

University of Michigan
Nuclear Engineering and Radiological Sciences

Weekly Colloquium

Effects of Surface Roughness on Electrical Contact, RF Heating and Field Enhancement

Speaker: Professor Y.Y. Lau, NERS

Abstract:

Surfaces are never perfectly flat. Because of the surface roughness on a microscopic scale, true contact between two pieces of conductors occurs only at the asperities (small protrusions) of the two contacting surfaces, leading to contact resistance, an important issue to high power microwave sources, wire-array Z pinches, metal-insulator-vacuum junctions, field emitters, thin film devices and integrated circuits, and interconnects, etc. Surface roughness may also cause enhanced RF absorption on the surface, an important consideration for MW gyrotron and for the development of THz source. Another profound effect of surface roughness is the excessive local electric field enhancement that triggers RF breakdown. In a superconducting cavity, surface roughness is known to cause local magnetic field enhancement that leads to abrupt quenching, i.e., rapid loss of superconductivity.

This talk features recent advances on the modeling of various effects of surface roughness, including electrical contact resistance for both bulk contacts and thin film contacts. Scaling laws are constructed for a large range of resistivity ratios and geometries in the contact members. Also presented is roughness-induced enhanced RF heating, and the enhanced RF electric and magnetic fields.

Friday, September 30, 2011
4:00 P.M.
White Auditorium
Cooley Building

Refreshments served at 3:45