

Discharged Produced Plasma based SXR/EUV Source

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It has been unequivocally identified that the short-pulsed transient plasmas of small size, high temperature and high density is the most efficient EUV/SXR radiation source and it is possible to achieve this kind of plasmas either by excitation through pulsed electrical discharge, so called Discharge Produced Plasma (DPP) or through pulsed laser radiation i.e., Laser Produced Plasma (LPP). The Plasma Radiation Sources Lab at NIE/NTU concentrates on conceptualizing, developing and optimizing Dense Plasma Focus (DPF) device, a non-cylindrical z-pinch device which belongs to DPP source category, as the SXR/EUV source for lithography. The DPF is essentially a coaxial plasma gun where an electrical discharge across the closed end of the electrode assembly is initially accelerated by self generated electromagnetic forces before being compressed into hot dense pinch plasma column which radiates copiously in SXR/EUV region. Record radiation yield, from neon filled DPF device, with wall plug efficiency of 4% has been successfully achieved in our NX2 plasma focus device. The 2 kJ NX2, a high performance high repetition rate DPF device, has been successfully used for demonstration lithography. Several plasma and radiation diagnostic techniques have been successfully developed and implemented to understand the plasma dynamics and radiation emission characteristics of plasma focus device. Recently, we have started to work on miniature low energy (<250 J) plasma focus device as portable radiation source. This talk/tutorial will concentrate on fundamental physics and technology of DPF devices, SXR/EUV emission processes and characteristics of DPF device, potential applications of DPF device as SXR/EUV source, advantage and limitations of this device as SXR/EUV source etc.

Rajdeep Singh Rawat - Biography



Rajdeep Singh Rawat, did his B.Sc.(Hons) Physics, M.Sc. Physics and Ph.D. from University of Delhi, Delhi in 1985, 1987 and 1994. He lectured at Department of Physics and Electronics, SGTB Khalsa College, University of Delhi, from 1992 to 2000. He joined National Institute of Education, Nanyang Technological University, Singapore in Dec 2000 as Assistant Professor and then later became Associate Professor in Oct 2005. Rajdeep's main research interest involves performing fundamental studies on pulsed plasma devices such as Dense Plasma focus (DPF) and Pulsed Laser Deposition (PLD) and their applications to soft x-ray lithography, radioisotopes synthesis, soft and hard x-ray imaging, material modification, and nano-structured material synthesis. He has extensive experience in various basic plasma diagnostic techniques like laser shadowgraphy, x-ray spectrometry, x-ray imaging, optical emission spectroscopy, ion beam analysis, optical streak photography, neutrons and charged particles measurement etc, that are use to carry out research in fundamental aspects of pulsed plasma systems. He is leading the research efforts at Plasma Radiation Source Lab at NSSE/NIE and have developed several plasma focus devices there which include two 3-kJ, three 200-J and one 20 kJ PF systems.