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LUX laser beamline for LWFA

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Within the LAOLA collaboration the university of Hamburg and DESY work closely together within the field of Laser Wakefield Acceleration. We report on a new laser beamline which will feed two laser plasma target areas, LUX and REGAE. The physics explored at LUX include 5 Hz, continuous gas flow operation, adiabatic matching, a pump probe set-up, and undulatory radiation. Because LUX is connected to REGAE, which uses a conventional electron gun and explores LWFA via external injection, the LUX part of the beamline is situated within a particle-free vacuum system. We outline the technical challenges and their solutions the first high power laser beamline within the accelerator UHV environment posed.

The in-house design of the 7 inch diameter low-vibration mirror mounts and the design process of their vacuum chambers are discussed alongside vibration studies, vacuum force analysis, and material selections. The laser diagnostics - far field and near field cameras behind every mirror chamber and the post target diagnostics - are also discussed.

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