Abstract Submitted
for the GEC07 Meeting of
The American Physical Society

Doppler broadening of atomic-hydrogen lines in low E-field plasmas R.L. MILLS, KAMRAN AKHTAR, J. HE, M. NANSTEEL, B. DHANDAPANI, Z. CHANG, W. GOOD, Y. LU, Blacklight Power Inc. — Substantial broadening of the H_α lines of hydrogen admixed with preionized atoms is observed in filament heated and inductively coupled plasmas where the applied electric field is quite low. These filament heated hydrogen plasmas forms at low temperatures (e.g.) and low field strength ($\sim$1-2 V/cm) when argon and strontium were present with atomic hydrogen, exhibit H_α line broadening ($\sim$24 eV). H_α line broadening (20-24 eV) is also observed in inductively coupled plasma where the voltage drop across the plasma sheath is small. Moreover, the selective transfer of energy to H atom and the absence of comparable hot helium atoms ($<$0.5 eV) where the atomic mass ratio is 4:1 along with the absence of hot H atoms in Xe/H_2 plasmas are also inconsistent with the field acceleration model [e.g., Cvetanovic et. al. J. App. Phys., 97, 033302-1, 2005]. Plasma diagnostics include high-resolution optical emission spectroscopy, Langmuir probe and millimeter wave interferometeric measurements. The model of an energetic chemical reaction of hydrogen [Mills et. al *IEEE Trans. Plasma Sci.,* 31, 338, 2003] as the source of broadening can explain the observation that certain plasmas exhibit the selective extraordinary broadening.

Kamran Akhtar
Blacklight Power Inc.

Date submitted: 18 Jun 2007 Electronic form version 1.4