A canonical normal form for mode conversion*

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Linear conversion occurs when two wave types, with distinct polarization and dispersion characteristics, are locally resonant in a nonuniform plasma [1]. In recent work, we have shown how to incorporate a ray-based (WKB) approach to mode conversion in numerical algorithms [2]. The algorithm in [2] assumes there is an 'avoided crossing' (in ray phase space), which is the most common type of conversion. Here, we present a new formulation that can deal with more general types of conversion that can occur in multidimensional plasmas [3]. This formalism is based upon a new definition of the 'normal' form for two-component coupled wave problems. In normal form, the 2X2 dispersion matrix has a natural physical interpretation: the diagonals are the uncoupled ray hamiltonians and the off-diagonal is the coupling constant. We also discuss how to incorporate the normal form into ray tracing algorithms so that the normal form can be propagated along rays.

[1] See references in E. R. Tracy, A. N. Kaufman and A. J. Brizard, invited tutorial in Phys. Plasmas **10** (2003) 2147.
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