

Abstract Submitted
for the DAMOP09 Meeting of
The American Physical Society

Low Energy Rydberg States in Dipositronium JOSEPH DIRIENZI,
College of Notre Dame of Maryland, RICHARD DRACHMAN — Previously the
possible resonances in positronium hydride, PsH, [1] were studied, assuming a
positronium ion, Ps^- , interacting with a proton, H^+ , as the prime configuration.
This study will look at the first resonances of dipositonium, Ps_2 , in a similar man-
ner. In this situation a variational method is used to determine the radial function
of the bound state. First, the model system consisting of Ps^- and a positron, e^+ is
investigated by including electron exchange but no positron exchange. Then the
antisymmetrization of the two positrons is considered giving rise to a non-local po-
tential. The full symmetrization of a system such as Ps_2 involves not only exchanging
electrons and exchanging positrons, but also the charge conjugation of the two in-
teracting ions in our model. Thus, in this second approach we construct a wave
function that includes representations of both the $\text{Ps}^- + e^+$ and $\text{Ps}^+ + e^-$ channels
to provide a complete description of this resonant system. From the calculations,
the lowest energy singlet Rydberg resonant states are determined. A comparison
will be made with results using group-theory analysis [2]. [1] J. Di Rienzi, R. J.
Drachman, Phys. Rev. A **76**, 032705 (2007). [2] J. Usukura and Y. Suzuki, Phys.
Rev. A **66**, 010502(R) (2002); C. G. Bao and T. Y. Shu, Phys. Rev. A **67**, 042505
(2003).

Joseph DiRienzi
College of Notre Dame of Maryland

Date submitted: 20 Jan 2009

Electronic form version 1.4