**ADVANCING UNDERSTANDING OF TRANSPORT IN STELLATORS AND RFPs WITH MEASUREMENTS FROM THE PLASMA CORE**

P. J. Fimognari, D. R. Demers
Xantho Technologies, LLC - Madison, WI, USA

**ABSTRACT**

The heavy ion beam probe (HIBP) offers the unique ability to probe the edge plasma in a tokamak and stellarator, in a radially and temporally resolved manner, to infer transport and turbulence. The HIBP and its plasmonic detector (Pn), a new tool for the tokamak community, are envisioned as a key path toward understanding the transport physics in plasmas, particularly in the edge region. The HIBP measures primary particle and secondary ion trajectories to infer radial and poloidal electric fields and plasma potential. A 25-50 keV Tl beam covers a portion of the upper-outer quadrant and RFPs with measurements from the plasma core. 0.9-1.7 MeV thallium beam covers a portion of the upper-outer quadrant, and RFPs with measurements from the plasma core. 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0

**HEAVY ION BEAM PROBE TRANSPORT PHYSICS FOCUS**

**UNIQUE MULTI-POINT, TIME-RESOLVED CORE MEASUREMENT ABILITIES**

Plasmonic detectors (Pn) monitor core plasma fluctuations and turbulence. The HIBP measures primary particle and secondary ion trajectories to infer radial and poloidal electric fields and plasma potential. A 25-50 keV Tl beam covers a portion of the upper-outer quadrant, and RFPs with measurements from the plasma core. 0.9-1.7 MeV thallium beam covers a portion of the upper-outer quadrant, and RFPs with measurements from the plasma core.

**DIAGNOSTIC INNOVATIONS FACILITATE OPERATION**

A 50 kW beam is capable of studying from edge to core.

**THE HIBP DEVELOPED FOR AND OPERATED ON TEXT-U IS NOW AT JPP**

**SUMMARY**

- The HIBP provides a unique suite of multi-point, non-perturbing, simultaneous measurements that can access the plasma core - 
  - A 25-50 keV Tl beam can probe the plasma upper half - Signal strengths would be sufficient out to 1-2 kA - 1.00 0.75 0.50 0.25 0.00 - Often, several simultaneously in the same discharge

- The phase space of the HIBP is unique in its ability to probe density and potential in the presence of magnetically confined plasmas. These measurements are critical to the inference of transport and turbulence and to understand edge and core physics. The HIBP and its plasmonic detector (Pn) are envisioned as a key path toward understanding the transport physics in plasmas, particularly in the edge region. The HIBP measures primary particle and secondary ion trajectories to infer radial and poloidal electric fields and plasma potential.

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