If the residual nucleus is in a discrete eigenstate $\phi_B \in E_m^{1}$

$|\Psi_f\rangle \simeq P\,|\Psi_f\rangle$ exclusive process

$$P = \int |\vec{r}_1 \vec{r}_2 \phi_B\rangle\langle\phi_B \vec{r}_1 \vec{r}_2|\, d\vec{r}_1\, d\vec{r}_2 \qquad P^2 = P$$

if $J^\mu = J^{(1)\mu} + J^{(2)\mu}$ 1-body + 2-body

$$\boxed{P\,\hat{J}^\mu\, Q \simeq 0} \qquad Q = 1 - P \qquad \text{DKO}$$

$$\boxed{\begin{aligned} J^\mu(\vec{q}) &\simeq \int e^{i\vec{q}\cdot\vec{r}} \langle\Psi_f|\,P\ \hat{J}^\mu(\vec{r})\ P\,|\Psi_0\rangle\, d\vec{r} \\ &= \int \chi^{(-)*}(\vec{r}_1\vec{r}_2)\, e^{i\vec{q}\cdot\vec{r}}\, J^\mu(\vec{r}_1\vec{r}_2,\vec{r})\, S^{1/2}\varphi(\vec{r}_1\vec{r}_2)\, d\vec{r}_1\, d\vec{r}_2\, d\vec{r} \end{aligned}}$$

- $J^\mu(\vec{r}_1\vec{r}_2,\vec{r}) = J^{(1)\mu}(\vec{r}_1)\,\delta(\vec{r}_1-\vec{r}) + J^{(1)\mu}(\vec{r}_2)\,\delta(\vec{r}_2-\vec{r}) + J^{(2)\mu}(\vec{r}_1,\vec{r}_2,\vec{r})$

- $S^{1/2}\varphi(\vec{r}_1\vec{r}_2) = \langle\phi_B \vec{r}_1\vec{r}_2|\Psi_0\rangle$ Two-nucleon overlap spectroscopic amplitude
  φ eigenstate of $\mathcal{H}(-E_m) \in -E_m$

- $\chi^{(-)}(\vec{r}_1\vec{r}_2) = \langle\phi_B \vec{r}_1\vec{r}_2|\Psi_f\rangle$ eigenstate of $\mathcal{H}^+(E_m+\omega) \in E_m+\omega$

$$\mathcal{H}(E) = PHP + PHQ\,\frac{1}{E - QHQ + i\eta}\,QHP$$

The eigenfunctions of $\mathcal{H}$ and $\mathcal{H}^+$ require the solution of a 3-body (2N + B) problem. for the initial and for the final state