Abstract Submitted
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Modeling the output of a TEA CO_2 laser DANIEL CROWDER, THOMAS WILSON, Marshall University — We compare the results of numerical solutions to a set of coupled rate (first-order linear differential) equations in a simplified theoretical model[1], to experimental measurements of the output of a transversely-excited atmospheric-pressure (TEA) carbon dioxide laser. The model is used to study the influence of the molecular gas ratio (partial pressures of CO_2, H_2, and N_2) and mirror reflectivities on the peak power and energy of the gain-switched pulse. The laser is a vintage *Gentec DD-250*[2] TEA CO_2 laser. We use a fast (0.2-ps risetime) room-temperature photoelectromagnetic mode (PEM) HgCdTe detector and a 1-GHz bandwidth digital oscilloscope to sample the gain-switched pulse. We review the model's assumptions of a four-level laser and the various processes involved in the production of the laser output. Good qualitative agreement is observed between theory and experiment, considering the simple assumptions of the model. In both cases, the gain-switched spike, containing several megawatts in ∼200-ns duration, is followed by a slower relaxation tail. The length of the lower-power tail scales with increasing N_2 partial pressure. The model takes no account of the competition between the various longitudinal and transverse modes of the cavity. [1]K.J. Andrews, P.E. Dyer and D.J. James, J. Phys. E: Scientific Instruments **8**, 493-497 (1975). [2]Gentec Electro-Optics Inc., 445 St. Jean-Baptiste, Suite 160, Quebec, QC, Canada G2E 5N7

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