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A Compact Superconducting RF Accelerator for Electron Beam and X-ray Irradiation

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As commercial and industrial applications of electron beam and x-ray irradiation have developed, new applications have emerged that require very high beam power to create the required radiation field. These new applications require dependable, efficient, high energy, high power electron accelerators.

Recent developments in Superconducting Radio-Frequency (SRF) technology can now enable accelerators with lower costs and improved performance. Cryogenic heat loads are dramatically reduced through use of new materials and improved component designs. New cooling methods allow the replacement of complex systems requiring cryogenic fluids with simple robust systems with no fluids. New RF sources can greatly reduce the cost of RF power. Each of these developments has been individually proven and an effort is underway at the Illinois Accelerator Research Center at Fermilab to integrate them into the first prototype of an entirely new class of industrial SRF-based accelerators. These accelerators will enable robust, turn-key operation with very high electrical efficiency. The accelerator prototype under design will be capable of 10 MeV beam, CW operation, and 250 kW of electron beam power. These modular systems are small enough to be palletized and transported to the point of use. Their high electrical efficiency mean that portable power generation systems can be enable their use in mobile applications.

The goal is a compact, cost effective, high power accelerator suitable for many of the applications covered by this conference. Fermilab is actively working to build the prototype and identify partners for commercialization. The end product will be a commercially available, robust, turn-key system for applications requiring reliable electron beam or X-ray irradiation.

Country/Organization invited to participate

United States of America

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