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**Role of external magnetic field and current closure in the force balance mechanism of a magnetically stabilized plasma torch** RAVI G, VIDHI GOYAL, Institute for Plasma Research, Gandhinagar, India — Experimental investigations on the role of applied external magnetic field and return current closure in the force balance mechanism of a plasma torch are reported. The plasma torch is of low power and has wall, gas and magnetic stabilization mechanisms incorporated in it. Gas flow is divided into two parts: axial-central and peripheral-shroud, applied magnetic field is axial and return current is co-axial. Results indicate that application of large external magnetic field gives rise to not only  $\mathbf{J} \times \mathbf{B}$  force but also, coupled with gas flow, to a new drag-cum-centrifugal force that acts on the plasma arc root and column. The magnetic field also plays a role in the return current closure dynamics and thus in the overall force balance mechanism. This in turn affects the electro-thermal efficiency of the plasma torch. Detailed experimental results, analytical calculations and physical model representing the processes will be presented and discussed.

Ravi G  
Institute for Plasma Research, Gandhinagar, India

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