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Electron Beam Materials Irradiation Station for Evaluating Thermal Shock, Fatigue, and Radiation Damage in High Power Targetry Materials (REMOTE)

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It is proposed to develop a more efficient method to evaluate radiation damage effects on fatigue life and mechanical/physical properties of future target materials using an existing 9 MeV electron beam machine at Fermilab's IARC facility. This method is unique in that it replicates the prototypic thermal shock environment of high energy proton target facilities while simultaneously accumulating the displacement damage from interactions with electron beam without activating specimen. Here we will attempt to change electron beam parameters (spot size, flux etc.) in order to create comparable radiation damage and thermal stress waves in material as in case of intense proton beam in accelerator. We will also include instrumentation to measure high frequency micrometer scale surface oscillations for fatigue studies. This would give us unique opportunity to estimate fatigue life under simultaneous radiation damage which is more realistic of service conditions of targets in accelerators.

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