

VI. INTERATOMIC FORCES*

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RESEARCH OBJECTIVES AND SUMMARY OF RESEARCH

1. Chemical Accelerator. To facilitate the detailed study of the reactive scattering of atoms and molecules we are developing a method for accelerating neutral atoms to energies in the eV range. The method employs the elastic scattering of fast charged particles from a neutral atomic-beam target. An apparatus has been constructed to study this process on a small scale. The measured intensity of the recoil atoms is in good agreement with the calculated results for this apparatus. To insure that the detected signal is not an artifact, and to show directly that the recoil atoms have increased energy, we are planning to carry out time-of-flight measurements using a pulsed electron gun.

2. Energy Levels of Hydrogen. There is some discrepancy between theory and experiment for the level structure of hydrogenic atoms. We have reconsidered the problem of calculating, from the Dirac equation, the wave functions for an electron in a Coulomb field perturbed by an added magnetic dipole field. We have solved the first-order perturbation theory equation exactly for this problem, and we intend to use these more exact wave functions in a detailed analysis of the lower levels of hydrogen and deuterium.

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