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Analysis of the Spectrum of Doubly-Ionized Cesium (Cs III)
CRAIG J. SANSONETTI, National Institute of Standards and Technology, KENNETH L. ANDREW, Purdue University, ROBERT D. COWAN, Los Alamos National Laboratory — We have made new observations of the spectrum of doubly-ionized cesium (Cs III) in the region 400 Å to 2.3 μm using grating and Fourier transform spectrometers. The spectrum was excited in sliding spark and pulsed radio-frequency discharges. Definitive separation of ionization stages was obtained by varying the source operating conditions. More than 1000 lines were classified as transitions between 76 odd and 97 even parity levels. Of 126 expected levels in the configurations $5s^25p^5$, $5s5p^6$, and $5s^25p^4$(5d, 6s, 6d, 7s, 6p, and 4f), 120 were found as well as some levels of $5s^25p^4$(7d, 8s, 7p, 5f, and 5g). The levels were theoretically interpreted using Hartree-Fock calculations and least-squares fitting of energy parameters to the observed levels. Transition probabilities were calculated using semi-empirical wave functions derived from the least-squares fits. The ^{2}P interval in the $5s^25p^5$ground configuration and the hyperfine structure of the $^2P_{1/2}$ and $^2P_{3/2}$ levels were determined to high accuracy by observation of the forbidden transition $5s^25p^5$ $^2P_{1/2}$ – $^2P_{3/2}$ at 7219 Å. The hyperfine structure of this transition shows it to be pure magnetic dipole in character in agreement with theoretical calculations of the magnetic dipole and electric quadrupole transition rates.

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