Calculations

the Weinberg distorted waves

1.Constructions of the χ_i^W from the CDCC wave function

- solve the CDCC equations using nucleon optical potentials
- the optical potentials: $U_n, U_p \rightarrow$ taken from the KD02 systematics
- discretize the s-wave n-p continuum to compute the bin states ϕ^{bin}

2.Using the coefficients C_{ij}

- with the coefficients C_{ij} given by

$$C_{i0} = -\left\langle \phi_i^W \middle| V_{np} \middle| \phi_d \right\rangle \quad (i \neq 1)$$

$$C_{ij} = -\left\langle \phi_i^W \middle| V_{np} \middle| \phi_j^{bin} \right\rangle \quad (i, j = 1, 2, \dots)$$

- then the Weinberg state

$$\chi_i^W(\boldsymbol{R}) = C_{i0}\chi_0(\boldsymbol{R}) + \sum_{j=1} C_{ij}\chi_j^{bin}(\boldsymbol{R})$$

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The result of χ_i^W

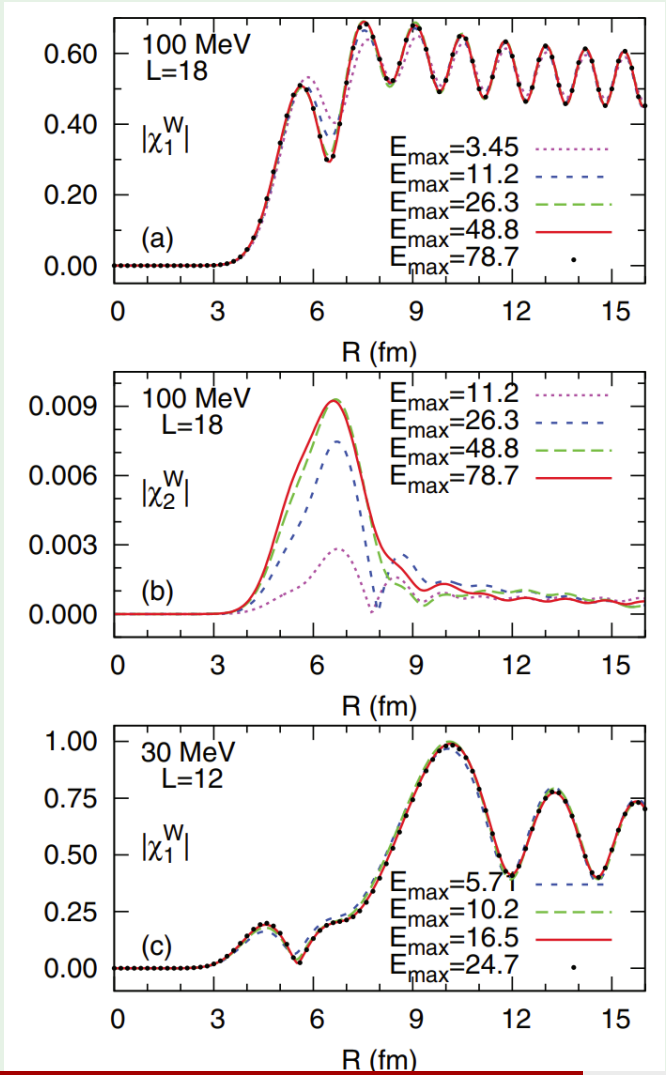

Figure 1: Selected partial waves of the Weinberg components χ_i^W for the $^{132}Sn(stannum)(d,p)^{133}Sn(stannum)$ reaction, with different maximum n-p continuum energy and different partial wave values L.

- good convergence with respect to n-p continuum energy
- the value of χ_1^W is significantly larger than that of χ_2^W in the selected region.

the dominance of χ_1^W

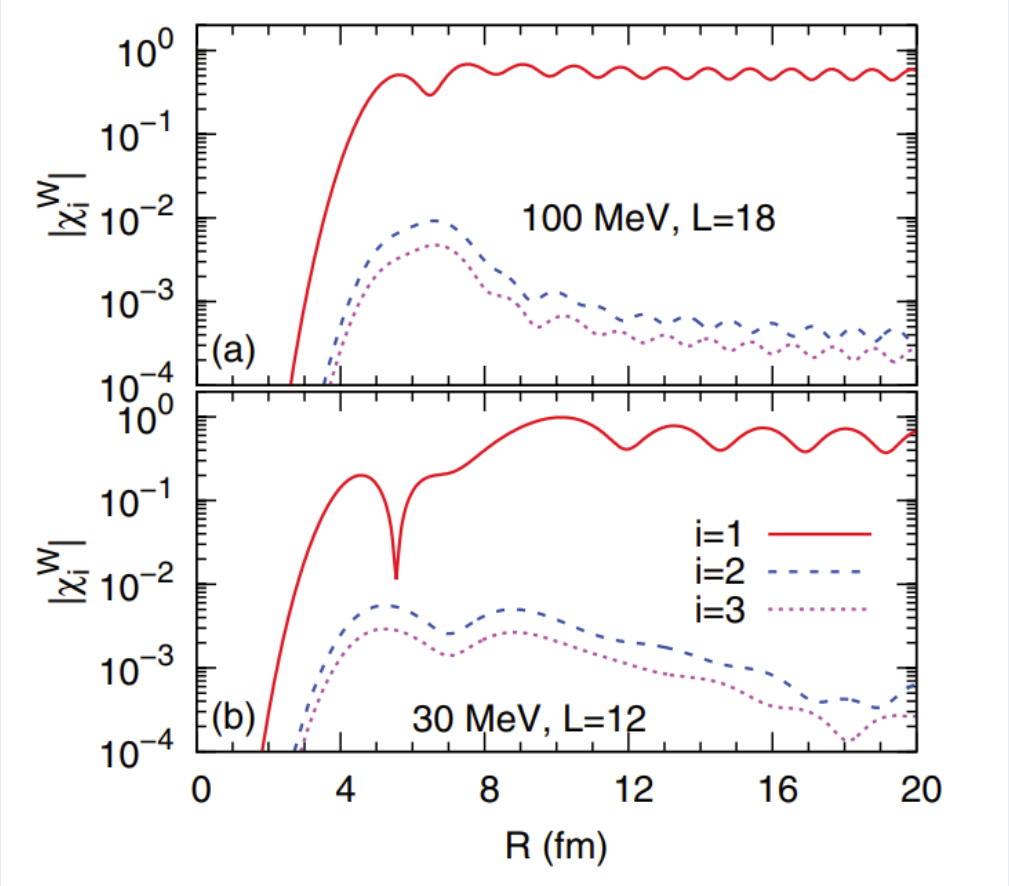

Figure 2: Calculated Weinberg distorted waves χ_i^W for $E_d = 100MeV$ and $E_d = 30MeV$ in the $^{132}Sn(stannum)(d,p)^{133}Sn(stannum)$ reaction, demonstrating the dominance of χ_1^W.

Calculations

differential cross sections

DWχ_iA cross sections $\rightarrow$ the dominance of χ_1^W

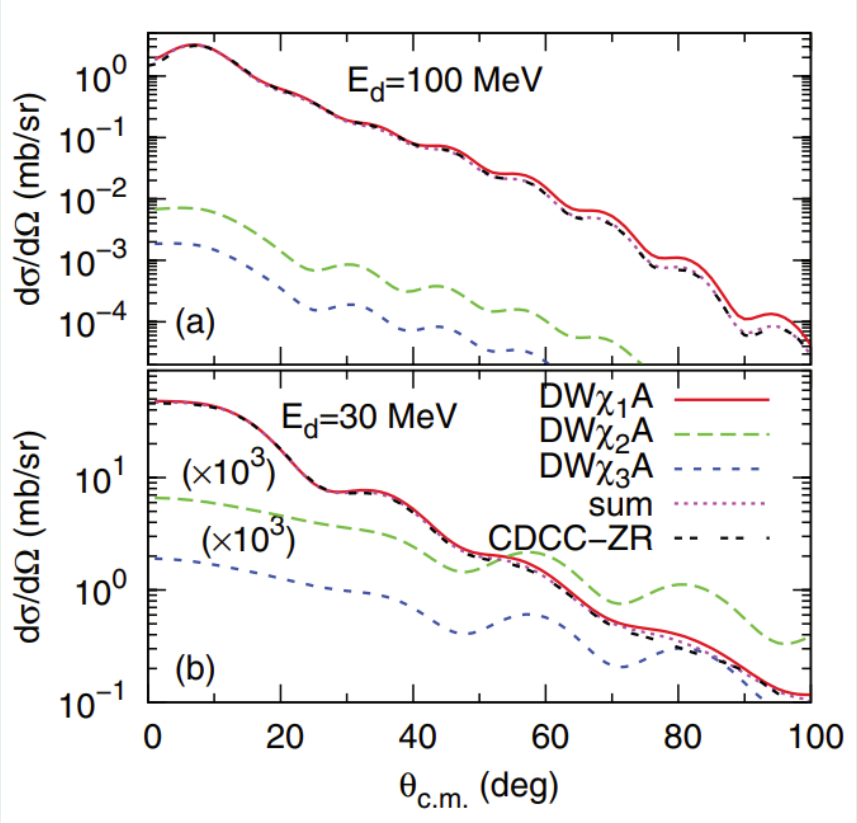

Figure 3: The differential cross sections for the $^{132}Sn(stannum)(d,p)^{133}Sn(stannum)$ reaction, using Weinberg distorted wave components $\chi_1^W, \chi_2^W, \chi_3^W$, the CDCC calculations and the sum of DWχ_iA fit very well

Conclusion

Conclusion 1

The dominant effects of deuteron breakup on the calculations of (d, p) reaction observables can be accommodated with one-channel distorted wave calculation.

Conclusion 2

The one-channel distorted-wave calculation corresponds to the dominance of χ_1^W.

Conclusion 3

These calculations go beyond the DWBA method because no Born approximation is involved.

- Maybe optimizing the calculation of the Weinberg states is more important than showing the convergence, because there are many bin states selected from CDCC.

Thank You!