Tests of quasi-linear and tracer transport with gyrokinetic simulations[1] R.E. WALTZ, G.M. STAEBLER, General Atomics, A. CASATI, EU-RATOM/CEA — The GYRO gyrokinetic code tests the quasi-linear transport approximation (QLTA) with a simulated nonlinear spectral intensity. There are two common forms of the QLTA which either use (1) the linear mode spectrum or (2) the complete frequency spectrum for the nonlinear spectral intensity. The first is tested via two-step linear then nonlinear simulations convoluting the quasi-linear and nonlinear field intensity spectral weights, and the second via one-step simulations which have ion and electron "plasma species" at full and "tracer species" negligible densities. If the tracer and plasma gyrokinetic equations are identical, then so are their respective energy and particle diffusivities. Comparing tracer and plasma diffusivities when the tracer equation nonlinearity is deleted provides a quantifiable test of the second QLTA form. The two-step test preserves ambipolarity but includes only the leading linear modes at each wave number. Net quasi-linear energy diffusivities are typically 1.4-1.8 larger and QLTA appears to breakdown most evidently for strongly pinched particle flows.

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