

Abstract Submitted
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On the saturation of plasma instability responsible for anomalous resistivity in the MRX YANSONG WANG, RUSSELL KULSRUD, HANTAO JI, Princeton University — Both enhanced resistivity and electromagnetic fluctuations have been identified in the MRX. In order to understand the origin of this fluctuation, the linear theory has been developed.¹ Determining the resultant anomalous resistivity from theoretical calculation, the wave amplitude has to be known.² To predict the amplitude and understand the underlying wave-particle interaction mechanism, we need to calculate non-linear saturation of the waves. The non-linear effect can be broken down into the sum of independent interactions between unstable and stable modes, which propagate in different directions. We consider a single pair of unstable and stable modes, and the beatwave determined by them. The interaction is a generalization to 3-D EM modes of the usual non-linear Landau mechanism for energy exchange between unstable and stable modes. We have calculated the energy exchange rate between any two pairs of modes. We use this to arrive at scaling for the amplitude (and the resultant resistivity), that can be applied to large space and astrophysical systems. We benchmark this calculation by comparing with observations of the fluctuation in the MRX.

¹H. Ji, R. Kulsrud, W. Fox, and M. Yamada, JGR 110, A08212 (2005).

²R. Kulsrud, H. Ji, W. Fox, and M. Yamada, PoP 12, 082301 (2005).

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