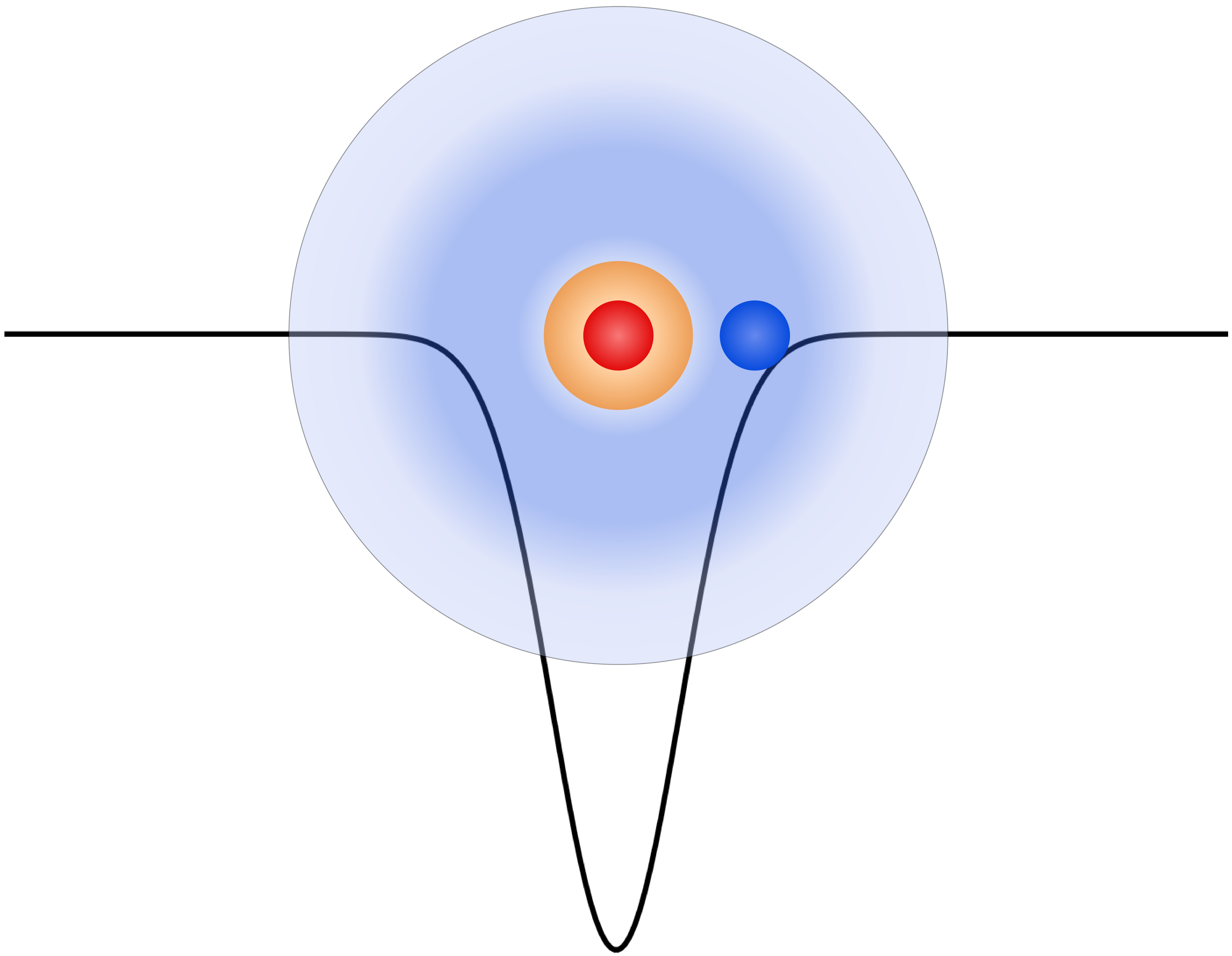
组会 2023/04/11

弱束缚核

刘昊

氘核

$r_0 = 1.25\ fm, a = 0.65\ fm, V_0 = -72.2\ V$



$\langle r \rangle = 3.15\ fm$

$\sigma_r = 2.22\ fm$

备选原子核

计算的主要是存在单中子晕的原子核，主要有 $^{11}Be, ^{15,19}C, ^{31}Ne, ^{37}Mg$

更细致一点，计算的是s波的单中子晕

s波halo

$^{11}Be, ^{15,19}C$

p波halo

$^{31}Ne, ^{37}Mg$

^{11}Be与^{11}B

^{10}Be + n的binding potential参数来自Capel的PHYSICAL REVIEW C **70**, 064605 (2004)，还有一篇相关的工

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

束缚能为0.504MeV

$$V_{cf}(\boldsymbol{r}) = V_0(r) + \boldsymbol{L}\cdot\boldsymbol{I}V_{LI}(r),$$

$$V_0(r) = -V_l f\left(r, R_0, a\right)$$

$$w(r) = \left[1 + \exp\left(\frac{r - R_0}{a_0}\right)\right]^{-1}$$

^{11}Be与^{11}B

$^{10}B + n$的binding potential参数来自Aage Bohr的Nuclear Structure(1965)

$$V = \left(-51 + 33\frac{N-Z}{A}\right)\mathrm{MeV}$$

$$V_{\mathrm{ts}} = -0.44V = \left(22 - 14\frac{N-Z}{A}\right)\mathrm{MeV}$$

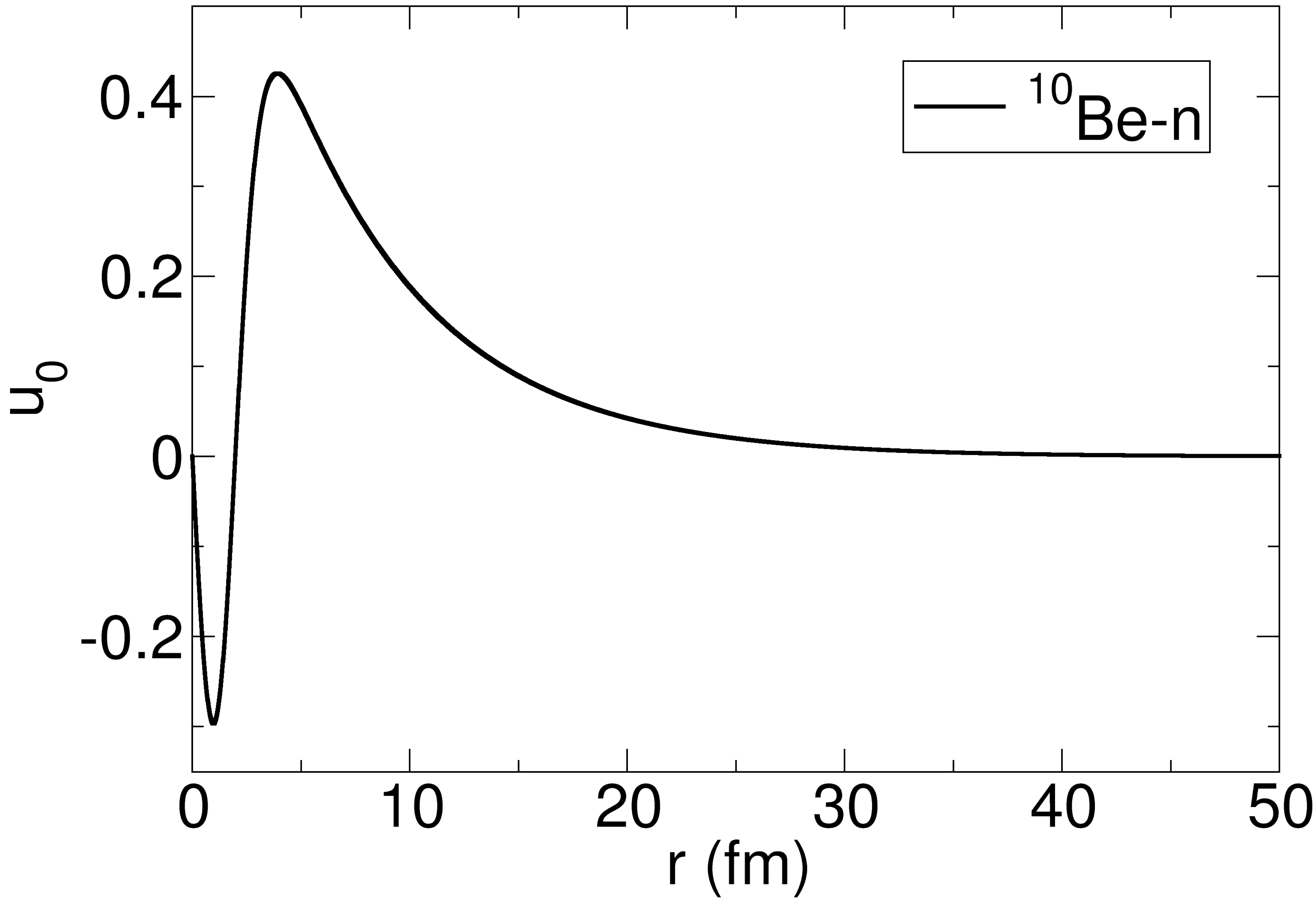
$$R = r_0 A^{1/3} \quad r_0 = 1.27\ fm$$

$$a = 0.67\ fm$$

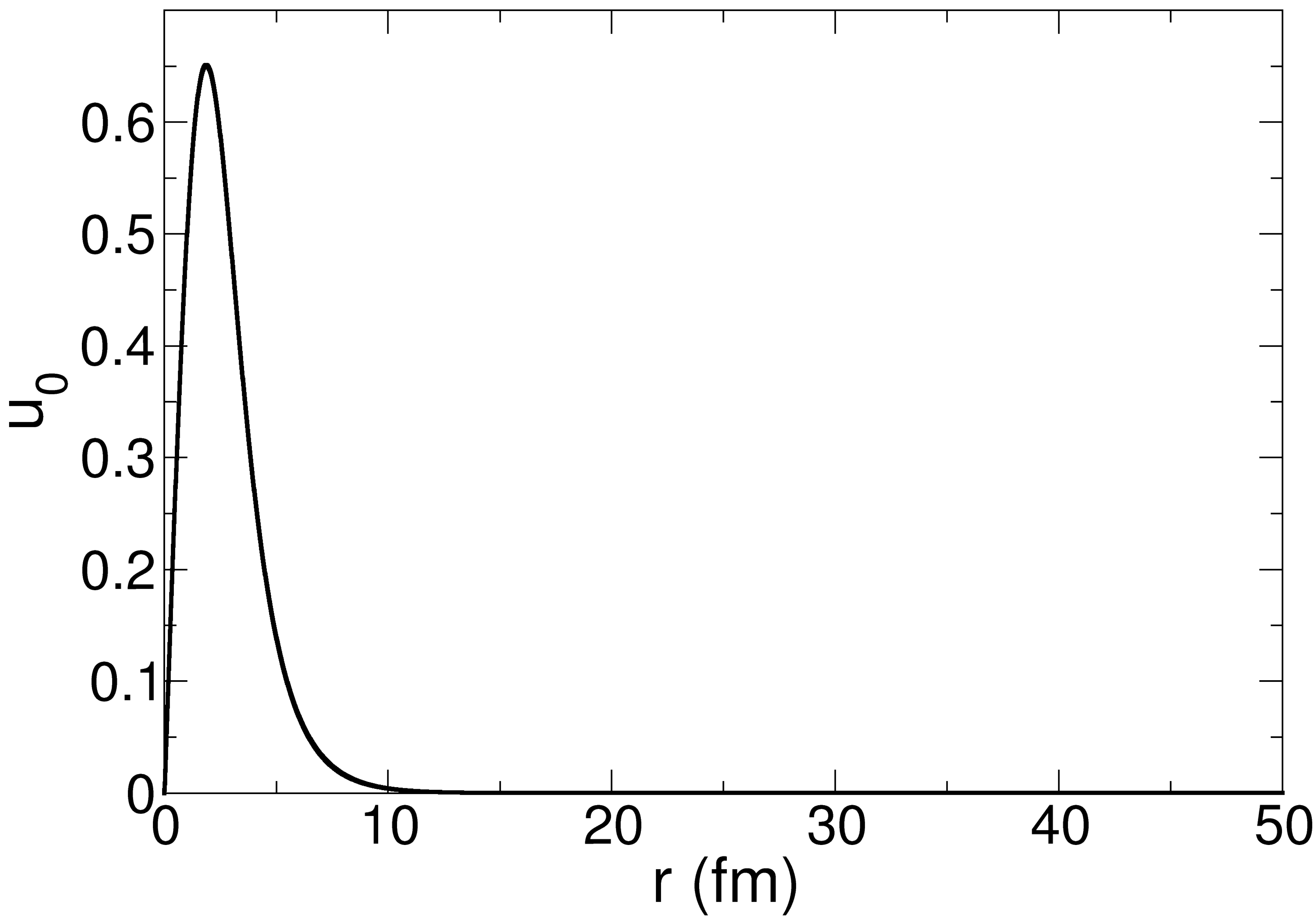
束缚能为11.454 MeV

解得的势阱深度为31.26 MeV

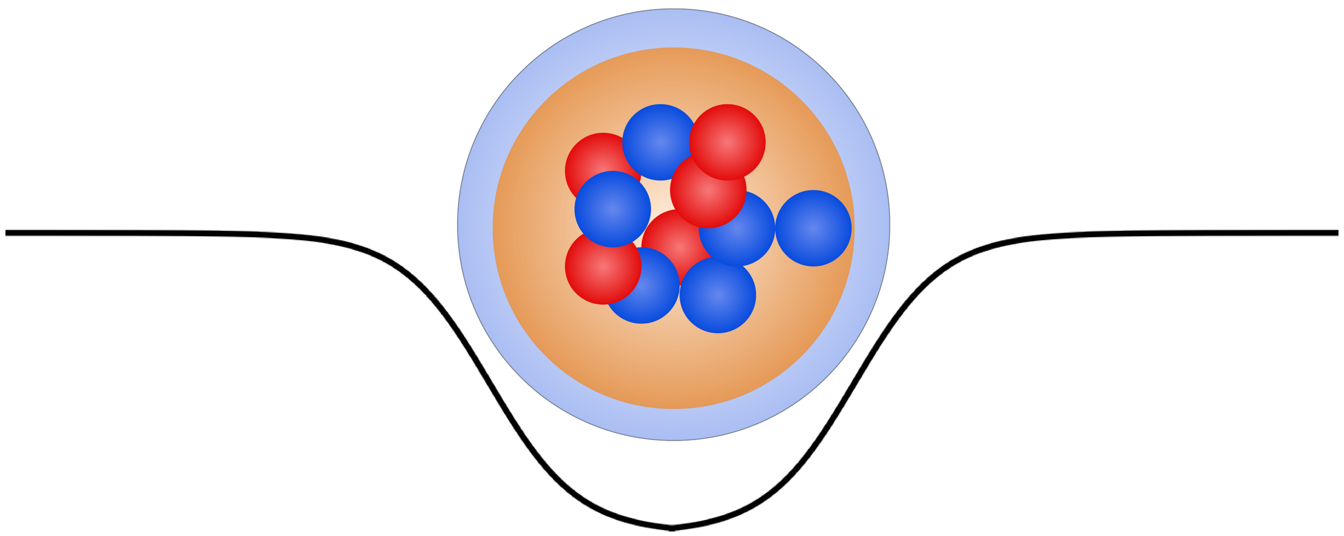
$^{11}Be(n + {}^{10}Be\ Core)$的s波函数

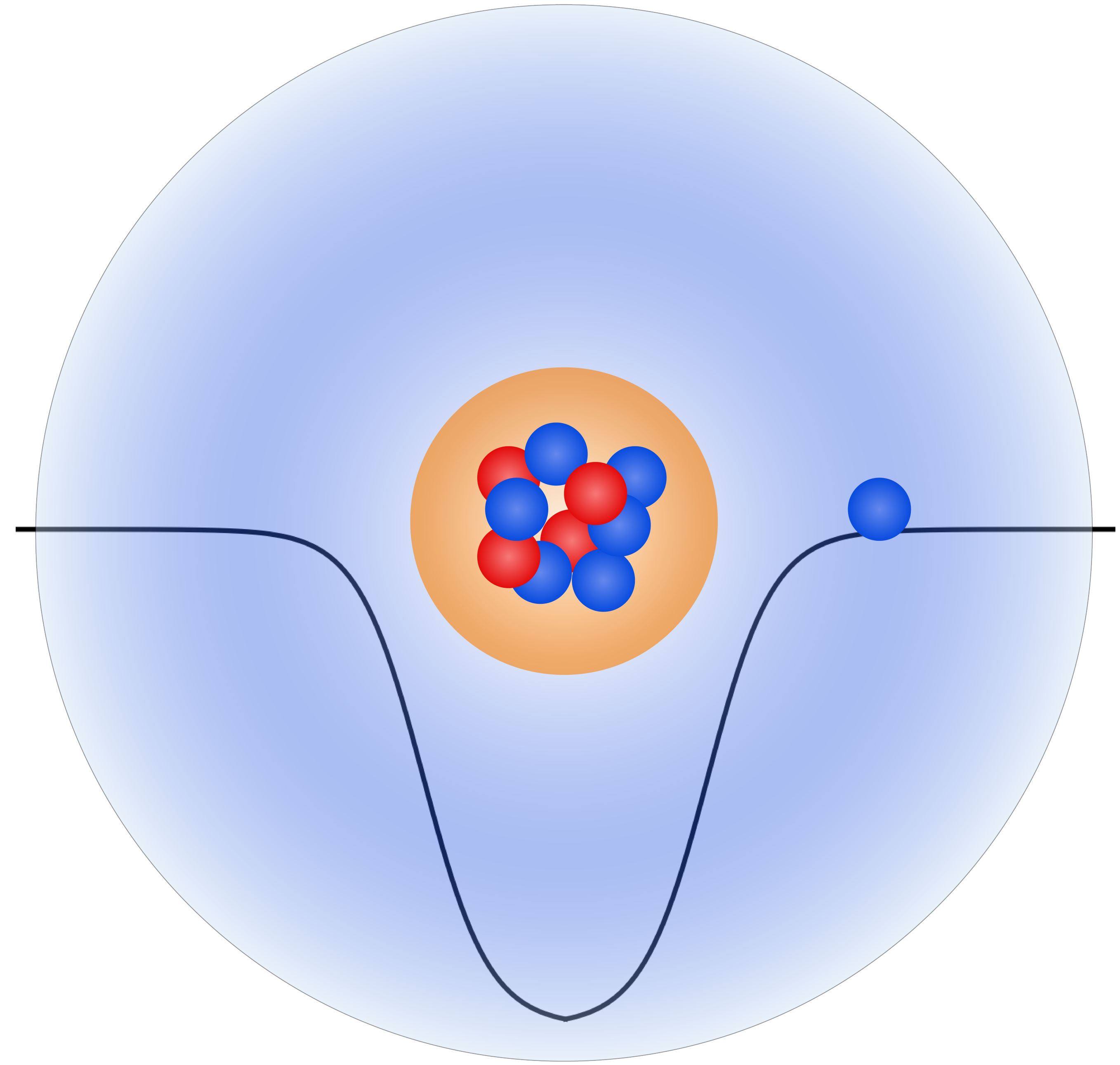


$^{11}B(n + {}^{10}B\ Core)$的s波函数



^{11}Be与^{11}B





^{11}B $\langle r \rangle = 2.23\ fm$

$\sigma_r = 1.02\ fm$

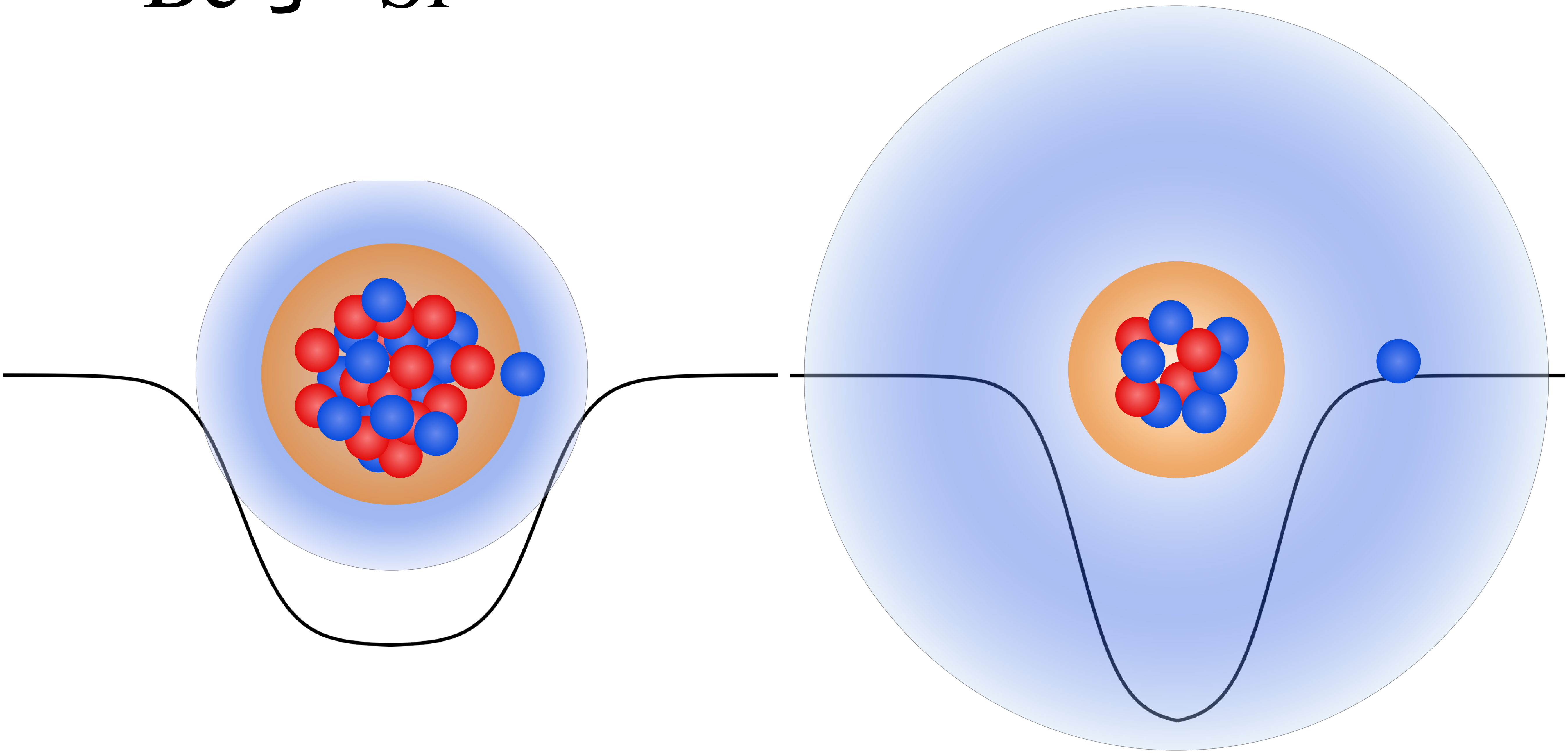
束缚能为11.454 MeV

^{11}Be $\langle r \rangle = 5.98\ fm$

$\sigma_r = 3.62\ fm$

束缚能为0.504 MeV

^{11}Be与^{29}Si



^{29}Si $\langle r \rangle = 3.15\ fm$

$\sigma_r = 2.22\ fm$

束缚能为8.47 MeV

^{11}Be $\langle r \rangle = 5.98\ fm$

$\sigma_r = 3.62\ fm$

束缚能为0.504 MeV

^{15}C与^{19}C

PHYSICAL REVIEW C **93**, 064609 (2016)

Proposal of a directly measurable parameter quantifying the halo nature of one-neutron nuclei

Masanobu Yahiro, Shin Watanabe,* Masakazu Toyokawa, and Takuma Matsumoto
Department of Physics, Kyushu University, Fukuoka 819-0395, Japan
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$$R = r_0 A^{1/3} \quad r_0 = 1.27\ fm$$

$$a = 0.67\ fm$$

B. Halo parameter in the vicinity of the weak-binding limit

No halo nucleus is discovered at extremely small S_n such as $S_n \ll 0.01$ MeV. We then do the following $c + n + \mathrm{T}$ model calculation to see the behavior of $\mathcal{H}$ in the vicinity of $S_n = 0$. The ground state $u_\ell(r)$ of the $c + n$ system is described with the Woods-Saxon potential determined by the well-depth method; namely, the depth parameter V_0 is tuned to measured S_n with the radius and diffuseness parameters fixed at the standard values $1.27 A_c^{1/3}$ fm and 0.67 fm [38], where A_c is the mass number of c. The potential U_c between c and T is obtained by folding the modified FL t matrix with the densities

^{15}C $\quad \langle r \rangle = 4.92\ fm$, $\quad \sigma_r = 2.60\ fm$

^{19}C $\quad \langle r \rangle = 6.10\ fm$, $\quad \sigma_r = 3.48\ fm$