

## **The Application of Disturbance Response Decoupling to the Vibration Control of an Electron Beam Lithography System**

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### **Abstract**

This paper demonstrates a method to control an electron beam lithography (EBL) system's vibrations with a newly developed technique called disturbance response decoupling (DRD). Resolution requirements make the vibration control of EBL systems increasingly important. Satisfying performance criteria requires considering two kinds of disturbances, load disturbances from the machine and ground disturbances from the environment, in EBL systems. Controlling lithography tools' vibrations has been studied for many years; however, designing controllers by traditional approaches can be very complicated because of these two types of disturbances' conflicting requirements. Therefore, DRD techniques were applied for this paper to deal independently with these performance requirements. The DRD control method was initially proposed in 2001 to address vehicle suspension control problems. This paper proposes a generalized and experimentally realized DRD control structure to suppress an EBL system's vibrations. The work was carried out in three parts. First, passive isolators were used to isolate ground disturbances. Second, active components were applied to improve the system's responses to load disturbances. Finally, the system was integrated to verify its overall performance. Simulations and experiments verify the proposed control strategies' effectiveness.