

Abstract Submitted
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A Complete Discharging Solution for LIGO¹ QUENTIN FUNK, DENNIS UGOLINI, Trinity University — Surface charge on LIGO interferometer optics creates a changing electric field that exerts an oscillating pull on the optics, creating a fake signal. Replacing viton earthquake stops with fused silica reduced charging from $(6 \pm 1) \times 10^{-12} \text{C/cm}^2$ to $(-4 \pm 1) \times 10^{-14} \text{C/cm}^2$ per contact. We also investigated three ways to discharge an optic in vacuum. UV light removes negative charge via the photoelectric effect with a time constant of $(9 \pm 3) \times 10^{-6} \text{s}^{-1}$, and neutralizes positive charge by liberating electrons from a reaction mass at a rate of $(-9.89 \pm .2) \times 10^{-4} \text{C/s}$. Both polarities are discharged faster at lower wavelengths. The energy to reduce negative surface charge by $1/e$ is $(3 \pm 1) \times 10^{-2} \text{J/cm}^2$, which could damage the reflective optical coatings over time. A Kimball Physics electron gun eliminates positive charge within seconds, but we believe that a modified Bayard-Alpert gauge could be a complete, less expensive, and more robust discharging solution.

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