National Aeronautics and Space Administration

Thermal Vacuum Testing Vacuum Facility 5 at NASA Glenn Research Center

Vacuum Facility 5 (VF–5) is a 15-ft-diameter thermal vacuum facility located at NASA Glenn Research Center in Cleveland, Ohio. The test chamber and supporting infrastructure serve as a valuable resource in space simulation ground testing. Some unique facility capabilities include a large chamber volume (15 ft diam by 60 ft long), and depending on test requirements, the option of using the internal helium/liquid nitrogen cryogenic pumping system or a nitrogen, cold-trapped, oil diffusion pumping train.

The clean, cryogenic vacuum system provides a no-load base pressure of 1×10^{-7} torr at a theoretical pumping speed of 3,500,000 l/sec on air. Approximately 40 m^2 of helium surface removes 750 W at 20 K. A baffled, diffusion pump system provides 250,000 l/sec pumping supporting noncondensible gases.

The 16-ton, closed-loop helium refrigeration system provides cryogenic temperatures conducive to maintaining hard vacuum while testing high-power test articles. This system also provides the option of an inexpensive and a continuous supply of helium for test article exposure. The test chamber has an internal rail system and an overhead beam for hoist operations. The facility is oriented horizontally with an attached 5-ft-diameter by 6-ft-long valved test port. Additional test capabilities consist of a large staging area, access to a class 1,000 cleanroom, a machine shop, and automatic and unattended vacuum operations. VF–5 is 1 of more than 25 chambers included in the unique suite of vacuum facilities supporting space simulation ground testing at Glenn.

Birds eye view of VF–5.

Plasma contactor unit (flight hardware) mounted inside of VF–5.

VF–5 preparing for operation.

Facility Applications

- Thermal vacuum testing of flight experiments
- Spacecraft hardware development
- Plasma interaction effects on spacecraft hardware and materials
- Advanced materials applications
- Electric propulsion research development
- Integration of space power systems

Facility Testing Information

http://facilities.grc.nasa.gov/epl

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Capabilities

Overall dimensions	
Main chamber	15 ft diam by 60 ft long
Test port	5 ft diam by 6 ft long
Internal working dimensions	
Main chamber	13 ft diam by 30 ft long
Test port	5 ft diam by 6 ft long
Vacuum system	
Cryopanels	750 W at 20 K, 40 m^2 of helium surface providing a no-load pressure of 1×10^{-7} torr with a pumping speed of 3,500,000 l/sec on air (measured capacity)
Diffusion pumps	Twenty 32-in. pumps with nitrogen cold traps providing a no-load base pressure of 1×10^{-7} torr with a pumping speed of 250,000 l/sec of air (oil diffuser pumps can be capped during cryo-testing)
Thermal simulation	
Cold	Liquid nitrogen and helium surfaces available upon request
Heat	Configurable lamps available upon request
Instrumentation	Thermocouples, Residual Gas Analyzers (RGA), Thermoelectric Quartz Crystal Microbalances (TQCM), cameras, and other necessary test equipment
Additional	