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14.4 Magnetic Perturbation Diagnostics in the High-Temperature, Lithiated Environment of LTX-

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Magnetic perturbation measurements will be invaluable for characterizing Lithium Tokamak Experiment Beta (LTX- β) plasmas due to the time-evolving, 3D nature of the magnetic fields generated by eddy currents in the vessel and copper shell segments, as well as enhanced MHD instability drive due to newly introduced neutral beam heating. The LTX- β upgrade includes two new arrays of Mirnov coils: a shell eddy sensor array of two-axis coils distributed over the back surface of one shell segment, and a toroidal array of poloidal field coils at the low-field side midplane gap. Evaporative lithium wall-coating and the high temperatures required for liquid lithium wall operation both complicate the implementation of in-vessel diagnostics. While the shell array is protected from lithium exposure, the shell segment to which it is mounted will at times exceed 300°C. The toroidal array, however, will experience direct line-of-sight exposure to the lithium evaporator as well as close proximity to the hot shell, and may also be subject to poorly-confined, beam-driven fast ions. We describe how the two new Mirnov arrays meet these environmental challenges and enhance the LTX- β diagnostic suite. This work is supported by US DOE contracts DE-AC02-09CH11466 and DE-AC05-00OR22725.

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