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Nanosecond Infrared Laser for Tissue Ablation G.S. EDWARDS, R.D. PEARLSTEIN, Duke University, M.L. COPELAND, Northern Rockies Neurosurgeons, M.S. HUTSON, Vanderbilt University, K. LATONE, A. SPIRO, G. PASMANIK, Passat, Inc. — The Mark-III Free-Electron Laser (FEL), operating at the 6.45μm wavelength, has been used successfully in human surgery. Due to the FEL's size and cost, there has been interest in the development of a compact, inexpensive infrared laser for human surgical applications. We have investigated the role of the FEL superpulse, leading to the prediction that nanosecond pulses can satisfy the dynamic criteria for tissue ablation. We have developed a laser based on difference frequency mixing and stimulated Raman scattering with four stages of frequency conversion, emitting at a wavelength of 6.45μm with 3-5ns pulse duration, pulse energies of up to 2mJ, and a pulse repetition rate of 3MHz. The laser system successfully ablated tissue, where collateral thermal damage was limited to several microns. In the future, it will be necessary to increase the pulse repetition rate to achieve an ablation rate acceptable for human surgery. We acknowledge the grant support: R43 RR018435, N00014-99-1-0891, and F49620-00-1-0370.

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