

Abstract Submitted
for the DAMOP18 Meeting of
The American Physical Society

The Ruby Phosphorescence Laboratory: Measuring the 2E -Term Room-Temperature Lifetime of Cr^{3+} .¹ ANTHONY CALAMAI, J. HINDS, W. DULANEY, T. DULA, J. BURRIS, B. HESTER, Appalachian State Univ — Many existing advanced laboratory experiences associated with the metastable 2E term of Cr^{3+} in ruby, which gives rise to the R-lines at 692.7 and 694.3 nm, focus on a room-temperature measurement of the radiative lifetime of the 2E term. These projects typically use commercially available ruby spheres for which the manufacturer(s) only state an ~ 2 -percent chromium concentration. The uncertainty in Cr^{3+} concentration represents one source of systematic error for this laboratory experience. In our local work developing a cost-effective laboratory experience in atomic phosphoresce, we noted a lack of consistency in the literature for the lifetime of the $\text{Cr}^{3+} {}^2E$ term. We present our results and corrections for systematic issues that make this project a more rewarding experience for students. Our result for the room-temperature radiative-lifetime for the 2E term is 3.3 ± 0.1 ms; which, unlike some more recent reports (e.g. [1]), compares favorably with that of Nelson and Sturge [2]. [1] Espositi, C.D. and Bizzocchi, L., J. Chem. Ed., V84, 1316, (2007). [2] Nelson, D.F. and Sturge, M.D., Phys. Rev., V137 4A, A1117, (1965).

¹We thank the NASA/NC Space Grant for student salary support.

A. G. Calamai
Appalachian State Univ

Date submitted: 25 Jan 2018

Electronic form version 1.4