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FAX COVER SHEET

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Final report for Dr. Kelley from Dan Kleppner, M.I.T.

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October 19, 1993

Dr. Ralph Kelley
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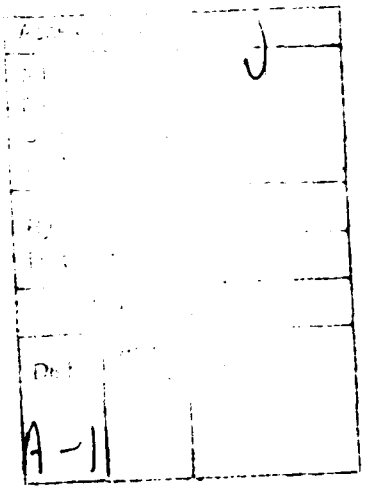
Dear Dr. Kelley,

Enclosed is the final Technical Report for AFOSR Grant F49620-92-J-0356 for the period 6/1/92-5/31/93.

Sincerely,

Dan Kleppner



Final report, AFOSR 90-0127B
Final Report for Grant period: 6/1/92 - 5/31/93
AFOSR F49620-92-J-0356

Daniel Kleppner
Massachusetts Institute of Technology

Our goal is to carry out ultra precise laser spectroscopy on trapped atomic hydrogen in the microkelvin regime, and to develop methods for measuring the 1S-2S transition frequency. The major effort during this past year was to perfect methods for carrying out ultraviolet laser spectroscopy in our cold hydrogen trap. We carried out extensive investigations on the absorption of UV light in various window materials, achieving values of a few percent. In addition, we developed a new method for dealing with the heat deposited in the window by controlling the helium film that lines the low temperature cell in which the experiment is carried out.

Other accomplishments include the development of improved instrumentation for spatially stabilizing and amplitude modulating the 243 nm laser beam, and improvements in the frequency control of the laser system.

We are currently incorporating these new developments into our apparatus, and anticipate carrying out an experimental run in the coming fall

In the course of our studies of the dynamics of our atom trap, we carried out a study of the sticking of hydrogen on a liquid helium surface in the quantum regime. The paper, "Evidence for Universal Quantum Reflection of Hydrogen from Liquid ^{4}He" by Ite A. Yu, John M. Doyle, Jon C. Sandberg, Claudio L. Cesar, Daniel Kleppner and Thomas J. Greytak, has been submitted to Physical Review Letters.

A Ph.D. thesis has been awarded during the past year to Jon C. Sandberg. The thesis title is "Research Toward Laser Spectroscopy of Trapped Atomic Hydrogen",