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Nonlinear mode coupling calculation on the perpendicularly propagating electromagnetic instabilities in the MRX YANSONG WANG, Princeton University, RUSSELL KULSRUD, HANTAO JI, PPPL — Motivated by the observation of electromagnetic fluctuations in the current sheet of the MRX, a local theory has been developed.[1] Because the *oblique* mode does not seem to be responsible for any enhanced resistivity, we have concentrated on *perpendicular* propagation mode. We found an unstable beam mode and two magneto-sonic modes. To calculate the mode saturation and anomalous resistivity, we develop a nonlinear theory using beat wave generated by the two coupling modes. Results show that it is easier for the damped magneto-sonic mode to get energy from the unstable beam mode but not other way around. The beam mode cannot be saturated by this nonlinear mode coupling process. Instead, this beam mode could be modified by the magneto-sonic mode through the mode coupling and have a larger group velocity across the current layer, then propagate out of the unstable region and be stabilized. Applying the quasi-linear theory,[2] we found the damping magneto-sonic mode could produce large amount of anomalous resistivity. Since this mode is linearly damped, the only way for it to grow is to get energy from unstable beam modes through nonlinear mode coupling. We show a plausible mechanism for the waves to produce anomalous resistivity. This work is supported by NASA.

[1]Y. Wang *et al.*. submitted to PoP.
[2]R. Kulsrud *et al.*, PoP. **12**, 082301 (2005)

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