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VACUUM PUMPING SYSTEM FOR A LARGE IFE TARGET CHAMBER*

[1]C.A. Gentile, [1]R.F. Parsells, [1]C. Priniski, [1]S.Langish, [1]W. Blanchard,
[1]F. Dahlgren and [2]J. Sethian
[1] Princeton Plasma Physics Laboratory, P.O. Box 451, Princeton, New Jersey 08543
[2] Naval Research Laboratory, 4551 Overlook Avenue, Washington D.C 20375
cgentile@pppl.gov

In support of The High Average Power Laser (HAPL) Program, the Princeton Plasma Physics Laboratory has designed a vacuum pumping system (VPS) for an Inertial Fusion Energy (IFE) target chamber. The VPS is designed to maintain a base operating pressure of $\leq$1 m torr during a cyclic gas load (for full operation at 5 Hz) of 141 torr-liters/sec. The 1.15 M liter target chamber is fitted with a mid-plane 145 K liter torodial duct, which incorporates 60 pumping vents, providing the physical platform for the resident 120 Turbo Molecular Pumps (TMP) (2 TMPs/vent). The TMPs are configured to continuously pump on the target chamber during pulsed operations. System in-leakage is assumed to be 1×10^{-5} torr which is consistent with vacuum chambers of similar size and complexity. The (6,000 l/sec) TMPs, which are located in a 1 kG field along the torodial duct, are magnetically shielded to an attenuated field of 50 gauss. Sixty beam ports interface with the target chamber providing a clear line of sight for the converging laser light to implode the target(s). The vacuum pumping system employs, to the largest extent possible, commercial off the shelf components (COTS) with a proven record of high operational availability in similar magnetic fusion energy (MFE) applications. The system has been designed to transition from D-D to D-T operation with minimal configuration change. The system has been estimated to cost ~$15 M. This paper will discuss the full design in detail.

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