FORTHCOMING PAPERS

Frequency Stability of an Optically Pumped Cesium Beam Frequency Standard

V. Candelier, V. Giordano, A. Hamel, G. Théobald, P. Cérez, C. Audoin (France)

Results obtained in an experimental optically pumped cesium beam frequency standard in which a single semiconductor laser is used for the state selection and the atom detection are reported. The separation between the two interaction regions is equal to 21 cm. This gives a 500 Hz linewidth which is observed with a signal to noise ratio equal to 10 000 in a 1 Hz noise bandwidth. A quartz crystal oscillator is frequency controlled by the atomic transition. The measured short term frequency stability is given by $\sigma_y(\tau) = 2 \times 10^{-12} \tau^{-1/2}$ for $1\text{ s} < \lesssim 500\text{ s}$. Prospects for improvement of this frequency stability are discussed.

Doppler-Free Resonances of the Second-Order Raman Scattering

V. P. Chebotayev, V. A. Ulybin (USSR)

The possibility of the observation of Raman scattering resonances completely free from the influence of the Doppler effect has been examined for the first time. The phenomenon is based on the excitation of a Raman oscillation standing wave in a gas by two standing light waves, whose frequency difference is equal to half the Raman frequency. The complete compensation of Doppler shifts results from the simultaneous interactions between atomic particles and two pairs of counter-propagating waves. Doppler-free resonances of the second-order Raman light scattering appear in the number of particles excited to the upper Raman level and in the radiation at the Stokes and anti-Stokes frequencies. The amplitude estimate for the resonance in the number of particles is given for the example of neon.

Dynamics of Laser-Induced Bubble and Free-Surface Oscillations in Absorbing Liquid

V. Yu. Bazhenov, M. V. Vasnetsov, M. S. Soskin, V. B. Taranenko (USSR)

A series of laser-driven dynamic photocapillary effects in absorbing liquid are described. We have observed self-oscillations of the free surface of a liquid (iodine solution in ethanol) and laser-induced bubble trapping and oscillations excited by a low power cw argon laser.

Pulsed 469.4 nm Hollow Cathode He-Kr Laser

M. Jánossy, K. Rózsa, P. Apai, P. Mezei, P. Horváth, L. Csillag, N. Kroó (Hungary)

Design principles, construction and operation characteristics of a pulsed 469.4 nm He-Kr laser are described. The laser was operated in a 20 cm active length transverse hollow cathode discharge and was excited by 50 Hz repetition rate 0.1—1 ms duration square wave current pulses. Cataphoresis of Kr ions was found to play an important role in forming the laser pulse shape. By increasing the voltage a considerable increase of peak laser power occurred, the maximum power obtained was 80 mW. The sealed-off laser was operated using 400 μs, 4 A current pulses, pulsed laser power being 20 mW, average power 0.4 mW, respectively. The lifetime of the laser was 440 h, tube failure being due to gas clean-up caused by cathode sputtering.

Atmospheric Influences in Optical Third-Harmonic Generation Experiments

F. Krausz, E. Wintner (Austria)

Third-harmonic generation in a thin solid plate surrounded by a gas is investigated. We conclude that atmospheric contributions can be suppressed in third-harmonic generation from thin solid plates. A phase-sensitive measurement of the third-order susceptibility of gases is proposed. We calibrated the third-order susceptibility of air to be $\chi_a^{(3)} = (3.4 \pm 1.5) \times 10^{-18}$ esu with a phase uncertainty of $\pm 10°$.

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