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Beswick, J. A., & Lefebvre, R. (1975). *On a level shift occurring in the treatment of a discrete state coupled to two interacting continua*. *Molecular Physics*, 29(5), 1611–1614.  
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Integrating both sides over  $E'$  gives an implicit relation for  $\int dE' \langle 1, E' | \psi_E^1 \rangle$ , which yields

$$\int dE' \langle 1, E' | \psi_E^1 \rangle = [1 + \pi^2 |V_{12}|^2]^{-1}.$$

Therefore, from (5 a, b) there is obtained for the amplitudes :

$$\langle 1, E' | \psi_E^1 \rangle = \frac{\delta(E - E')}{1 + \pi^2 |V_{12}|^2} - \frac{i\pi |V_{12}|^2}{1 + \pi^2 |V_{12}|^2} \left( \frac{P}{E - E'} \right),$$

$$\langle 2, E' | \psi_E^1 \rangle = \frac{V_{12}^*}{1 + \pi^2 |V_{12}|^2} \left\{ \frac{P}{E - E'} - i\pi \delta(E - E') \right\},$$

where  $P/(E - E')$  is the principal part distribution.

Permuting the continua 1 and 2 leads immediately to the amplitudes

*Stage (ii).* We consider now how the discrete state is coupled to new continua. We have, for instance, after some rearrangement :

$$\langle a | H | \psi_E^1 \rangle = \frac{V_1 - i\pi V_{12}^* V_2}{1 + \pi^2 |V_{12}|^2} + \frac{V_{12}^* (V_2 - i\pi V_{12} V_1)}{1 + \pi^2 |V_{12}|^2} \int dE' \frac{P}{E - E'}.$$

This is the coupling depicted as  $\tilde{V}_{1E}$  in figure 1 (b). Coupling  $\tilde{V}_{2E}$  is through a permutation of labels 1 and 2. By Fano's formulae [3] the and the shift are given by

$$\Gamma(E) = \pi^2 \{ |\tilde{V}_{1E}|^2 + |\tilde{V}_{2E}|^2 \},$$

$$\Delta(E) = \int dE'' \{ |\tilde{V}_{1E''}|^2 + |\tilde{V}_{2E''}|^2 \} \frac{P}{E - E''}.$$

It is important, as will now be shown, to keep in formula (9) the  $\int dE' (P/E - E')$  which makes  $\tilde{V}_{1E}$   $E$ -dependent (the same holding for  $\tilde{V}_{2E}$ ). At first view it might seem that this integral could be replaced by  $\int dE' P/E$  which case we would have  $E$ -independent couplings with two continua. In application of (10) the damping would be that given by equation (3) and the shift would be zero. In the derivation of formula (2) the principal part distribution such as that found in (9), are also present. However, they are all discarded.