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Determination of Experimental Mutual Inductances in Magnetic Diagnostics Through Linear Modeling JONATHAN HEBERT, Auburn University, JAMES HANSON, BENJAMIN STEVENSON — When using magnetic diagnostics for equilibrium reconstruction of a plasma, it is necessary to know the mutual inductances between the diagnostics and known sources of current, such as field generating coils. The mutual inductance is a purely geometric factor and, as such, can be found computationally given the locations of the target coils. Even so, direct calculation may not be the most accurate method of determination. This method does not, for example, take into account the error inherent in the placing of the coils (which can have a large effect when a perfectly placed coil should have an extremely low inductance). A method for experimentally determining the mutual inductances, explored here, is possible through a linear model. The flux in each diagnostic is measured during a plasma-free (vacuum) shot. Under the assumption that any flux in the magnetic diagnostics during such a shot is the product of measured coil currents and their mutual inductances with the diagnostic, a chi-squared minimization is done on the difference between the measured flux data and the product of the model. This method also has the advantage of offering some insight into the modeling of induced currents in the vacuum vessel.

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