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**LBQ2D, Extending the Line Broadened Quasilinear Model to TAE-EP Interaction**[1] KATY GHANTOUS, NIKOLAI GORELENKOV, Princeton Plasma Physics Lab, HERBERT BERK, Institute for Fusion Studies — The line broadened quasilinear model was proposed and tested on the one dimensional electrostatic case of the bump on tail[2] to study the wave particle interaction. In conventional quasilinear theory, the sea of overlapping modes evolve with time as the particle distribution function self consistently undergo diffusion in phase space. The line broadened quasilinear model is an extension to the conventional theory in a way that allows treatment of isolated modes as well as overlapping modes by broadening the resonant line in phase space. This makes it possible to treat the evolution of modes self consistently from onset to saturation in either case. We describe here the model denoted by LBQ2D which is an extension of the proposed one dimensional line broadened quasilinear model to the case of TAEs interacting with energetic particles in two dimensional phase space, energy as well as canonical angular momentum. We study the saturation of isolated modes in various regimes and present the analytical derivation and numerical results. Finally, we present, using ITER parameters, the case where multiple modes overlap and describe the techniques used for the numerical treatment.

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[2]H.L Berk, B. Breizman and J. Fitzpatrick, Nucl. Fusion, 35:1661, 1995

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