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High Intensity Ultrashort Pulse Interactions with Dielectric Filters SARAH DUNNING, CARL M. LIEBIG, W.M. DENNIS, University of Georgia — Modern ultrafast laser systems are capable of generating optical pulses of sufficient intensity to induce nonlinear effects in several of the materials used in thin-film dielectric optical filters. Such effects degrade the performance of these devices at high intensities. In this paper we describe computer simulations used to investigate the interaction of high intensity ultrashort laser pulses with three dielectric filters: a quarter- wave dielectric stack, a rugate filter, and an idealized rugate filter, with a continuously varying refractive index. Using the finite-difference time-domain (FDTD) technique, we simulated the reflection of optical pulses (with pulse widths in the range 5–100 fs and peak intensities up to ~ 10 TW/cm^2) from all three devices. The simulated low intensity reflective properties were found to be in excellent agreement with calculations using the characteristic matrix method. For high intensity pulses a decrease of the filter reflectance and a distortion of the reflected pulse was observed.

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