

CHARACTERIZATION OF ION SOURCES FOR COMPACT ACCELERATOR NEUTRON PRODUCTION

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ABSTRACT

Compact neutron interrogation systems are a good candidate for use in active interrogation systems when large scale active or passive interrogation systems are not ideal. Field emitter arrays and plasma ion sources could produce ion beams of deuterium or deuterium and tritium which strike a target doped with deuterium or deuterium and tritium, thus producing and interrogating neutron flux.

Ion sources for accelerator neutron generators are being studied. Field emitters are simulated using different aspect ratios, cone angles, and base-to-base spacing to determine the changes in field enhancement factor and theoretical ion currents. The plasma ion source is tested to determine the most appropriate gas pressures, extraction voltages, aperture sizes and gap distances for extraction of the highest ion currents from the plasma.

Field emitters with spherical tips have a large area of high electric field near the tip and have theoretical ion currents on the order of nanoamps per structure. Differentially pumped plasma ion sources produce extracted ion currents in the microamp range using small apertures and a short gap length.