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Effects of IR-FEL Wavelength, Fluence and Spot size on Porcine Corneal Ablation GILMA ADUNAS, SHANE HUTSON, Vanderbilt University — The tunability of infrared Free Electron Lasers (FELs) has been previously used to measure the wavelength-dependence of ablation – both in terms of efficiency and collateral damage. However, interpretation of the wavelength-dependence is complicated by variations of both fluence and spot size. Here, we systematically investigate these effects during FEL ablation of porcine corneal tissue. Ablation efficiency and collateral damage are quantified for a set of five wavelengths (2.77, 3.32, 5.97, 6.26 and 6.45 microns) for which porcine cornea has matching absorption coefficients. Fluences varied from 5-200 J/cm^2; and spot diameters varied from 60-400 μm. Our results show that decreasing the spot diameter or decreasing the fluence both decrease the ablation efficiency. Histological analysis of ablation craters has further shown that the wavelength-dependence of collateral damage also varies with fluence. At low fluence, the collateral damage around 2.77 or 6.45-μm craters is quite comparable. However, at high fluence, both the crater shape and the collateral damage deep to the crater differ strongly. We conclude that the interplay of fluence, spot size and wavelength has strong implications for the interpretation of previous conflicting FEL studies.

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