Optimization of Pyroelectric Neutron Generators

by

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ABSTRACT

A two pyroelectric crystal system is designed around producing a high potential to accelerate deuterium ions in order to achieve D-D fusion. To achieve the highest possible neutron yield, the two pyroelectric crystals must be working in unison. This was successfully accomplished through the use of crystal synchronization. When the individual crystals emission and energy spectrum are aligned by a delay in their thermal profiles there is an increase in the observed energy. In addition to crystal synchronization, the vacuum chamber was redesigned to limit components in the vicinity of the crystal. The new features included custom designed aluminum inserts to mount the crystal and a glass chamber. An average neutron yield of 3.3×10^3 ($\pm$ 455) neutrons per thermal cycle was obtained in consecutive experiments. The highest yield for a single thermal cycle was 4.6×10^3 ($\pm$ 539) neutrons. Development and implementation of a deuterated metal target in a two crystal system was achieved. This work further contributes to two pyroelectric crystal neutron generators and can be used as a guideline for future experiments.