

## The Interaction of Fast Alpha Particles with Pellet Ablation Clouds

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### *Abstract*

The energy spectra of energetic confined alpha particles are being measured using the pellet charge exchange method [R.K. Fisher, J.S. Leffler, A.M. Howald, and P.B. Parks, *Fusion Technol.* **13** (1988) 536]. At present this is the only proven method for making such measurements. The technique uses the dense ablation cloud surrounding an injected impurity pellet to neutralize a fraction of the incident alpha particles, allowing them to escape from the plasma where their energy spectrum can be measured using a neutral particle analyzer. The signal calculations given in the above-mentioned reference disregarded the effects of the alpha particles' helical Larmor orbits, which causes the alphas to make multiple passes through the cloud. Other effects such as electron ionization by plasma and ablation cloud electrons and the effect of the charge state composition of the cloud, were also neglected. This report considers these issues, reformulates the signal level calculation and uses a Monte-Carlo approach to calculate the neutralization fractions. The possible effects of energy loss and pitch angle scattering of the alphas are also considered.

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