

## FORTHCOMING PAPERS

### Using the Seventh-Order Numerical Method to Solve First-Order Nonlinear Coupled-Wave Equations for Degenerate Two-Wave and Four-Wave Mixing

Y. H. Ja (Australia)

Using a new seventh-order numerical method [the  $O(h^7)$  method] for solving two-point boundary value problems, numerical solutions of the first-order nonlinear coupled-wave equations for degenerate two-wave and four-wave mixing in a reflection geometry have been obtained. A computer program employing the Gauss-Jordan elimination technique has also been adopted to effectively solve the resultant large, sparse and unsymmetric matrix, obtained from the  $O(h^7)$  method and the Newton-Raphson iteration method. Numerical results from the computer calculations are presented graphically. A comparison between this  $O(h^7)$  method and the shooting method, mainly from the viewpoint of computational efficiency, is also made.

### Excitation, Inversion, and Relaxation Mechanisms of the HCN FIR Discharge Laser

D. D. Skatrud, F. C. De Lucia (USA)

Millimeter/submillimeter rotational absorption spectroscopy has been used as a diagnostic probe of a cw HCN discharge laser. This sensitive technique allowed in situ absolute population measurements of a number of vibrational states of HCN (including the upper lasing state) and other pertinent molecules. This unique set of data, which was obtained under a variety of discharge and laser conditions, is directly related to excitation, inversion, and relaxation processes. Along with elucidating several fundamental aspects of inversion and relaxation these results also strongly indicate that the primary laser excitation mechanism is near-resonant energy transfer from vibrationally excited nitrogen,  $N_2(v=1)$ , to the fundamental symmetric stretching mode of hydrogen cyanide, HCN(100), and subsequent population exchange between HCN(100) and the upper laser state, HCN(110).

### Characterization of Free-Electron Laser Bunch-Lengthening on the ACO Storage-Ring

K. E. Robinson, D. A. G. Deacon, J. M. J. Madey, M. F. Velghe (USA)  
C. Bazin, M. Bergher, M. Billardon, P. Elleaume, J. M. Ortega, Y. Petroff (France)

This paper summarizes the basic low-current laser-induced bunch-lengthening measurements that have been made on the ACO Storage-Ring Free-Electron Laser (SRFEL). The measurements provide verification of both the functional dependence and absolute magnitude of SRFEL theoretical models. The method of measurement, which is explained, exploits frequency-domain techniques and is capable of accuracies comparable to those of a streak camera. The measurements are in good agreement with existing SRFEL theory and provide an important base for future work.

### High-Order Harmonic Mixing with Schottky Diodes in the Fir Region

C. O. Weiss, A. Godone (F. R. Germany)

We report results of harmonic mixing experiments between millimetric oscillators and FIR laser radiations up to 3 THz, using micrometer-size Schottky-barrier diodes. Signal-to-noise ratios suitable for precise frequency counting have been obtained for harmonic numbers up to 40.

### Performance of a Nd:YAG Oscillator/Amplifier with Phase-Conjugation via Stimulated Brillouin Scattering

I. D. Carr, D. C. Hanna (UK)

Phase conjugation via stimulated Brillouin scattering in  $CH_4$  gas has been used to correct amplifier aberrations in a Nd:YAG oscillator/amplifier system. The single amplifier stage has been used in two-pass and four-pass arrangements. Using the four-pass arrangement incorporating compensation for thermal birefringence, a single-frequency diffraction-limited output of 350 mJ, in a compressed 6 ns pulse is achieved at 15 Hz repetition rate.

## Ultrafast Phenomena IV

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The Topical Meeting on Picosecond Phenomena, held biannually since 1978, has grown in size and, as evidenced by the papers in this proceedings **Ultrafast Phenomena IV**, the application of ultrafast light pulses continues to extend in new and diverse directions encompassing an increasingly wide range of subject areas. This progress has gone hand in hand with the development of new and more precise methods of generating and measuring ultrafast light pulses, which now extend well into the femtosecond time domain. It was this latter advance which was responsible for changing the name of the conference to Ultrafast Phenomena. The conference took place in Monterey, CA, from June 11 to 15, 1984 and was attended by 320 registered participants.



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