lengths. Nonlinear laser-plasma interaction leads to intensity-dependent refractive index which makes the plasma act as an optical guide to compensate for diffraction. A three dimensional code has been developed recently to study the propagation of such a short intense laser pulse ($\geq 10^{18}$ w/cm^2) in underdense plasma, based on previously derived model equations.[1] In the model, we have assumed a cold plasma and immobile ions. The fully nonlinear simulations of intense laser pulse evolution over many diffraction lengths will be presented. The three dimensional code exceeds the capabilities of usual two dimensional codes, which either assume axi-symmetry or neglect finite pulse duration effect. We are able not only to simulate self-focusing of laser pulse, but also to study the filamentation instabilities which break axi-symmetry and modulation instabilities which break the laser pulse. These three dimensional simulations will provide hopefully a more complete picture of self-focusing for comparison with experiments.

*Supported by Office of Naval Research and Naval Research Laoratory; Computations performed on the Cornell National Supercomputing Center.

†In collaboration with R.N. Sudan.

[1]X.L. Chen and R.N. Sudan, Phys. Fluids, **B5**, 1336(1993).

12:48

N4 4 Harmonic Radiation from Intense Laser Pulses in Neutral Jets and Plasmas.*

M. PERRY, Lawrence Livermore National Laboratory.

13:24

N4 5 Progress Towards Generation of VUV and X-Ray Radiation by FEL's.

S. KRINSKY, Brookhaven National Laboratory.

SESSION N5: ORDER AND DISORDER IN MULTIPARTICLE ATOMIC SYSTEMS. SYMPOSIUM OF THE FEW-BODY SYSTEMS AND MULTIPARTICLE DYNAMICS TOPICAL GROUP

Thursday morning, 21 April 1994; Regency Ballroom C and D at 11:00; D. J. Wineland, presiding

11:00

N5 1 Quantum Chaos in Few-Body Systems.*

REINHOLD BLUMEL, University of Delaware.

For more than a century[1] it is known that the three-body problem is nonintegrable in general and can exhibit chaotic features. One of the simplest quantum three-body systems is the helium atom whose classical chaoticity clearly manifests itself in its doubly excited planetary states. This talk will review some recent advances in our understanding of the chaotic properties of the helium atom[2,3]. An apparently different, but closely related atomic system is a charged Coulomb cluster in a Paul-trap[4,5]. The trap sets up an average trapping field very similar to the background field of Thomson's plum-pudding model. For this reason trapped particles in a Paul-trap form a "Thomson atom". Depending on the trap control parameters Thomson helium (two trapped particles) can exhibit regular as well as chaotic motion. Its quantum spectral properties will be discussed[6]. Some general concepts useful for the description of Thomson atoms will be discussed.

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5. D. J. Wineland, J. C. Bergquist, W. M. Itano, J. J. Bollinger, C. H. Manney, Phys. Rev. Lett. 59, 2935 (1987).
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11:36

N5 2 Strongly-Coupled Coulomb Systems: Nonneutral Ion Plasmas and Crystals in Traps.*

JOHN BOLLINGER,† National Institute of Standards and Technology.

Experimental work which uses Penning and Paul traps to achieve long term confinement of laser-cooled ions will be discussed. Penning traps use a static uniform magnetic field and a static electric field to confine ions. The Paul (or rf) trap uses the ponderomotive force from inhomogeneous rf fields to confine ions to a region of minimum field