A Hall Sensor Array for Internal Current Profile Constraint

M.W. Bongard, R.J. Fonck, B.T. Lewicki, A.J. Redd

Department of Engineering Physics, University of Wisconsin-Madison, Madison, WI 53706, USA

mbongard@wisc.edu

Measurements of the internal distribution of **B** in magnetically confined plasmas are required to obtain current profiles via equilibrium reconstruction with sufficient accuracy to challenge stability theory. A 1D, 16-channel array of InSb Hall effect sensors with 7.5 mm spatial resolution has been constructed to directly measure internal $B_z(R,t)$ for determination of $J(\psi,t)$ associated with edge-localized peeling mode instabilities in the PEGASUS Toroidal Experiment. The diagnostic is mounted in an electrically isolated vacuum assembly which presents a slim, cylindrical profile (~1 cm OD) to the plasma, using graphite as a low-Z PFC. Absolute calibration of the sensors is determined via *in situ* cross-calibration against existing magnetic pick-up coils. Present channel sensitivities are of order .25 mT. Internal measurements with bandwidth $\leq$ 25 kHz have been obtained without measurable plasma perturbation. They can resolve n=1 internal MHD and indicate systematic variation in $J(\psi)$ under different stability conditions.

Work supported by US DOE grant DE-FG02-96ER54375.