2. INTRODUCTION – *P. Richard*

This document summarizes work carried out in the J. R. Macdonald Laboratory, JRML, over the past three years under the project entitled, "Atomic Physics with Highly Charged Ions." The report presents a review of the research performed by the personnel of the experimental and theoretical groups of the JRML and of the technical assessments of the laboratory. The report is prepared for the Atomic, Molecular, and Optical physics program of the Fundamental Interactions Branch of the Division of Chemical Sciences, Office of Science.

This Progress Report is for the work done under DOE Grants DE-FG02-86ER13491 and DE-FG03-98ER14900. The former grant number refers to the grant with the title given above, and the latter grant number refers to the grant entitled, "Atomic Theory of Strongly Correlated Systems," C. D. Lin, Principal Investigator. The two grants are being combined and reviewed as one project in this and future years as discussed in Section B of the accompanying renewal proposal. This change will streamline the administrative efforts and strengthen the research program. It is being done with the approval of DOE.

During the last three years, work from the JRML was published in 115 papers in refereed journals, and was presented in 114 talks at international conferences and professional society meetings. Twenty-one of the latter were invited talks. The List of Publications and the List of Abstracts are given in Section 5. Section 3 contains the Progress Report. Section 3A presents the experimental program; Section 3B presents the theoretical program; and Section 3C presents a report on the facilities operation. Section 3B5 presents the progress reports on "Atomic Theory of Strongly Correlated Systems".

In the experimental program there are presently 7 tenured KSU faculty who receive two months of compensation (summer) from the grant, and 2 research faculty who receive full compensation from the grant. The tenured faculty is allocated four-tenths release time for research. The major changes in staffing during the last three years are that Martin Stöckli, who was a research faculty member, has become a tenured faculty member, and Charles Fehrenbach has been hired to replace him as a full time research faculty member. In the theory program, there are 3 tenured KSU faculty who receive two months of compensation (summer). As of last year, Chander Bhalla is on phased retirement status in which he no longer has teaching duties, but continues his research efforts. The physics department hired Brett Esry, who aspires to participate in the new grant (see accompanying Renewal Proposal). Jim Legg is the former laboratory director and the present head of the Physics Department. He does not participate in the research program, and therefore does not receive compensation from the grant. He attends our laboratory meetings and acts as an advisor.

We have a steady state of 9 full-time staff members and one part-time secretary. One of our 9 staff members is paid by KSU. The only change in staffing over the last three years has been the departure of Steve Kelly, Electronics Technician, who accepted a job at the University of Montana as their chief Electronics Engineer. We have recently hired Scott Chainey in his place. He has an EE degree from KSU.

We presently have four research associates (2 in experiment, 2 in theory) and one visiting faculty member. We have 12 graduate students, each of whom has a four-tenths time appointment.

The JRML research program therefore receives a 33 FTE effort and the DOE grant funds a 22 FTE effort, or 67% of the total effort.

Note: Most results presented in this Progress Report are described much more comprehensively in the publications listed. The accounts given here summarize only some of the main and typical results and conclusions.