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**Detection of plasma stability on DIII-D, using the experimentally extracted plasma transfer function based on 3D MHD spectroscopy**[1]
ZHIRUI WANG, NIKOLAS LOGAN, JONGKYU PARK, JONATHAN MENARD, RAFFI NAZIKIAN, Princeton Plasma Physics Lab, STEFANO MUNARETTO, YUEQIANG LIU, General Atomics, JEREMY HANSON, Columbia University —
Three-dimensional (3D) magnetohydrodynamic (MHD) spectroscopy is successfully applied to extract the plasma transfer function from DIII-D experiments. The method uses upper and lower internal coils to perform scans of frequency and poloidal mode spectrum, and measure the corresponding n=1 plasma response on 3D magnetic sensors. The transfer function is extracted, based on Padé approximation, by fitting the measured signals on different sensors simultaneously. The experimental transfer function not only points out the multi-mode plasma response but also shows the number of dominant modes and the contribution of each mode to the plasma response. The extracted damping rate of the least stable mode can be a new index indicating plasma stability quantitatively. This method has the potential to optimize ELM suppression and monitor the plasma stability in future fusion reactors. Results and analysis of 3D MHD spectroscopy experiments will be presented.

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Zhirui Wang
Princeton Plasma Physics Lab

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