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Novel visualization and computational methods for iterated conversions in tokamak RF heating E.R. TRACY, William & Mary Physics, A.S. RICHARDSON, MIT PSFC, A.N. KAUFMAN, LBNL & UCBerkeley, N. ZOBIN, William & Mary Mathematics, A.J. BRIZARD, St. Michaels College — Mode conversion is of great interest as a tool for RF heating and control of flow and current in fusion devices. In a closed system, waves convert many times, leading to a complex interference pattern. To aid in visualization, we introduce the concept of a 'room' associated with each of two uncoupled modes, and illustrate the idea with a tokamak model for its two-dimensional poloidal cross-section (hence the ray phase space is four-dimensional). Each of the two dispersion surfaces, $D_j(x, y, k_x, k_y) = 0$ for j =1,2, is three-dimensional, hence they can be visualized as two separate 3-spaces. The set of points where conversion can occur is a two-dimensional surface in each room. When a ray of type 1 in room 1 punctures the conversion surface, it continues in room 1 as a transmitted ray, but it also spawns a daughter ray of type 2 in room 2. Starting from a point on the conversion surface, we can follow a ray of either type in the relevant room to construct two maps, which take the conversion surface to itself. All possible sequences of conversions can be summarized by all possible combinations of the maps.

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