

Plasma characterization in GLAST-III spherical tokamak using linear photodiode array and triple Langmuir probe

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Abstract

A newly developed diagnostic system based on linear photodiode array and triple Langmuir probe for spatial and temporal characterization of hydrogen plasma in Glass Spherical Tokamak (GLAST-III) has been reported. The spectral range of each silicon photodiode is from 300 nm to 1100 nm with response time of 10 ns and active area of 5 mm²(circular). The light from the plasma is collected through narrow opening along 4 lines of sight channels with spatial resolution of about 5 cm. The photodiode's signals located at position of 10 and 14 cm from inboard side show fluctuating behaviour of the central plasma region. Moreover, the sequence of plasma lighting shows that plasma instigates from the central resonant field region and then expands outwards. At lower pressure, outboard movement of the plasma is slower suggesting better plasma confinement. In addition to photodiode array, an Ocean spectrometer (HR2000+) has been used to record the visible spectrum over the selected range (597–703 nm) with a spectral resolution of 0.15 nm. The studies have been conducted during initial phase of plasma formation for two different hydrogen gas fill pressures. Triple Langmuir probe (TLP) is used to obtain time-resolved information on plasma parameters in the edge region. The time evolution of whole discharge including microwave pre-ionization phase and current formation phase has been well seen by temporal profiles of light emission and plasma floating potential.

Biography:

A. Qayyum was born in District Bhimber (AJ&K), in 1965. He received the M.Sc. degree in Physics, and the M.Phil. and Ph.D. degrees in Plasma Physics from the QAU, Islamabad. From 2006 to 2007, he has been an Assistant Professor with the Physics Department of GC University, Lahore. Currently he is Principal Scientist and head of "Electric Probes & Spectroscopy Group" with the National Tokamak Fusion Program. He is the author of one book and more than 40 research articles. He has developed triple, emissive and sweep Langmuir probes for GLAST. He was the winner of WORLD LABORATORY scholarship for research project entitled "Establishment of a Centre for High-Energy Physics and Cosmology in Pakistan" by World Federation of Scientists, Lausanne, Switzerland. He was also the winner of Research Productivity Award from Ministry of Science & Technology, Government of Pakistan for the years 2010, 2011, and 2012.



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