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The Suitability of 3D Printed Plastic Parts for Laboratory Use

ANDREW ZWICKER, JOSH BLOOM, ROBERT ALBERTSON, SOPHIA GERSHMAN, Princeton Plasma Phys Lab — 3D printing has become popular for a variety of users including scientists and engineers interested in producing their own laboratory equipment. Pearce and his group have tested a variety of different objects, developed a library of open-source files for printing optics equipment and found a cost savings of up to 97% compared to the equivalent objects purchased commercially.¹ In order to determine the suitability of 3D printed parts for our plasma physics laboratory, we measured the accuracy, strength, vacuum compatibility, and electrical properties of test pieces printed in PLA plastic. For example, samples could be printed with a dimensional accuracy on the order of $50\mu\text{m}$ and had an average tensile strength of 60 MPa, similar to bulk plastic. For pressures greater than 10^{-6} torr a residual gas analyzer showed no increase above background until samples were heated to greater than 75°C . While clearly not for all applications, the flexibility of rapidly creating custom parts has led to the 3D printer becoming an invaluable resource in our laboratory.

¹Joshua M. Pearce, Open-Source Lab: How to Build Your Own Hardware and Reduce Research Costs, (Elsevier, 2014).J

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