MECHANICAL & INDUSTRIAL ENGINEERING COLLOQUIUM: ME 794

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1:00 – 2:30 PM
221 MEC

Electron Cyclotron Heating Launchers on the DIII-D and KSTAR Tokamaks

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Controlled nuclear fusion has long been regarded as an ideal energy source for the future. Sustaining the reaction in a controlled fashion is an immense technological challenge. A plasma consisting of deuterium and tritium ions must be confined and heated sufficiently for an adequate reaction to occur.

Achieving this goal is an immense scientific and technological challenge involving many fields of activity. One such field is electron cyclotron heating, which is used to heat the plasma and to control instabilities. The launcher of an electron cyclotron heating system, which steers the microwave beam, must withstand large electromagnetic forces, high heat loads and, ultimately, high radiation doses. Operation of these moving components in ultra high vacuum poses additional challenges.

These challenges, and their solutions, are illustrated by the design of ECH launchers for two fusion experiments, the DIII-D and KSTAR tokamaks. I will show that, even for high technology projects involving advanced materials and computer analysis, old-fashioned mechanical engineering is still fundamentally important.

BIOGRAPHY

Bob Ellis is a mechanical engineer at the Princeton Plasma Physics Laboratory (PPPL). Born in Princeton, NJ, he received a BSE from Princeton University in Mechanical and Aerospace Engineering and, years later, a MSME in Mechanical Engineering from New Jersey Institute of Technology.

He has been employed at PPPL since 1981, working on the design and analysis of components and systems for controlled nuclear fusion experiments, and his hardware has been used on experiments in South Korea, England, and in the United States at General Atomics, MIT, and PPPL.

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