Using mylar-insulated cryopumping panels to improve vacuum level during warm temperature testing at JSC's large thermal vacuum facilities

The Johnson Space Center's Space Environment Simulation Lab (SESL) has both Chamber A, the world's largest purpose-built thermal vacuum chamber capable of creating deep space conditions, and Chamber B, the largest human rated thermal vacuum chamber. A unique design feature of these chambers is the gaseous helium cryopumping panels within the liquid nitrogen shroud. This shroud is used to bring the chamber to cryogenic temperatures while the cryopumping panels trap gasses using their large surface area in order to create a high vacuum environment of 5*10^-6 Torr.

In preparation for the James Webb Space Telescope (JWST) flight test, a series of functionals required the chamber to run at higher temperatures, and therefore did not need active cooling from the liquid nitrogen shroud. During testing, cryopumping panels were used to mitigate contamination during this main shroud warm-up. One of the cryopumping panels in Chamber A was covered with several layers of aluminized mylar in order to thermally protect the zone from the warmed shroud. This strategy was effective and became part of operations during JWST testing.

Currently, Chamber B has requests for both commercial and NASA space suit tests at both high and low temperatures to accurately generate thermal models. High temperature tests would greatly benefit from simultaneous shroud warming and the high vacuum environment provided by the cryopumping panels. This paper will quantitatively define the thermal loads on the panels used in previous Chamber A warm up sequences. Additionally, this report will perform a thermal analysis to judge the feasibility of adding layers of aluminized mylar to the cryopumping panels of Chamber B.