Abstract Submitted
for the DAMOP09 Meeting of
The American Physical Society

Hyperfine-induced Intercombination Transitions n^3D_1 to 2^1P_1 in ^{3}He* GORDON DRAKE[1], QIXUE WU, University of Windsor — In heliumlike ions with nuclear spin, the electric dipole transition $2\ ^3P_J \rightarrow 1\ ^1S_0$ is allowed since hyperfine interaction causes mixing between two hyperfine states with different J but the same F (due in part to fine-structure interactions for $J = 1$). Since the pioneering works of Garstang and Mohr, the hyperfine-induced intercombination transition has been a subject of experimental and theoretical interest. However, previous works treated only the more highly charged He-like ions ($Z \geq 6$) since the singlet-triplet mixing caused by hyperfine interaction is so small for low-Z ions that the induced intercombination line $2\ ^3P_J \rightarrow 1\ ^1S_0$ is difficult to observe. In contrast, we have found theoretically that for ^{3}He ($Z = 2$), the hyperfine-induced intercombination transitions $n\ ^3D_1(F = 3/2) \rightarrow 2\ ^1P_1(F = 1/2)$ with higher n have comparable intensities to normal E1 transitions between two hyperfine states. The calculated results show that hyperfine-induced intercombination transitions contribute 46 percent ($n = 10$), and 35 percent ($n = 9$) of all E1 transitions $^3D_1(F = 3/2) \rightarrow 2\ ^{1,3}P_J(F)$. Similar results of this induced transition have been obtained as well for $^3D_1(F = 3/2) \rightarrow n\ ^1P_J(F)$ with $n = 3$ to 10. High precision variational calculations in Hylleraas coordinates of the line strength will be presented.

[1]Supported by NSERC (Canada) and SHARCNET.

Gordon Drake
University of Windsor

Date submitted: 23 Jan 2009 Electronic form version 1.4