组会 2023/06/13

弱束缚核

刘昊

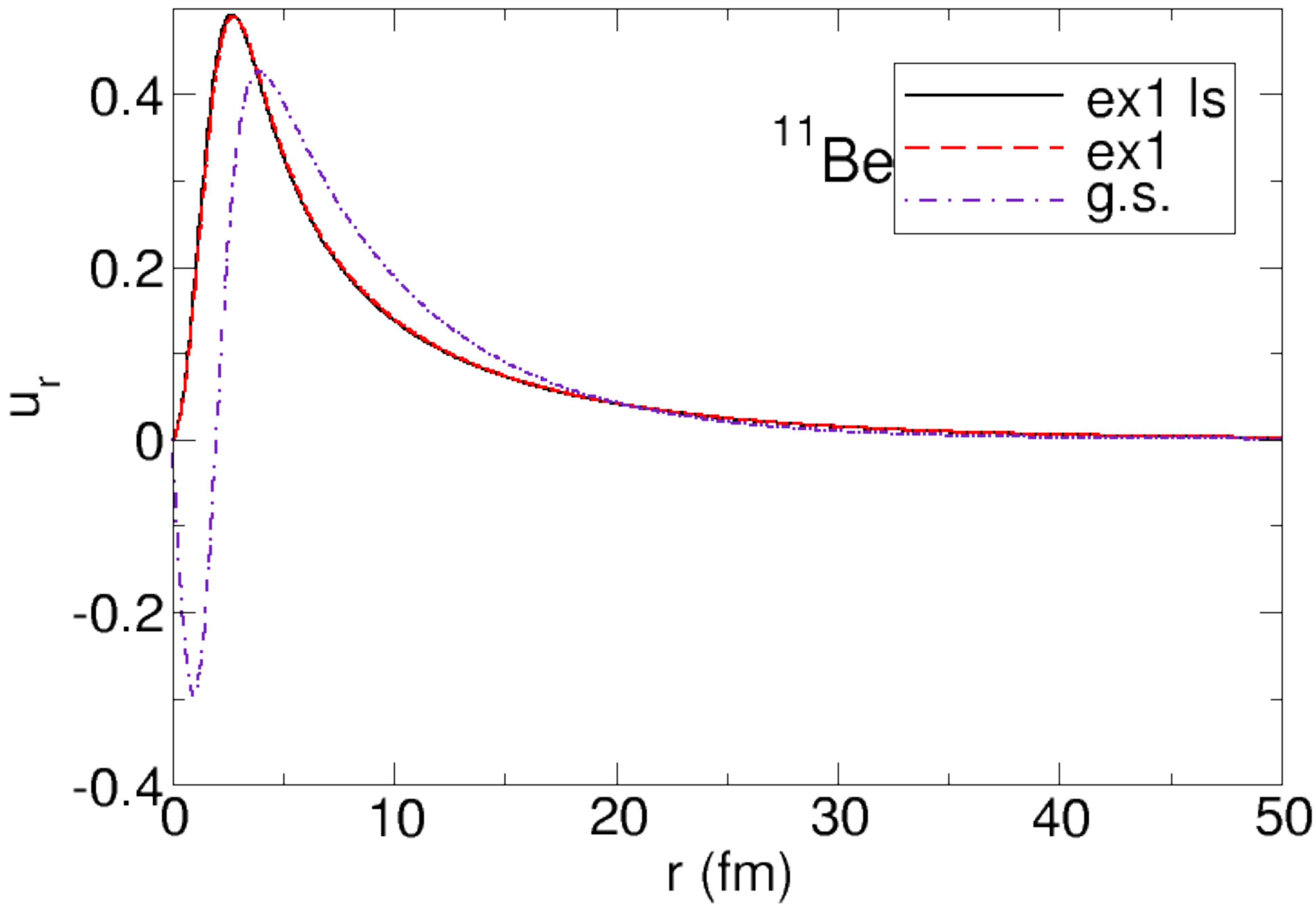
考虑与不考虑ls耦合项的差异

TABLE I. Parameters of the ^{10}Be-n potential [see Eqs. (14)–(16)].

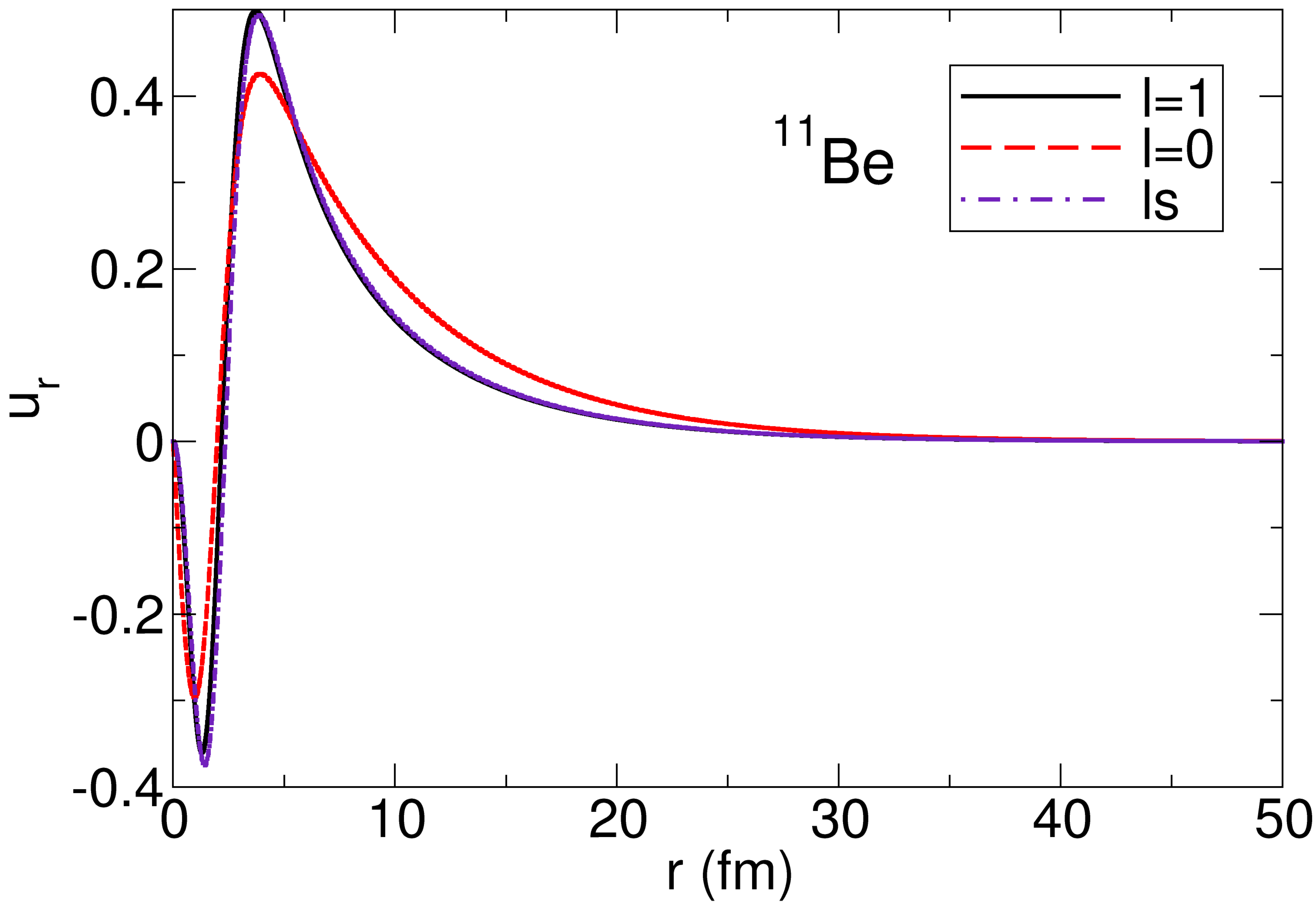
$V_{l\text{even}}$ (MeV)	$V_{l\text{odd}}$ (MeV)	V_{LS} (MeV fm^2)	a (fm)	R_0 (fm)
62.52	39.74	21.0	0.6	2.585

TABLE II. Experimental bound-state and resonance energies (E_{exp}), width (Γ_{exp}), and quantum numbers of ^{11}Be [42,43] used to fit the parameters of the Woods-Saxon potential V_{cf}. The theoretical energies (E_{th}) and width (Γ_{th}) obtained with the parameters of Table I are also listed.

J^π	l	E_{exp} (MeV±keV)	Γ_{exp} (keV)	E_{th} (MeV)	Γ_{th} (keV)
$\frac{1}{2}^+$	0	−0.504±6		−0.5045	
$\frac{1}{2}^-$	1	−0.184±7		−0.1845	
$\frac{5}{2}^+$	2	1.274±18	100±20	1.274	~162



考虑与不考虑ls耦合项的差异



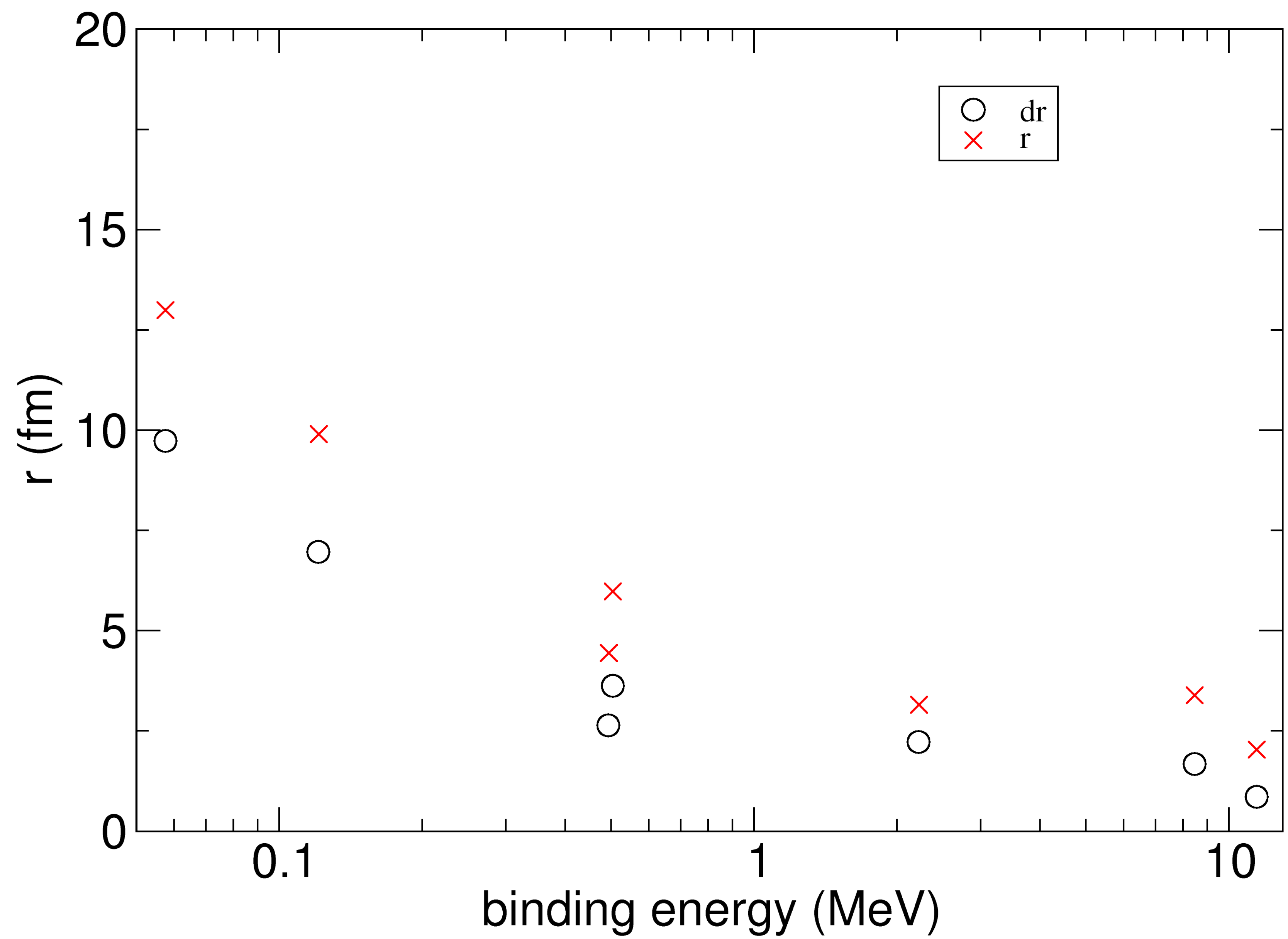
Ls耦合项对波函数的影响不是很大，但是离心势垒影响比较大。

不同原子核的最外层中子

	be	σ_r	$\langle r \rangle$
d	2.224	2.22	3.15
11Be	0.504	3.6231	5.9797
11B	11.454	0.8559	2.0364
13C	0.494	2.6386	4.4424
15C	0.121	6.9526	9.8991
19C	0.0576	9.7252	12.9911
29Si	8.473	1.6689	3.3896

计算的得到的势的深度大致符合Aage Bohr的给出的通式，但^{31}Ne,^{37}Mg计算有收敛问题，还需要进一步的改进。

不同原子核的最外层中子



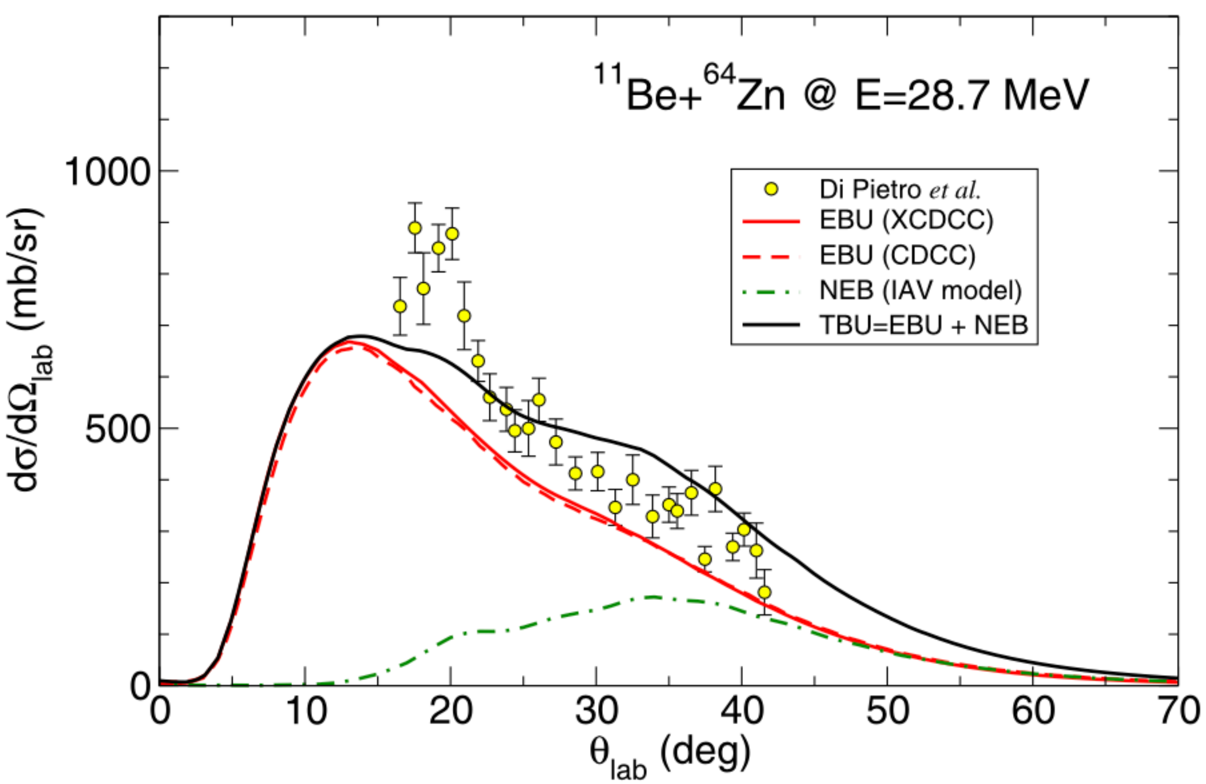
可能具有一定的回归关系，还需要多算很多核。

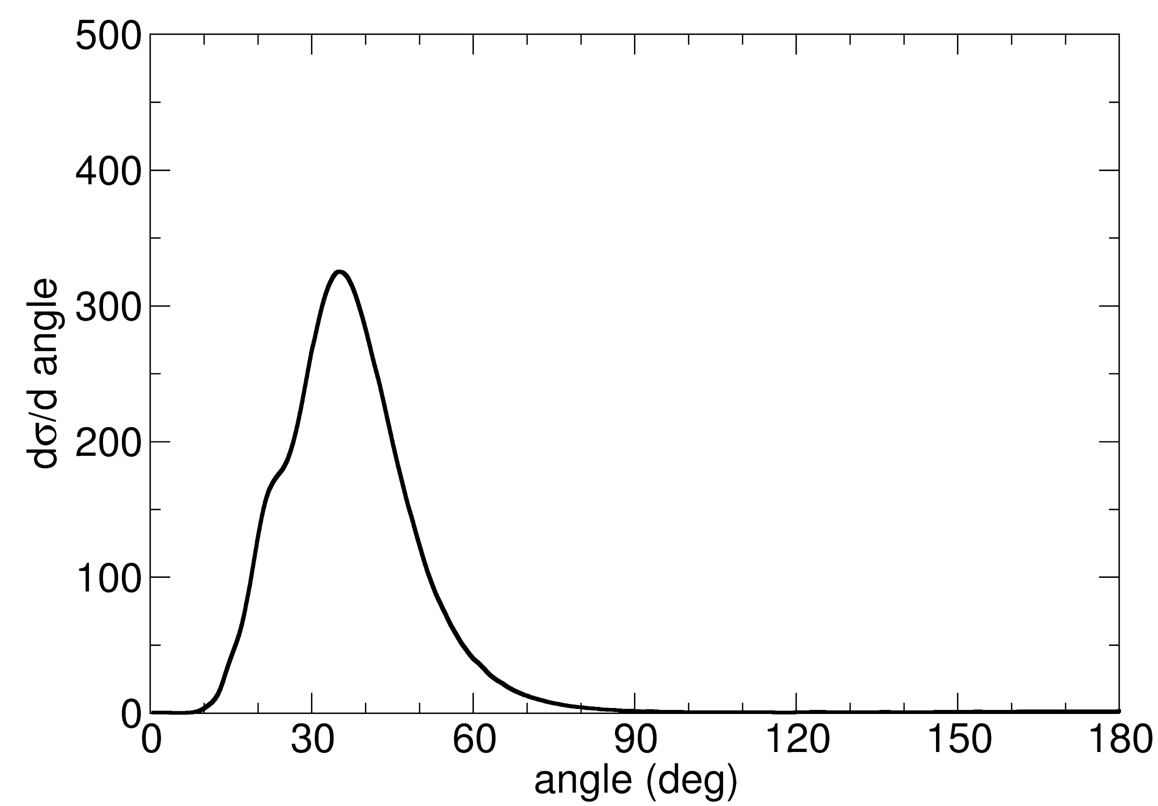
计算^{11}Be + ^{64}Zn的NEB截面

PRL **105,** 022701 (2010) PHYSICAL REVIEW LETTERS week ending 9 JULY 2010

TABLE I. WS optical potentials obtained from the fit of the experimental data. The real potential radius parameter is $r_0 = 1.1$ fm and the imaginary one is $r_i = 1.2$ fm, where $R_{0,i,si} = r_{0,i,si}(A_p^{1/3} + A_t^{1/3})$. The Coulomb radius parameter is $r_C = 1.25$ fm.

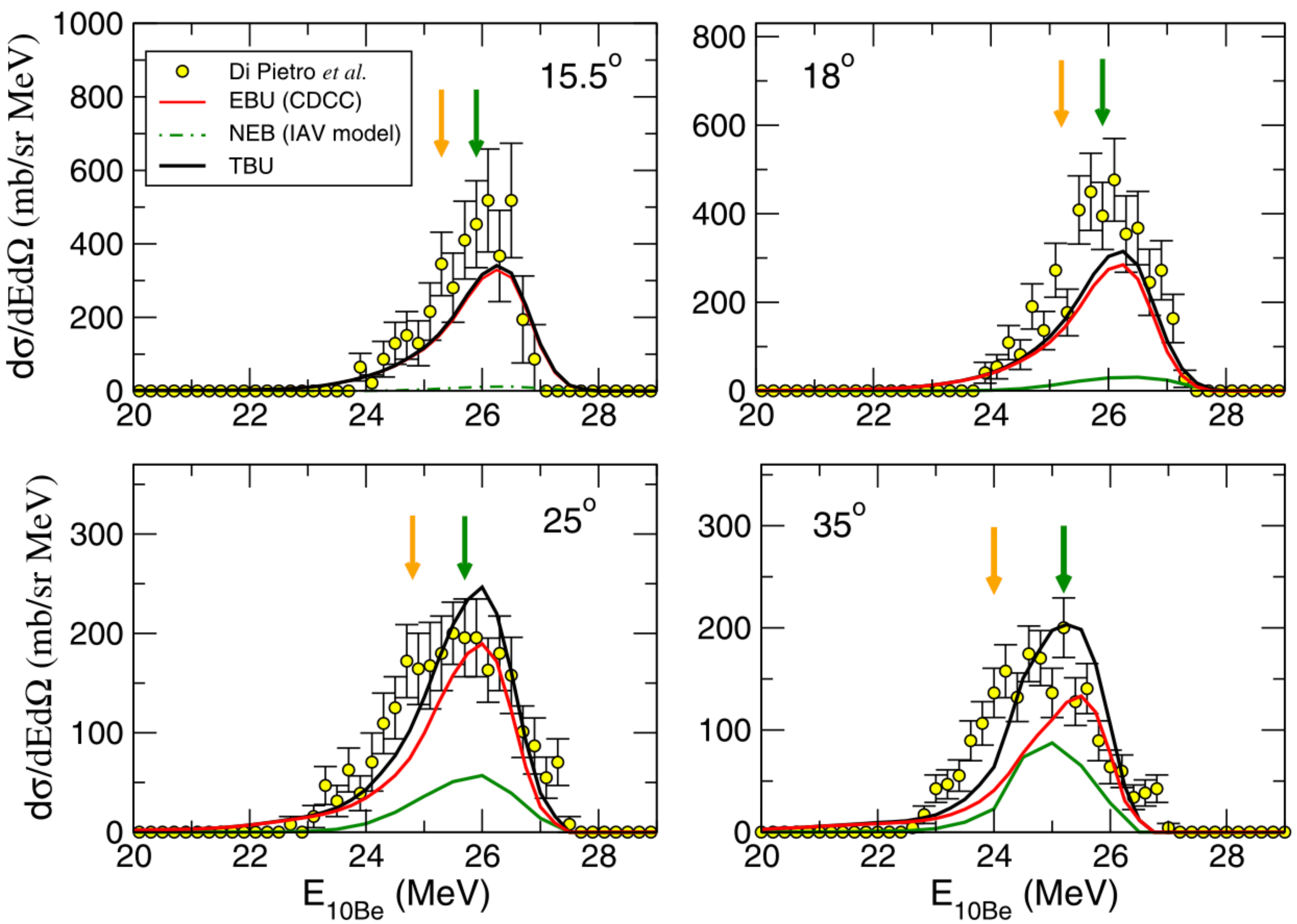
Reaction	V (MeV)	a (fm)	V_i (MeV)	a_i (fm)	V_{si} (MeV)	r_{si} (fm)	a_{si} (fm)	J_V (MeV fm^3)	J_W (MeV fm^3)
^{9}Be + ^{64}Zn	126	0.6	17.3	0.75				295	53
^{10}Be + ^{64}Zn	86.2	0.7	43.4	0.7				193	124
^{11}Be + ^{64}Zn	86.2	0.7	43.4	0.7	0.151	1.3	3.5	193	129

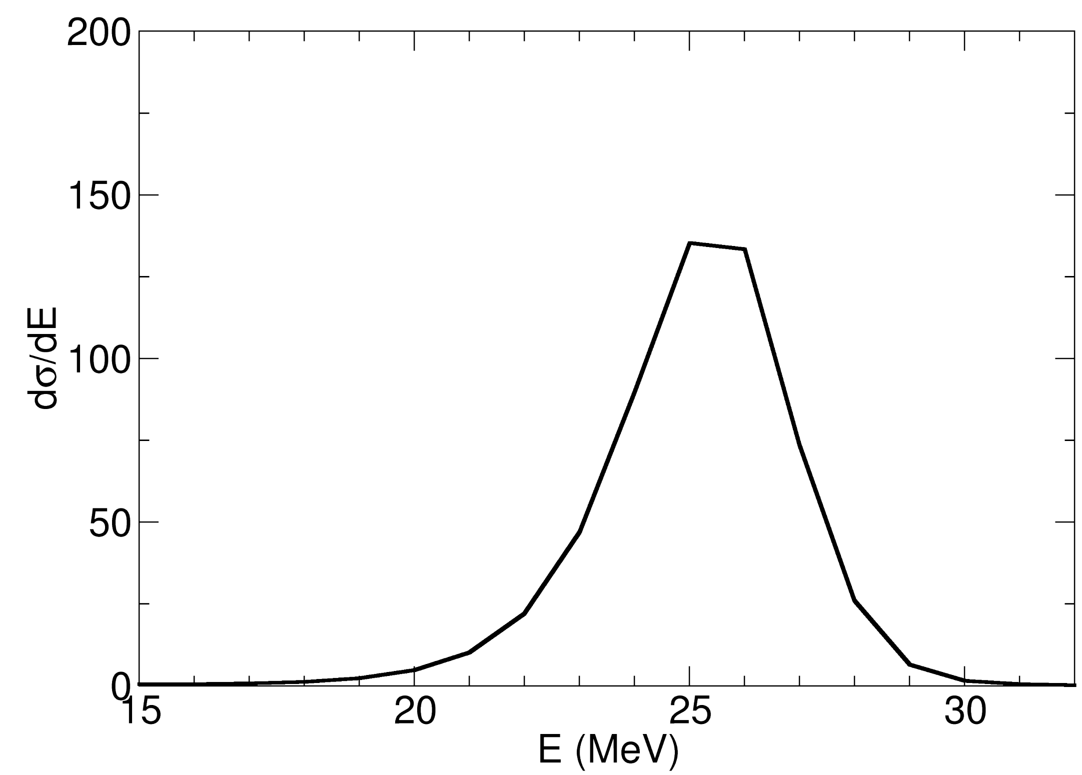




截面集中在35度附近，但是幅度上差异比较大

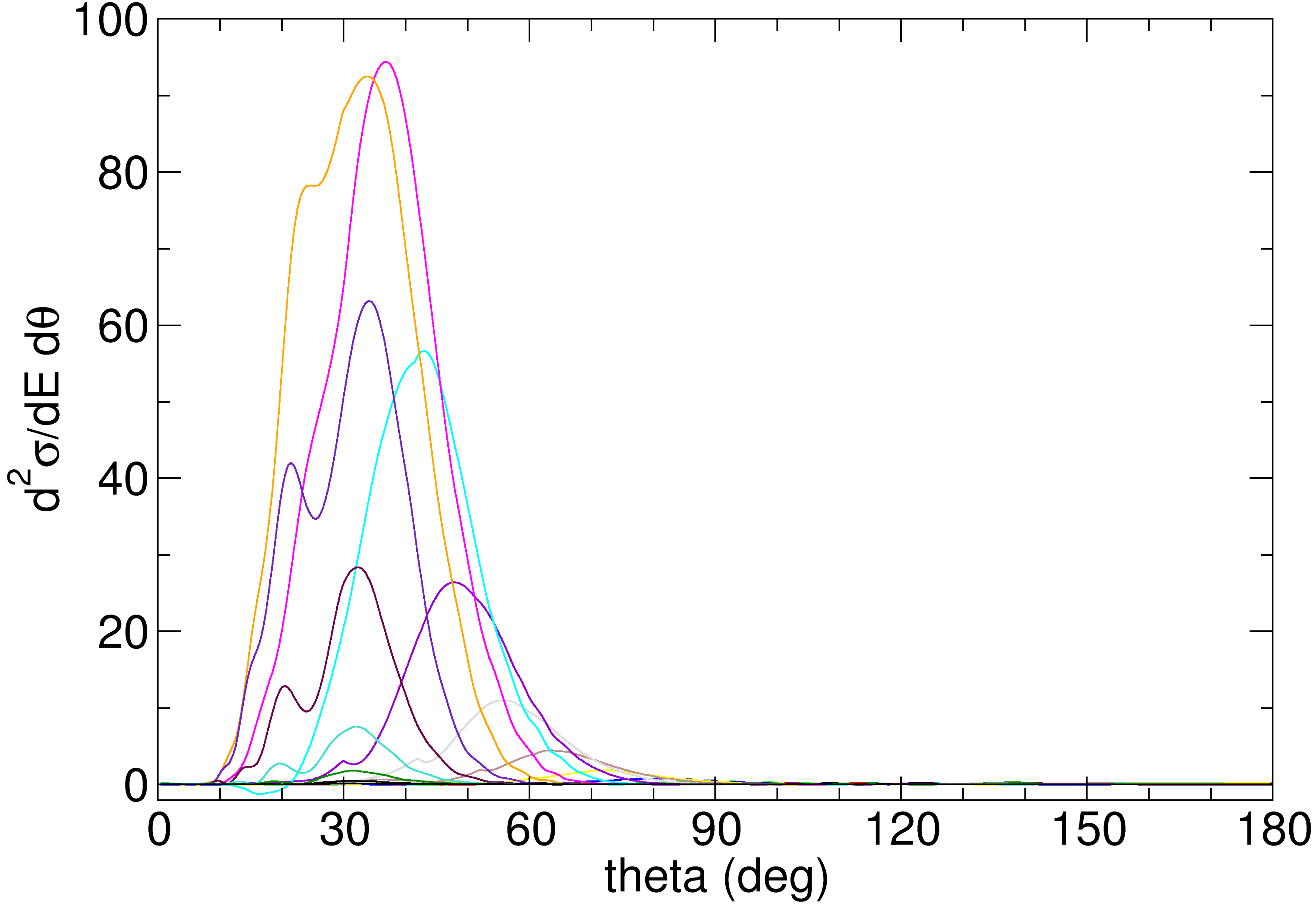
计算^{11}Be + ^{64}Zn的NEB截面





峰值位置集中在25.5MeV

双微分截面



100
80
60
40
20
0
0
30
60
90
120
150
180
theta (deg)
$d^2\sigma/dE\ d\theta$

寻找的一些光学势

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Folding Model Analysis of Elastic Scattering of ^{11}B from Light, Medium, and Heavy Nuclei

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Abstract *The elastic scattering angular distributions of ^{11}B projectile on light, medium, and heavy target nuclei including ^{7}Li, ^{9}Be, ^{12}C, ^{16}O, ^{24,25,26}Mg, ^{27}Al, ^{28}Si, ^{40}Ca, ^{58}Ni, ^{59}Co, ^{60}Ni, ^{197}Au, ^{208}Pb, and ^{209}Bi have been analyzed at various incident energies. The theoretical results have been obtained by using two different nuclear potentials within the framework of the optical model (OM). Firstly, the double folding potential for real part and the Wood–Saxon (WS) potential for imaginary part have been applied. Secondly, the calculations with double folding potential for both real and imaginary part have been performed and compared with the experimental data. It has been seen that the results are in very good agreement with the experimental data. Also, the volume integrals and cross-sections for each reaction have been obtained. Finally, a new and simple formula for the imaginary potential depth has been derived to clarify the nuclear interactions of ^{11}B nucleus at low energy reactions.*

PACS numbers: 24.10.Ht, 24.50.+g
Key words: optical model, elastic scattering

基于现实核力
（Michigan 3 Yukawa）
的折叠势

寻找的一些光学势

Global optical model potential for the weakly bound projectile ^{9}Be

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The global optical model potential for the ^{9}Be projectile is developed by systematically studying the experimental data of elastic-scattering angular distributions and reaction cross sections from ^{24}Mg to ^{209}Bi below 100 MeV. The analysis is performed in terms of comparing the theoretical results with the available experimental data. A satisfactory agreement is observed in the whole energy and target mass regions. Moreover, the elastic-scattering angular distributions and reaction cross sections of ^{9}Be on some lighter targets are also predicted using the global optical model potential and a reasonable description of the experimental data is obtained.

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给出了参数化的^{9}Be的光学势

寻找的一些光学势

Global phenomenological optical model potentials for ^{8,10,11}B projectiles

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Based on the obtained ^{7}Li global optical model potential, the global phenomenological optical model potential for ^{11}B projectile is obtained by fitting the experimental data of ^{11}B elastic scattering angular distributions from ^{28}Si to ^{209}Bi targets with incident energies below 100 MeV. Using the found global optical model potential, the reaction cross-sections are predicted and compared with the available experimental data. Moreover, the elastic-scattering angular distributions and reaction cross-sections for isotopic chain ^{8,10}B projectiles are predicted by the ^{7}Li global optical model potential at different incident energies. These results are also compared with the corresponding experimental data. The performance shows that the ^{8,10,11}B global phenomenological optical model potentials can give a satisfactory description for elastic scattering of these projectiles.

Keywords: Global phenomenological optical model potential; elastic scattering angular distributions; reaction cross-sections.

PACS Number(s): 24.10.Ht, 25.60.Bx, 25.70.Bc

文章中没有对应的给出势的具体参数（只给了一部分）

寻找的一些光学势

Global optical potential for nucleus-nucleus systems from 50 MeV/u to 400 MeV/u

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We present a new global optical potential (GOP) for nucleus-nucleus systems, including neutron-rich and proton-rich isotopes, in the energy range of 50–400 MeV/u. The GOP is derived from the microscopic folding model with the complex *G*-matrix interaction CEG07 and the global density presented by the São Paulo group. The folding model accounts for realistic complex optical potentials of nucleus-nucleus systems well and reproduces the existing elastic scattering data for stable heavy-ion projectiles at incident energies above 50 MeV/u. We then calculate the folding-model potentials (FMPs) for projectiles of even-even isotopes, $^{8-22}$C, $^{12-24}$O, $^{16-38}$Ne, $^{20-40}$Mg, $^{22-48}$Si, $^{26-52}$S, $^{30-62}$Ar, and $^{34-70}$Ca, scattered by stable target nuclei of ^{12}C, ^{16}O, ^{28}Si, ^{40}Ca ^{58}Ni, ^{90}Zr, ^{120}Sn, and ^{208}Pb at incident energies of 50, 60, 70, 80, 100, 120, 140, 160, 180, 200, 250, 300, 350, and 400 MeV/u. The calculated FMP is represented, with a sufficient accuracy, by a linear combination of 10-range Gaussian functions. The expansion coefficients depend on the incident energy, the projectile and target mass numbers, and the projectile atomic number, while the range parameters depend only on the projectile and target mass numbers. The adequate mass region of the present GOP by the global density is inspected in comparison with FMP by realistic density. The full set of the range parameters and the coefficients for all the projectile-target combinations at each incident energy are provided on a permanent open-access website together with a FORTRAN program for calculating the microscopic-basis GOP (MGOP) for a desired projectile nucleus by the spline interpolation over the incident energy and the target mass number.

DOI: 10.1103/PhysRevC.85.044607 PACS number(s): 24.50.+g, 24.10.Ht, 25.70.Bc

也是折叠势，没有给出参数化的公式。