The Power of a Star in a Jar: Using Nuclear Fusion for Medical Radioisotope Production

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With the leading causes of death in America, heart disease and cancer, requiring the use of medical radioisotopes for diagnostic and treatment purposes, and a limited amount of production sites, medical radioisotopes are in constant short supply. This project aims to address the limited and inconsistent supply of medical radioisotopes with the usage of a Farnsworth - Hirsch fusor as a neutron source. The project involved the use of a Farnsworth - Hirsch-styled chamber that operated at 9kv, ~ 3mA with a 40-micron deuterium pressure. The project utilized the neutrons produced from nuclear fusion to activate elements. Various test runs concluded that while the chamber was in the theoretical range of d2 - d2 fusion, the voltage was too low to activate Silver. The project was limited in parts but will be operating with a feedthrough capable of 50kv and a 60kv power supply that should put the fusor far within the number of fusion events necessary for activation while still staying within the ISEF limit of 25Kv. In the future, more isotopes will be tested to determine the cross-section limits of the fusor.

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