Physics of the Future: Demonstrating Quantum Entanglement

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This experiment was conducted to detect quantum entanglement of paired photons produced by electron - positron (matter – antimatter) annihilation events that result from Sodium-22 decay. Entangled photons have many applications, such as quantum computers, or in futuristic technology like instant teleportation of information. It was hypothesized a pair of Geiger counters connected to coincident detection equipment could be used to detect the gamma-ray energy of entangled photons released from positron-electron annihilation events. A lead collimator was used to reduce spurious radiation detected by the Geiger counters, but allowed gamma-rays to escape from the ends of it. Aluminum blocks were then placed at the ends of the collimator to diffuse gamma-ray emissions and sent them in all directions. Entangled photons reveal themselves as gamma-ray emissions that radiate from the aluminum blocks at 90 degrees or “perpendicular” to each other. The hypothesis was proven correct on at least one occasion when the level of coincident gamma-rays were detected in the perpendicular position above the background radiation level and above levels detected when the detectors were in a position other than perpendicular to each other. This experiment could be improved by conducing it underground or in a proper research facility equipped with lead walls.

Awards Won: