

**Abstract Submitted for the Twelfth Topical Conference  
on High Temperature Plasma Diagnostics  
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Category Number and Subject:

Theory       Experiment

**A New DC Magnetic Sensor**,\* M.J. Schaffer, *General Atomics* — Non-inductive means are needed to measure magnetic fields in order to control and diagnose long-pulse fusion plasmas, such as ITER. A concept is proposed to measure a vector DC magnetic field  $\mathbf{B}$ , provided its amplitude is large enough to strongly saturate a small ferro- or ferrimagnetic sphere. Operation of the sensor is based on the assumption that magnetization vector  $\mathbf{M}$  aligns parallel to instantaneous  $\mathbf{B}$  but does not vary greatly in magnitude as  $\mathbf{B}$  varies. The basic method is to modulate  $\mathbf{B}$  by a small field  $\tilde{\mathbf{B}}$ , produced by one or more exciter coils near the magnetic sphere, and detect the resultant magnetic flux change, which contains the direction-varying magnetization,  $\mathbf{M} = M_{\text{sat}} (\mathbf{B} + \tilde{\mathbf{B}}) / |\mathbf{B} + \tilde{\mathbf{B}}|$ , by a set of one or more detector coils preferably placed nearer to the sphere. Many combinations of exciter and detector coils are possible, especially if distinct frequencies are used for each direction component, and all three components of  $\mathbf{B}$  can be calculated from the raw data. Requirements of the magnetic material and applications to long-pulse, magnetically confined plasmas will be discussed.

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- Prefer Poster Session
- Prefer Oral Session
- No Preference
- This poster/oral should be placed in the following grouping: (specify order)

Submitted by:

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(Signature of APS member)

M.J. Schaffer  
(Same Name Typewritten)

- Special Facilities Requested (e.g., movie projector)

**General Atomics**  
P.O. Box 85608  
San Diego, CA 92186-5608  
(Address)

(619)455-2841/(619)455-4156  
Phone/Fax

- Other Special Requests

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[schaffer@gav.gat.com](mailto:schaffer@gav.gat.com)  
Email Address