Abstract Submitted
for the GEC14 Meeting of
The American Physical Society

Theoretical modeling of laser-induced plasmas using the ATOMIC code[1] JAMES COLGAN, HEATHER JOHNS, DAVID KILCREASE, ELIZABETH JUDGE, JAMES BAREFIELD II, SAMUEL CLEGG, KYLE HARTIG, Los Alamos National Laboratory — We report on efforts to model the emission spectra generated from laser-induced breakdown spectroscopy (LIBS). LIBS is a popular and powerful method of quickly and accurately characterizing unknown samples in a remote manner. In particular, LIBS is utilized by the ChemCam instrument on the Mars Science Laboratory. We model the LIBS plasma using the Los Alamos suite of atomic physics codes. Since LIBS plasmas generally have temperatures of somewhere between 3000 K and 12000 K, the emission spectra typically result from the neutral and singly ionized stages of the target atoms. We use the Los Alamos atomic structure and collision codes to generate sets of atomic data and use the plasma kinetics code ATOMIC to perform LTE or non-LTE calculations that generate level populations and an emission spectrum for the element of interest. In this presentation we compare the emission spectrum from ATOMIC with an Fe LIBS laboratory-generated plasma as well as spectra from the ChemCam instrument. We also discuss various physics aspects of the modeling of LIBS plasmas that are necessary for accurate characterization of the plasma, such as multi-element target composition effects, radiation transport effects, and accurate line shape treatments.

[1]The Los Alamos National Laboratory is operated by Los Alamos National Security, LLC for the National Nuclear Security Administration of the U.S. Department of Energy under Contract No. DE-AC5206NA25396.

James Colgan
Los Alamos National Laboratory

Date submitted: 04 Jun 2014 Electronic form version 1.4