

## **Robust Control Design for Vibration Isolation of an Electron Beam Projection Lithography System**

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### **Abstract**

This paper describes vibration control for an electron beam projection lithography (EPL) system. Two kinds of disturbances should be considered for an EPL: load disturbances from the machine and ground disturbances from the environment. However, the suspension settings for insulating these two disturbances conflict with each other. Therefore, we propose a double-layer optical table and apply disturbance response decomposing (DRD) techniques to independently control the disturbances. We use a passive control structure to isolate the ground disturbances, and an active control structure to suppress load disturbances. In addition, symmetric transformation is applied to decouple a full optical table into bounce/pitch and roll/warp half-table models, which can be further decoupled into quarter-table models to simplify controller design. Finally, we apply robust control techniques to design active controllers. From both simulation and experimental results, the designed  $H_\infty$  robust controllers are proven effective in reducing EPL system vibrations.