Abstract Submitted
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Applying a Kalman Filter to Magnetic Diagnostics[1] R. ARBACHER, S. ANGELINI, J.P. LEVESQUE, M.E. MAUEL, G.A. NAVRATIL, Q. PENG, D. RHODES, Columbia University — Accurate and efficient filtering is vital to removing noise and improving feedback, which in turn allows for longer and more effective containment of plasmas in tokamaks. Assuming random Gaussian noise, the Kalman filter is ideally suited for noise elimination, as it acts recursively using an optimized model to assess both the noise present in the system and the noise inherent to the measurement. This allows for the calculation of a locally accurate Kalman gain, which can be applied in real time. The data for this particular implementation of a Kalman filter derives from 40 sensor pairs spaced evenly around HBT-EP's ten shells, with each pair providing a radial and a poloidal component. These signals, when combined with a resistive wall mode (RWM) dispersion relation [1], yield the magnetic flux both at the wall and at the plasma's edge. This information can be used to identify the RWM and the ideal kink mode, and to apply the appropriate fields to prevent disruption and prolong the life of the plasma. Variation in the initial noise parameters can also induce signal differentiation, which can help isolate non-dominant modes whose effects would otherwise be masked.

[1] Mauel, M. E., *et al*, (2005). Nuclear fusion, **45** (4), 285.

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Jeffrey Levesque
Columbia University

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