

Seminar

Institute for Plasma Research

- Title:** Development of an Experimental Facility for the Measurement of Emissivity at Cryogenic Temperature
- Speaker:** Dr. Avijit Dewasi
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- Date:** 28th September 2022 (Wednesday)
- Time:** 11:00 AM
- Venue:** Join the talk online:
https://meet.ipr.res.in/Dr.Avijit_Dewasi_PDF_Extension_Talk

Abstract

Emissivity of materials at low temperature plays a crucial role in designing cryopumps, cryopumps, fusion devices, and space applications. These systems are operated at low temperature (< 123 K) and the contribution of the radiation heat load can be a major concern in large-scale. Radiation heat load in a cryo-system can be properly estimated if the emissivity of the material is known at the operating temperature. As the values of emissivity of different materials at low temperature are scarcely available in open literature, an experimental setup is developed for measuring emissivity of the materials around 80 K. The present apparatus offers ease of sample loading facility, compact in size, lower time required to reach thermal equilibrium and capable to measure emissivity of a sample of any roughness. To understand the effectiveness of low and high emissive heat radiators for the system, a theoretical as well as an experimental approach has been taken. It is found that the high emissive heat radiator led to a significant reduction in the time required to reach the thermal equilibrium as compared to a low-emissive heat radiator (from 14 hrs. to 2.6 hrs.). The apparatus is further validated with respect to the samples having high and low emissivity. Finally, the work has been extended to measure emissivity at cryogenic temperature for the commercially available materials and the indigenously developed cryopump materials such as black paints, adhesive, and activated charcoals.
