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Crystallographic analysis using electron transmission by graphite[1] BRYAN NEAL, NICK LANNING, CRISTIAN BAHRIM, Department of Physics, Lamar University — The transmission of electrons through graphite crystals reveals quantum details about the interaction between projectile electrons and the atoms in the crystal. The projectile electrons are Fourier transformed into wave packets by the K-shell and L-shell electrons of Carbon atoms in the ground state. The formation of a wave packet in crystals can be explained using Heisenberg's Uncertainty Principle. The quick passage of projectile electrons through the crystal is due to the Pauli Exclusion Principle which forbids the projectile electrons from occupying quantum states in the ground state electronic configuration of Carbon. The analysis of the electron diffraction pattern indicates the effective electronic charge density responsible for spreading the initially well-collimated electron beam into a broad diffraction maximum with a Lorentzian shape in the center. This Lorentzian profile allows us to extract the characteristic time of the projectile electron – atom interaction. Furthermore, the analysis of the interference maxima allows us to calculate the length of the C-C bond, the crystal lattice, and the spacing between the graphene layers of a hexagonal graphite crystal.

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Bryan Neal
Lamar University

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