Abstract Submitted
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The theory of equilibrium reconstruction and Real Time Forecast of tokamak discharges[1] LEONID ZAKHAROV, Princeton University, PPPL — Since 1973 and especially during the last two decades, the equilibrium reconstruction on tokamaks provides the basic data on magnetic configuration for plasma control and interpretation of experimental results. Still some fundamental questions about reconstruction were never answered. Some variations of the current density or pressure in the Grad-Shafranov equation have a little effect on the signals. Even if the resulting fit to the measurements (within their accuracy) seems to be good, without assessment of all possible variances the value of such reconstruction is questionable. Here, a theory and numerical technique is presented which addresses the long standing problem of variances. It allows to calculate the range of "visible" (well reconstructed), "barely visible" (poorly reconstructed), and "invisible" perturbations and to make a quantitative evaluation of diagnostic systems. Also, the optimal algorithm for performing the reconstruction in practice has been formulated. This theory of variances allows to use information of different physical nature and makes possible the Real Time Forecast (RTF) of tokamak discharges, very important, e.g., for ITER, when the transport and equilibrium reconstruction codes work together for predicting the plasma discharge for the following energy confinement time interval.

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