

BEAM-PLASMA INTERACTION AND LANGMUIR TURBULENCE

Peter H. Yoon, IPST, University of Maryland

The Langmuir wave turbulence generated by the electron beam-plasma interaction has been studied since the early days of plasma physics research. In the present talk a number of recent developments in this research topic shall be overviewed. The topics include [1] the problem of suprathermal electron generation by Langmuir turbulence, [2] the generation of electromagnetic radiation during the beam-plasma interaction process, and [3] the spatio-temporal beam and Langmuir turbulence propagation. First, the solar wind electron distribution function measured at 1 AU shows that the observed distribution possesses an energetic power-law tail component. The recent theory of Langmuir turbulence predicts that such an energetic tail distribution can be produced. Upon comparison with observed power-law index, it is found that the theory agrees remarkably well with observation. Second, the solar radio bursts known as type II and type III radio emissions are commonly interpreted in terms of nonlinear conversion of beam-generated Langmuir turbulence into EM radiation at the plasma frequency and its harmonic. However, the actual set of basic plasma turbulence equations that describe such a process has never been fully solved. We have recently begun to address this age-old problem, and we shall report the latest findings. Finally, the spatio-temporal evolution of the electron beam and Langmuir turbulence is of importance in both laboratory as well as space plasmas. This topic may have a direct relevance to ionospheric application, and recent developments in this are shall also be discussed.