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Physics and optimization of plasma startup in the MST RFP[1]
W. MAO, University of Science and Technology of China, B.E. CHAPMAN, A.F. ALMAGRI, J.K. ANDERSON, D.J. DEN HARTOG, J. KO, S.T.A. KUMAR, L. MORTON, E. PARKE, J.A. REUSCH, J. WAKSMAN, University of Wisconsin-Madison, D.L. BROWER, W.X. DING, L. LIN, University of California, Los Angeles — MST's Bp circuit relies on an iron core transformer, and the 2 V-s flux swing of the iron sets limits on the peak Ip and discharge duration. A substantial fraction of this flux is consumed during startup of each discharge. To some extent, this flux consumption can be reduced by applying a larger vacuum Bt at discharge initiation, a fact long known in RFP research. However, the detailed physics of this Bt dependence is not completely understood. Toward better understanding, MST's profile diagnostics are being employed to try to measure the temporal evolution of, e.g., the magnetic equilibrium and plasma resistance. Initial target plasmas have a peak Ip of about 600 kA but with different vacuum Bt. Initial results include the observation of m = 1 modes, with n = 1, 2, 3... growing and decaying in succession. This occurs as the Bt profile evolves rapidly from that of a tokamak to that of an RFP. Preliminary reconstructions of the toroidal current profile suggest that it is initially quite hollow. This work should help optimize startup with MST's new Bt programmable power supply.

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