

Abstract Submitted  
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**Plasma Assisted Electron Beam Energy Boosting by Ambient Gas Pressure Optimization in Pyroelectric Crystal Accelerators** JAMES BROWNRIDGE, Binghamton Univ, Binghamton, NY, STEPHEN SHAFROTH, Univ of NC at Chapel Hill — Pyroelectric crystal x-ray generators [1] were first reported in 1992. These crystals have a nonzero spontaneous polarization at all temperatures below their Curie temperature. A change in crystal temperature will result in a strong electric field at its surface. If the Z- face on a Z-cut pyroelectric crystal is located in a gas at mTorr pressure the energy of electrons that are accelerated away from the crystal as it is cooled can be increased by increasing the gas pressure. As the crystal is cooled the spontaneous polarization increases, this results in an increase in the uncompensated negative charge at the surface of the crystal. The field produced by this charge is strong enough to field ionize molecules of the gas. A tentative explanation for the energy boosting of the beam follows: In this strong field these molecular ions are polarized and attracted to and stick to the surface of the crystal. Once attached to the surface of the crystal the electron cloud around the molecules is further distorted and pushed away. These polarized molecular ions increase the strength of the electric field at the surface of the crystal and increase the electron beam energy. Hence an increase in pressure boosts the beam energy. In an ultra high vacuum no energy boosting occurs.  
[1] J.D. Brownridge, Nature (London) **358,278 (1992)**

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