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Transient absorption centers in  $CaF_2$  under 157-nm irradiation<sup>1</sup> TOM DICKINSON, SHARON GEORGE, STEVE LANGFORD, Washington State University — With an 11.8 eV band gap,  $CaF_2$  is nominally transparent at 157 nm. However, exposure to x-rays, vacuum ultraviolet photons, or energetic electrons can produce defects that degrade its optical properties. We report transient VUV and UV absorption features centered at 153 nm, 220 nm, and 375 nm that appear during pulsed 157-nm irradiation. We attribute the 153-nm feature to substitutional hydride ions  $(H_s^{-})$ ; the 220- nm feature to electrons trapped at Ca<sup>2+</sup> interstitials; and the 375-nm feature to F-centers. Annealing in hydrogen strengthens the transient feature at 153 nm, consistent with the  $H_s^-$  absorption. During prolonged exposure, the transmission at these wavelengths drops by 1-3%. When irradiation ceases, the transmission partially recovers. When irradiation is resumed, however, transmission drops rapidly to the previous low value. We propose that these defects are created by the laser and that charge transfer to and from these defects is responsible for the resulting absorption and recovery. A model incorporating bimolecular recombination provides a good description of the kinetics of transient absorption and recovery.

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