

MAGNETIC DIAGNOSTICS FOR FUTURE TOKAMAKS*

T.R. Hodapp, J.D. Broesch, J.A. Leuer, R.T. Snider, E.J. Strait
General Atomics, San Diego, California 92186-9784

Magnetic diagnostics are planned for future tokamaks such as the International Thermonuclear Experimental Reactor (ITER) and the Tokamak Physics Experiment (TPX). These diagnostics will measure the plasma position, shape, loop voltage, total current, diamagnetism and some of the magnetohydrodynamic properties. Existing tokamaks use inductive coils and loops as magnetic sensors. The electrical signals from the sensors are integrated over time to determine the desired plasma properties. The sensors are located outside the plasma boundary but within the plasma's external magnetic fields.

Present magnetic diagnostics are designed for plasmas lasting seconds to tens of seconds. In their present form, the inductive magnetic sensors are not suitable for future tokamaks with their long duration plasmas lasting for 1000 seconds or more. In particular magnetic diagnostics for future tokamaks require: (1) electronics with integrators capable of integrating for 1000 seconds, and (2) coils and loops that will not overheat when subjected to nuclear heating for 1000 seconds. This paper presents the engineering development, construction and test results of prototype inductive magnetic coils and electronics that will be suitable for future tokamaks.

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Submitted by:

Signature

Typed Name: T.R. Hodapp

Institution/Company General Atomics

Address P.O. Box 85608

City, Province, State/Postal Code

San Diego, California 92186-9784

Country USA

Phone: (619) 455-2669

Fax: 619 455-4190

E-mail: hodapp@gav.gat.com