16:06
C7 9 Electron-Impact Dissociation of F_2, B. H. LENGSFIELD III and T. N. RESCIGNO , Lawrence Livermore National Laboratory - We have carried out a theoretical determination of electron impact dissociation cross sections for F_2 from 5 to 30 eV via excitation of the two lowest ($^3\Pi_u$ and $^1\Pi_u$) exited electronic states. The three-state close coupling calculations were carried out using the complex Kohn variational method. This work will focus on the generation and use of accurate multi-configuration target state wave functions in these type of calculations. The short-range correlation terms that have to be introduced to relax unphysical orthogonality constraints between the target and the scattering wave functions can give rise to a plethora of pseudo-resonances at intermediate energies when large-scale CI target wave functions are used. We discuss several techniques for circumventing this problem.

*Work performed under the auspices of the U.S. Dept. of Energy by the Lawrence Livermore National Laboratory under contract No. W-7405-ENG-48.

16:18
C7 10 Theoretical Study of Low Energy Electron-NH_3 Scattering S. D. PARKER and C. W. McCURDY*, Ohio State University, T. N. RESCIGNO , Lawrence Livermore National Laboratory ** - We have used the complex Kohn method to study low energy electron scattering from NH_3. We have found that it is essential to take proper account of the long-range dipolar field to properly describe the elastic differential cross section at small angles, as well as the momentum transfer cross section, at collision energies below 3 eV. We have adopted a hybrid approach in which the low ℓ components of the T-matrix are obtained from ab initio variational calculations and the weakly scattered high ℓ components, which are needed to obtain converged cross sections, are obtained in a simple perturbative manner. Unlike other investigators who have erroneoulsy applied this type of hybrid approach to compute differential cross sections directly, we show that the hybrid scheme is more properly applied to the scattering amplitude. The low energy cross sections we find are in good agreement with available experimental data.

*Supported by NSF CHE-8922836 and the Ohio Supercomputer Center.

**Work performed under the auspices of the U.S. Dept. of Energy by the Lawrence Livermore National Laboratory under contract No. W-7405-ENG-48.

16;30
C7 11 *Ab Initio* Treatment of Low Energy Electron Collisions With C_2H_4* B. I. SCHNEIDER, Los Alamos National Laboratory, T. N. RESCIGNO and B. H. LENGSFIELD III, Lawrence Livermore National Laboratory, C. W. McCURDY**, Ohio State University -We report results of a complex Kohn variational calculation of the low energy electron scattering from C_2H_4. The calculations include exchange, target distortion and polarization via a separable, *ab initio* optical potential constructed using bound state techniques. The calculations reveal a low energy shape resonance in $^2B_{2g}$ symmetry at 1.83 eV, in excellent agreement with both beam and swarm measurements. In addition, a very low energy Ramsauer-Townsend (RT) minimum has been discovered in the ^2A_g cross section at 200 meV. Such minima have been observed in atoms and molecules having a high degree of symmetry (eg. CH_4.). Although swarm measurements have suggested the presence of such minima in many hydrocarbons, including C_2H_4, there has been skepticism on the part of many experimentalists to accept these data as fact. Our calculations are the first to confirm the existence of the RT effect in as aspherical a molecule as C_2H_4 and suggest that such minima are a ubiquitous feature of many e^- - polyatomic collision cross sections.
*Work performed under the auspices of the U.S. Dept. of Energy by the Los Alamos and Lawrence Livermore National Laboratories. **Supported by NSF CHE-8922836 and a grant from the Ohio Supercomputer Center.

16:42
C7 12 Low Energy Electron-Silane Scattering: *ab initio* Calculations in the Ramsauer minimum and low energy shape resonance regions*, C. W. MCCURDY and S. WEIGUO, Ohio State University, and B. H. LENGSFIELD III, Lawrence Livermore National Laboratory -- We have performed calculations of total and differential cross sections for e^--SiH_4 collisions at impact energies between 0 and 7.5 eV using the complex Kohn variational method. The response of the target SiH_4 molecule is described by an *ab initio* optical potential which contains of the order of 6000 configurations describing excited states of the target in the presence of the scattered electron. We find, in agreement with previous work, that there is no Ramsauer minimum in the static-exchange approximation (no optical potential). With the optical potential, excellent agreement is found with available experimental data in the region of the Ramsauer minimum. We identify the behavior of the cross section near 3 eV incident energy with a weak d-wave shape resonance, and we discuss how the inclusion of additional correlation effects may modify the computed cross sections in that region.

*Work at Ohio State supported by NSF CHE-8922836 ,Work at Lawrence Livermore National Laboratory performed under the auspices of the U. S. Dept. of Energy under contract W-7405-Eng-48.

Supplementary Paper

C7 13 Laser Assisted Dielectronic Recombination in Highly Charged Ions. S. N. Dixit , M. H. Chen, Lawrence Livermore National Laboratory*. --- In laser assisted dielectronic recombination (LADR), the DR rate is modified by absorption and re-emission of photons. Near resonances with intermediate states can enhance the LADR rate significantly. We are examining the possibilities of observing LADR in Helium-like ions. We are calculating *ab initio* LADR cross sections in order to determine specific level scheme and to estimate the required laser intensities for observing enhanced LADR. Detailed results will be presented.

* Work performed under the auspices of the U. S. Department of Energy by the Lawrence Livermore National Laboratory Under Contract No. W-7405-ENG-48.

SESSION C8: DAMOP: FUNDAMENTAL MEASUREMENTS AND PRECISION SPECTROSCOPY

Monday afternoon, 22 April 1991
Room 29, Washington Convention Center at 14:30
G. Greene, presiding

14:30
C8 1 Watt Balance Method for Determination of Planck's Constant. W.L. Tew, P.T. Olsen and E.R. Williams, NIST, Gaithersburg, MD. -- Highly accurate voltage standards based on the AC Josephson effect have long been maintained at NIST. When such a standard is calibrated against a SI voltage, as measured in terms of a known force, the Josephson constant, $K_J = 2e/h$, may be determined in SI units. Similarly, the integral quantum Hall effect provides a very accurate representation of the ohm. Hence, resistance standards at NIST are now calibrated in terms of the VonKlitzing constant, $R_K = h/e^2$. While these calibrations can be made with a relative accuracy of 10^{-8} or better, the accuracy of force determinations have heretofore been limited to about 10^{-6}. The watt balance method represents a significant improvement in force determinations by using a classical current balance modified to allow vertical motion of the force coil through a static magnetic field gradient[(1)]. A two part measurement determines the ratio of the SI watt to an electrical watt in terms of K_J and R_K [(2)]. First, a known gravitational force is compared with the force on the coil carrying an azimuthal current in a radial magnetic field. The coil is then swept vertically at a measured velocity to produce an EMF that determines the mutual inductance. The results are combined to yield $K_J^2 R_K = 4/h$, in SI units. We present preliminary measurements using the NIST watt balance with a special radial field superconducting magnet.
1. B.P. Kibble, in *Atomic Masses and Fundamental Constants*, vol. 5, J.H. Sanders and A.H. Wapstra, eds., Plenum, New York, 1976.
2. P.T. Olsen *et.al. IEEE Trans. Instrum. Meas.*, vol. IM-38 , 238, (1989).

14:42
C8 2 **Clock Synchronization and Isotropy of the One-Way Speed of Light.*** CLIFFORD M. WILL , Washington U. -- We analyze several recent experimental tests of the isotropy of the