)

Abstract

E-TEST is an innovation project in the frame of the Einstein Telescope, developed to validate technologies regarding sensitivity at low frequency and contactless cooling of a large suspended cryogenic silicon mirror. The prototype will be tested in our FOCAL6.5 vacuum chamber, one of the main CSL's environmental test facilities used for space instrumentation.

One of the E-TEST experiment's goals is to cool a suspended mirror to 20K. To avoid transmitting vibration to the payload, it has to be mechanically decoupled from the rest of the cryostat. Therefore, CSL has developed two intertwined radiator-like structures to maximize the radiative exchanges.

The design of such a structure in a compact envelope and the thermal modeling performed with ESATAN to assess the cooling time until steady-state conditions are explained. In particular, the approach to deal with uncertainties related to the decrease of the emissivity with the temperature of usual black paint used in space applications, thermal properties of less common materials and state-of-the-art solutions are presented.