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Understanding the role of compressed guide field during magnetic reconnection on MRX[1] SAYAK BOSE, WILL FOX, HANTAO JI, MASAAKI YAMADA, JONGSOO YOO, JONATHAN JARA-ALMONTE, Princeton Plasma Physics Laboratory, AARON GOODMAN, ANDREW ALT, Princeton University
— Guide field reconnection is studied by varying normalized guide field, $b_{gn} = b_g/b_{up}$ from 0 to 1.3, where b_g is the guide field at X-point and b_{up} is the upstream reconnecting magnetic field. The current sheet profile resembles a Harris sheet at zero guide field. At a finite guide field, the thickness of the current sheet increases. Reconnection inflow advects the guide field towards the X-point while the boundary conditions of MRX impedes the outflow causing the guide field to pile up in the reconnection region. Theoretically predicted magnetic field profiles for current sheets that are intermediate between Harris and force-free Harris sheets are found to be in good agreement with the experimental data. This suggests that the non-uniform guide field pressure due to the pile up may contribute to the force balance in both inflow and outflow directions, thus affecting the reconnection rate. We also analyze the role of non-uniform guide field in producing a density gradient in the reconnection region which in turn can affect the parallel electric field by Ohms law.

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