FORTHCOMING PAPERS

Comparison of Frequency Stabilities of the Rb Standard and of the He-Ne/CH_4 Laser Stabilized to the E Line in Methane

V. P. Chebotayev, V. M. Klementyev, M. V. Nikitin, B. A. Timchenko, V. F. Zakharyash (USSR)

The paper reports on the production of an optical time standard on the basis of the He-Ne laser stabilized to the E line in methane and on a comparison of its frequency stability with that of the rubidium standard. It is shown that the stability of the optical standard is better than that of the rubidium one. Frequency measurements of the E line gave $\nu_E = 88,373,149,031.2 \pm 1.2$ kHz. We have also made new measurements on the frequency of the He-Ne laser stabilized to the $F_2^{(2)}$ methane line: $\nu_F = 88,376,181,602.9 \pm 1.2$ kHz.

Determination of the Rotational Temperature and the Molecular Density in an Expanding NH_3 Jet by Infrared Absorption

K. Veeken, J. Reuss (The Netherlands)

Rotational temperatures are determined by measuring the absorption of infrared laser radiation. The possibilities of this method are critically examined and tested. As a result the molecular density in the expansion could be determined, too. Color-center laser radiation has been absorbed by a molecular jet of NH_3. An anomalous line shape has been observed, related to a Doppler shift from molecules moving along the various streamlines. No deviations from a thermal rotational distribution have been observed.

Influence of Dephasing Relaxation on the Transient Properties of Parametric Four-Wave Mixing

J. G. Fujimoto, T. K. Yee (USA)

Transient parametric scattering is investigated theoretically using density matrix perturbation theory. Emphasis is placed on the effects of population and transverse or dephasing relaxation on the scattered parametric pulse durations. Pulse duration measurement provides important insight into the actual transient temporal behavior of four-wave mixing processes and is shown to be a potentially useful technique for the characterization of material time constants and incident pulse shape.

Study of the SF_6^- Ion Lifetime in a rf Quadrupole Trap

M. Vedel, J. André, G. Brincourt, Y. Zerega, G. Werth, J. P. Schermann (France)

We use an experimental apparatus to study SF_6^- ions lifetimes. Theses ions are created inside a quadrupole rf trap by charge exchange between highly excited argon atoms and SF_6 molecules. Ions are observed from 200 μs up to 15 ms after their creation time. In order to explain experimental results, collisions with SF_6 molecules and the influence of ionized core of argon are taken into account. A part of SF_6^- ions are stabilized by the last influence. These results evidence a radiative stabilization phenomenon, the lifetime of which is estimated at about 5 ms.

Dynamics of a Three-Level Atom in a Resonant Light Field

V. G. Minogin, Yu. V. Rozhdestvensky (USSR)

The paper is devoted to a consideration of the motion of a three-level atom in two resonant light waves. A kinetic equation of the Fokker-Planck type for the atomic distribution function is derived, which is valid when the recoil energy is small compared to the linewidths of the resonant transitions. The detailed behaviour of the radiation force and the diffusion tensor are studied numerically. The case of exact resonance and the nonresonant case are both considered. It is shown that a detuning from exact resonance results in a drastic decrease of the resonant light pressure force. For the detuning we determine the condition, under which an efficient action of the light pressure on a three-level atom takes place.

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