Plasma-induced electron screening at the Bragg Peak

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Over 36 years of laboratory astrophysics experiments employing accelerated hydrogen isotope beams have demonstrated the role of electron screened, enhanced nuclear reactions. The astrophysical role of weak and strong electron screening was first discussed by Saltpeter [1] in 1954 and later by Hagino and Balantekin [2] in 2002. Assenbaum, *et al.* [3], Czerski, *et al.* [4], and Schenkel, *et al.*, [5] have used accelerated deuteron beams on various metal targets and observed increased fusion rates over the expected Astrophysical, *S(E),* and Gamow Factors for bare deuteron-deuteron fusion rates. The Pines [6] calculated both electron screened direct and asymptotic enhancement factors, *f(E)* in condensed matter. Arguably, *electron screening makes LENR possible.*

We propose an enhanced electron screening effect occurs due to plasma screening as charged particles traverse condensed matter and sweep electrons with them. These electrons will be most pronounced at the Bragg Peak where the ions come to rest and have been observed with high Linear Energy Transfer (LET) particles in Solid State Nuclear Track Detectors. In fact, Pines [6] noted plasma screening equals erbium atomic electron screening.

Ziegler's SRIM/TRIM code [7] modeled the effective Bragg Peak (Fig 1) for a 6 keV deuteron beam in Pd where the ions have a range of 433 angstroms. Experimentally, this Bragg Peak model can assist in statistically knowing the nuclear reaction depth in condensed matter by the charged particle LET losses. For example, a 3 MeV proton from the D(*d,p*)^{3}He reaction in a lattice could be predicted/located using this model. Plasma screening effects haven't been previously considered in laboratory astrophysics experiments. If these effects are considered, a better understanding of when and where d-d fusion reactions occur could be accomplished.

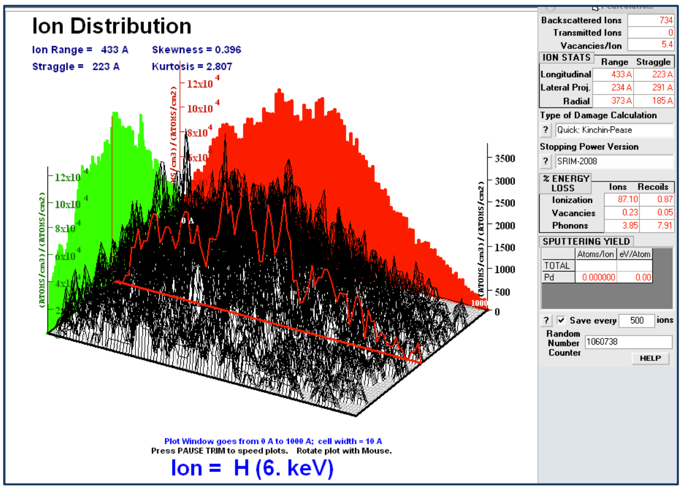

Figure 1 Bragg Peak for 6 keV D on Pd

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