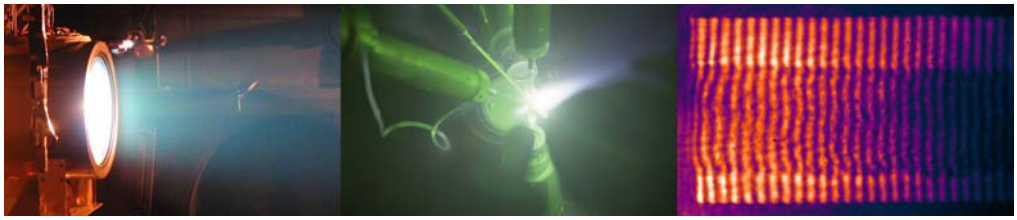

Michigan Institute for Plasma Science and Engineering Seminar

ENGINEERING CHALLENGES OF PARTICLE ACCELERATORS

Prof. Richard Carter
Lancaster University, UK

Wednesday, 12 May 2010 - 1:00 pm
Baer Conference Room – Cooley Building
Joint Seminar - Dept. Nucl. Engr. & Radiol. Sci.

Abstract

Engineers seek to respond to human needs and aspirations. They do this by drawing on the vast accumulated knowledge of the profession and by engaging in research to meet new challenges. An example of this process is found in the design of particle accelerators for advanced scientific research.

Particle accelerators are essential research tools in many fields of science and technology. The use of machines such as the Large Hadron Collider at CERN to probe the fundamental secrets of the universe is well-known. Other, less familiar, machines are used to make progress in life sciences, surface and materials science and nano-technology. All accelerators employ high power radio waves to accelerate tiny bunches of charged particles to speeds approaching that of light. The particle bunches may be used directly in scientific experiments or to generate other particles or intense light for that purpose. The development of these machines provides great challenges for the engineers who design and build them.

This talk will describe some of the engineering challenges involved in developing accelerators and illustrate them from research being carried out in the High Power Microwave Research Group in the Engineering Department at the University of Lancaster, UK.

About the Speaker: Prof. Richard Carter was appointed to the Engineering Department of Lancaster University in 1972 and was promoted to a Chair in 1996. He was influential in the formation of the Faraday Partnership in High Power Radio-Frequency Engineering in 2001 and the Cockcroft Institute of Accelerator Science and Technology in 2004. He is an IEEE Electron Devices Society Distinguished Lecturer and has been a member of the Technical Committee on Vacuum Electronics since 1998. Prof. Carter received the IVEC 2009 Award for Excellence in Vacuum Electronics at the 10th International Vacuum Electronics Conference for "a life-long commitment to education in vacuum electronics and visionary leadership in academia and technical research in the field". Prof. Carter's breadth of expertise is demonstrated by innovative contributions to modeling a variety of structures of travelling-wave tubes (TWTs) with particular emphasis on equivalent circuit definition, performance improvements and large signal aspects; design and simulation of strapped magnetron anodes; beam-wave interaction in klystrons and multi-beam klystrons; and development of methods of cold-test measurement for components used in microwave tubes.