Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Improved Inner Region Matching Conditions for Resistive MHD[1]

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In a recent publication, [A. H. Glasser, Z. R. Wang, and J.-K. Park, Phys. Plasmas **23**. 112506 (2016); doi 10.1063/1.4967862], a procedure was presented to construct a global growth rate and eigenfunction for resistive instabilities in axisymmetric toroidal plasmas, using the method of matched asymptotic expansions. Verification against the straight-through MARS code [Y. Liu, A. Bondeson, C. Fransson, B. Lennartson, and C. Breitholtz, Phys. Plasmas 7, 3681 (2000)] was presented for a limited range of cases. More extensive comparisons reveal serious discrepancies. Further studies show that the inner region solutions are too broad to match to the outer region solutions. The problem has been identified as an error in the asymptotic large-x power series solutions for the inner region. A new method is presented that corrects this error. More extensive benchmarks show that the new solutions are in much better agreement. Results will be presented. While the inner region equations contain only resistive MHD, the new mathematical methods should be applicable to more general plasma dynamics.

[1]Supported by US DOE/OFES contracts DE-SC0016106 and DE-AC02-09CH11466.

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Date submitted: 03 Jul 2019 Electronic form version 1.4