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HYPERNUCLEAR MATTER CALCULATIONS

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Abstract: *In this paper results are reported for the binding energy B_Λ of a Λ-particle in nuclear matter, obtained by means of the differential equation for the Jastrow Λ-nucleon correlation function f, using eentral potentials and values for the density of nuclear matter, which are smaller than the initially used (0.172 nucleons/fm^3) and have been more recently determined. Results are also given by using the integrodifferential equation for the determination of f and various approximate expressions for the Λ-nucleon distribution function* $G_{N\Lambda}(r)$ *and its functional derivative.*

1. INTRODUCTION

Considerable work has been done for the calculation of the binding energy of a Λ-particle in nuclear matter $B_\Lambda = -E_\Lambda$. Both reaction matrix and variational techniques have been employed and use of various potentials, mainly centrals, has been made[1-7].

The possibility of obtaining the Λ-nucleon correlation function, in the variational approach, as a solution of a differential equation, which is derived by applying the variational principle to the first-order-energy expression, $E_\Lambda^{(1)}$ has also been examined. Two ways of determining the parameter β, related to the Lagrange multiplier, which is due to the healing condition have been considered[8,9]. The results are improved with the second choice of β, which corresponds to the «better convergence» (BC choice) of the cluster expansion. There is, however, still considerable overbinding and it appears interesting to investigate possible other ways of obtaining reduced values of B_Λ. In this paper results are reported of calculations performed with smaller values of the density of nuclear matter ρ. It should be noted that the analyses of experiments of elastic proton scattering from nuclei, made by Greenless et al.[10] led to values of ρ smaller than the value of 0.172

nucleons/fm^3, which has been more commonly used. In addition, results obtained by means of the integrodifferential equation for the Λ-nucleon correlation function, are given. In the next section the formalism is briefly described and in the final one the results are given and discussed.

2. THE FORMALISM

If the functional variation is performed to the first order energy functional $E_\Lambda^{(1)}$

$$E_\Lambda^{(1)} = \rho \int f(r)\, H_{\Lambda 1}\, f(r)\, d\vec{r} \tag{1}$$

with the healing condition

$$\rho \int (f(r) - 1)^2 \, d\vec{r} = I_1 < \infty \tag{2}$$

the Euler equation for the Λ-nucleon correlation function is the following differential equation[8 9]

$$\frac{d^2 f_0}{dr^2} + \frac{2}{r}\frac{df_0}{dr} - \frac{2\mu_{\Lambda N}}{\hbar^2} V_{\Lambda N}(r)\, f_0 - \beta^2 f_0 = -\beta^3 , \; c \leq r < \infty \tag{3}$$

This is solved numerically with boundary conditions

$$f(c) = 0, \qquad f(\infty) = 1 \tag{4}$$

A few additional remarks concerning this approach are in order.

Firstly, we observe that a relation holds between $E_\Lambda^{(1)}$, I_1 and the intergal I_2, defined by

$$I_2 = \rho \int (f^2 - 1)\, d\vec{r} \tag{5}$$

This relation is the following :

$$E_\Lambda^{(1)} = - \frac{\hbar^3}{4\mu_{\Lambda N}} \beta^2 \, (I_1 + I_2) \tag{6}$$

By using the above expression we may avoid the numerical intergation of one of the integrals $E_\Lambda^{(1)}$, I_1 and I_2.

Secondly, in the case of the exponential with hard core potential, in which the derivation of an analytic solution is possible, we may find the asymptotic form of the solution for large internucleon distances or for large values of the parameter β. This asymptotic form is the following:

$$f(r) \simeq 1 - \frac{1}{r}\{ce^{-\beta(r-c)} + \frac{2\mu_{\Lambda N}}{\hbar^2} \frac{V_0}{\beta^2-\mu^2}(c - \frac{2\mu}{\beta^2-\mu^2})\, e^{-\beta(r-c)}$$

$$- \frac{2\mu_{\Lambda N}}{\hbar^2} \frac{V_0}{\beta^2-\mu^2}(r - \frac{2\mu}{\beta^2-\mu^2})\, e^{-\mu(r-c)}\} \qquad (7)$$

Furthermore, in the case of very large values of β, the following asymptotic expressions of $E_\Lambda^{(1)}$, I_1 and I_2 may be derived:

$$E_{\Lambda,as}^{(1)}(\beta) = 4\pi\rho \frac{\hbar^2}{2\mu_{\Lambda N}}\left[\frac{1}{2}c^2\beta + c - \frac{2\mu_{\Lambda N}}{\hbar^2}\frac{V_0}{\mu^3}(\mu^2c^2 + 2\mu c + 2)\right] \qquad (8)$$

$$I_{1,as} = \frac{4}{3}\pi\rho c^3 + \frac{2\pi\rho c^2}{\beta} \qquad (9)$$

and

$$I_{2,as} = -\frac{4}{3}\pi\rho c^3 - \frac{6\pi\rho c^2}{\beta} \qquad (10)$$

It is seen that $E_{\Lambda,as}^{(1)}$ is represented by a straight line while $I_{1,as}$ and $I_{2,as}$ by hyperbolas.

When the functional variation is applied to the expression of E_Λ :

$$E_\Lambda = 4\pi\rho\int_0^\infty dr \,.\, r^2\, [f(r)\, W(r)\, f(r)]\, G_{N\Lambda}(r) \qquad (11)$$

with the conditions

$$4\pi\rho\int_0^\infty (f-1)^2\, G_{N\Lambda}(r)\, r^2\, dr = \tilde{I}_1 < \infty \qquad (12)$$

and

$$4\pi\rho\int_0^\infty (f^2\, G_{N\Lambda}(r) - 1)\, r^2 dr = \tilde{I}_2 < \infty \qquad (13)$$

a complicated integrodifferential equation for f is obtained (see equ. 3.6 of ref. 11). The expressions of W and the distribution function $G_{N\Lambda}(r)$ are also given in ref. 11.

The calculation of the functional derivative of $G_{N\Lambda}$ which appears in the integrodifferential equation may be done by using the expression (3.3) of reference 11 and substituting subsequently an approximate expression for $G_{N\Lambda}$, as for example

$$G_{N\Lambda}(r) \simeq 1 + X_{(r)} \tag{14}$$

or, according to Westhaus[5]

$$G_{N\Lambda} \simeq e^{X(r)} \tag{15}$$

where

$$X(r) = \rho \int d\vec{r}_{1\Lambda} [f^2(r_{1\Lambda}) - 1] [g_0^{(2)}(|\vec{r}_{1\Lambda} - \vec{r}|) - 1] \tag{16}$$

$$g_0^{(2)}(|\vec{r}_{1\Lambda} - \vec{r}|) = f^2_{NN}(|\vec{r}_{1\Lambda} - \vec{r}|)[1 - \frac{1}{4} l^2(k_F|\vec{r}_{1\Lambda} - \vec{r}|)], \quad l(x) = \frac{3j_1(x)}{x} \tag{17}$$

An alternative procedure is to calculate the functional derivative directly from expressions (14) or (15).

The following cases may therefore be considered in solving the integrodifferential equation:

A_1:
$$G_{N\Lambda}(r) \simeq 1+X(r) \tag{18}$$

$$\frac{\delta G_{N\Lambda}(r)}{\delta f(r_{1\Lambda})} \simeq 2\rho f(r_{1\Lambda}) [g_0^{(2)}(|\vec{r}_{1\Lambda} - \vec{r}|) - 1] \tag{19}$$

A_2:
$$G_{N\Lambda}(r) \simeq e^{X(r)} \tag{20}$$

$$\frac{\delta G_{N\Lambda}(r)}{\delta f(r_{1\Lambda})} \simeq 2\rho f(r_{1\Lambda}) e^{X(r)} [g_0^{(2)}(|\vec{r}_{1\Lambda} - \vec{r}|) - 1] \tag{21}$$

B_1:
$$G_{N\Lambda}(r) \simeq 1+X(r) \tag{22}$$

$$\frac{\delta G_{N\Lambda}(r)}{\delta f(r_{1\Lambda})} \simeq 2\rho f(r_{1\Lambda}) [1 + X(r_{1\Lambda})][1+X(r)][g_0^{(2)}(|\vec{r}_{1\Lambda} - \vec{r}|) - 1] \tag{23}$$

and

B_2: $G_{N\Lambda}(r) \simeq e^{\chi(r)}$ (24)

$$\frac{\delta G_{N\Lambda}(r)}{\delta f(r_{1\Lambda})} \simeq 2\rho f(r_{1\Lambda})\, e^{\chi(r_{1\Lambda})}\, e^{\chi(r)}[g_0^{(2)}(|\vec{r}_{1\Lambda} - \vec{r}|) - 1] \quad (25)$$

From the examination of the integrodifferential equation at large distances it turns out that the Lagrange multiplier λ_1 may be taken equal to zero. This value will be assumed in this paper.

3. RESULTS AND DISCUSSION

The results obtained with the differential equation for f are given first.

The potentials H, E′ and B′ of Herndon and Tang[12 13] were used and two values for the density of nuclear matter: a) $\rho = 0.166$ nucleons/fm^3 ($k_F = 1.35$ fm^{-1}) and b) $\rho = 0.121$ nucleons/fm^3 ($k_F = 1.2144$ fm^{-1}). For each value of the density the nucleon-nucleon correlation function was determined by using the potentials OMY-I (functions g_2' and g_2'') and OMY-II[14] (functions g_3' and g_3'' respectively) described in ref. 9. The nucleon-nucleon correlation function has the form (44) of ref. (9) and the parameters are the following[15].

For g_2' :
$c_{NN} = 0.6$ fm, $a = 2.3284$ fm^{-1}, $b = 1.37282$
For g_2''
$c_{NN} = 0.6$ fm, $a = 2.3791$ fm^{-1}, $b = 1.3664$
For g_3'
$c_{NN} = 0.4$ fm, $a = 2.5621$ fm^{-1}, $b = 1.26792$
and for g_3''
$c_{NN} = 0.4$ fm, $a = 2.5964$ fm^{-1}, $b = 1.24612$

The parameter β was determined in two ways, as in ref. 9. The results for the various cases are given on tables I-VIII. It is seen that the values of B_Λ are closer to the empirical value compared to the corresponding ones of ref 9. In particular with the smaller value for the density and the potential B′ the results are very good and in agreement with the empirical value.

The integrodifferential equation was solved numerically with the method of iteration. The correlation function f_0, together with the corresponding f_0 which satisfies the differential equation is shown in fig. 1 for the BC choice for β_1 $(\beta_1^2 = \frac{2\mu_{\Lambda N}}{\hbar^2}\lambda_2)$ and potential B′. In fig. 2 the values of the healing integral are plotted as functions of β (or β_1) and in fig. 3 the $E_\Lambda^{(1)}$, $E_\Lambda^{(2)}$ and their sum E_Λ are plotted as functions of β_1. It is seen from the latter figure that the minimum of E_Λ corresponds now to $\beta_1 \to 0$. This is well-understood since the minimum should appear when the integral constraint has the least possible effect.

The results obtained with the integrodifferential equation are shown in tables IX-XII. It is seen that with potential B′ do not differ much from the results obtained with the differential equation, while with potential E′ there is more deviation from the empirical value of E_Λ. It is also seen that the results in cases B_1 and B_2 are very slightly better. The results for E_Λ with the smaller value for tbe density ρ are closer to the empirical value as in the case of the differential equation. It should be finally noted that in the case of the integrodifferential equation the inaccuracies are larger and this should be kept in mind in the assessment of the results.

We would like to thank Mr. Panos for computational assistance and the staff of the computting centre of the University of Thessaloniki, where the computations were performed.

TABLE I.

Values of $E_\Lambda^{(1)}$, $E_\Lambda^{(2)}$, $E_\Lambda^{(1)} + E_\Lambda^{(2)}$, I_1 and I_2 for values of β which minimize $E_\Lambda^{(1)} + E_\Lambda^{(2)}$ (ME choice). The g'_2 nucleon-nucleon correlation function and the value ϱ=0.166 nucleons/fm³ for the density of nuclear matter were used.

Potential	$E_\Lambda^{(1)}$ (MeV)	$E_\Lambda^{(2)}$ (MeV)	$E_\Lambda = E_\Lambda^{(1)} + E_\Lambda^{(2)}$ (MeV)	I_1	I_2
H	-86.1	13.0	-73.1	0,259	1.164
E′	-71.0	8.5	-62.5	0.140	1.209
B′	-49.4	4.4	-45.0	0.061	0590.

TABLE II.

Values of $E_\Lambda^{(1)}$, $E_\Lambda^{(2)}$, $E_\Lambda^{(1)}+E_\Lambda^{(2)}$, I_1 and I_2 for values of β which minimize $E_\Lambda^{(1)}+E_\Lambda^{(2)}$ (ME choice). The g_3' nucleon-nucleon correlation function and the value $\varrho=0.166$ nucleons/fm^3 for the density of nuclear matter were used.

Potential	$E_\Lambda^{(1)}$ (MeV)	$E_\Lambda^{(2)}$ (MeV)	$E_\Lambda=E_\Lambda^{(1)}+E_\Lambda^{(2)}$ (MeV)	I_1	I_2
H	-88.8	12.2	-76.6	0.286	1.780
E′	-72.8	8.4	-64.4	0.160	1.784
B′	-50.4	5.0	-45.4	0.072	1.274

TABLE III.

Values of $E_\Lambda^{(1)}$, $E_\Lambda^{(2)}$, $E_\Lambda^{(1)}+E_\Lambda^{(2)}$, I_1 and I_2 for values of β which minimize $\left|E_\Lambda^{(2)}\ E_\Lambda^{(1)}\right|$ (BC choice). The g_2' nucleon-nucleon correlation function and the value $\varrho=0.166$ nucleons/fm^3 for the density of nuclear matter were used.

Potential	$E_\Lambda^{(1)}$ (MeV)	$E_\Lambda^{(2)}$ (MeV)	$E_\Lambda=E_\Lambda^{(1)}+E_\Lambda^{(2)}$ (MeV)	I_1	I_2
H	-76.0	7.8	-68.2	0.215	0.092
E′	-61.9	4.2	-57.7	0.101	0.102
B′	-38.8	0.6	-38.2	0.030	0.013

TABLE IV.

Values of $E_\Lambda^{(1)}$, $E_\Lambda^{(2)}$, $E_\Lambda^{(1)}+E_\Lambda^{(2)}$, I_1 and I_2 for values of β which minimize $\left|E_\Lambda^{(2)}/E_\Lambda^{(1)}\right|$ (BC choice). The g_3' nucleon-nucleon correlation function and the value $\varrho=0.166$ nucleons/fm^3 for the density of nuclear matter were used.

Potential	$E_\Lambda^{(1)}$ (MeV)	$E_\Lambda^{(2)}$ (MeV)	$E_\Lambda=E_\Lambda^{(1)}+E_\Lambda^{(2)}$ (MeV)	I_1	I_2
H	-75.4	5.2	-70.2	0.214	0.075
E′	-61.8	3.2	-58.6	0.101	0.096
B′	-40.1	0.9	-39.2	0.030	0.022

TABLE V.

Values of $E_\Lambda^{(1)}$, $E_\Lambda^{(2)}$, $E_\Lambda^{(1)}+E_\Lambda^{(2)}$, I_1 and I_2 for values of β which minimize $E_\Lambda^{(1)}+E_\Lambda^{(2)}$ (ME choice). The g_2'' nucleon-nucleon correlation function and the value $\varrho=0.121$ nucleons/fm^3 for the density of nuclear matter were used.

Potential	$E_\Lambda^{(1)}$ (MeV)	$E_\Lambda^{(2)}$ (MeV)	$E_\Lambda=E_\Lambda^{(1)}+E_\Lambda^{(2)}$ (MeV)	I_1	I_2
H	-64.7	9.0	-55.7	0.208	1.298
E′	-53.1	6.1	-47.0	0.117	1.301
B′	-37.1	3.7	-33.4	0.058	1.092

TABLE VI.

Values of $E_\Lambda^{(1)}$, $E_\Lambda^{(2)}$, $E_\Lambda^{(1)}+E_\Lambda^{(2)}$, I_1 and I_2 for values of β which minimize $E_\Lambda^{(1)}+E_\Lambda^{(2)}$ (ME choiee). The g_3'' nucleon-nucleon correlation function and the value $\varrho=0.121$ nucleons/fm³ for the density of nuclear matter were used.

Potential	$E_\Lambda^{(1)}$ (MeV)	$E_\Lambda^{(2)}$ (MeV)	$E_\Lambda=E_\Lambda^{(1)}+E_\Lambda^{(2)}$ (MeV)	I_1	I_2
H	-66.5	8.8	-57.7	0.233	1.829
E′	-54.4	6.3	-48.1	0.138	1.840
B′	-37.6	3.9	-33.7	0.066	1.301

TABLE VII.

Values of $E_\Lambda^{(1)}$, $E_\Lambda^{(2)}$, $E_\Lambda^{(1)}+E_\Lambda^{(2)}$, I_1 and I_2 for values of β which minimize $|E_\Lambda^{(2)}/E_\Lambda^{(1)}|$ (BC choice). The g_2'' nucleon-nucleon correlation function and the value $\varrho=0.121$ nucleons fm³ for the density of nuclear matter were used.

Potential	$E_\Lambda^{(1)}$ (MeV)	$E_\Lambda^{(2)}$ (MeV)	$E_\Lambda=E_\Lambda^{(1)}+E_\Lambda^{(2)}$ (MeV)	I_1	I_2
H	-55.0	4.0	-51.0	0.156	0.054
E′	-44.7	2.2	-42.5	0.073	0.063
B′	-28.0	0.3	-27.7	0.022	0.008

TABLE VIII.

Values of $E_\Lambda^{(1)}$, $E_\Lambda^{(2)}$, $E_\Lambda^{(1)}+E_\Lambda^{(2)}$, I_1 and I_2 for values of β which minimize $|E_\Lambda^{(2)}/E_\Lambda^{(1)}|$ (BC choice). The g_3'' nucleon-nucleon correlation function and the *value $\varrho=0.121$ nucleons/fm³ for the density of nuelear matter were used*

Potential	$E_\Lambda^{(1)}$ (MeV)	$E_\Lambda^{(2)}$ (MeV)	$E_\Lambda=E_\Lambda^{(1)}+E_\Lambda^{(2)}$ (MeV)	I_1	I_2
H	-54.3	2.6	-51.7	0.155	0.032
E′	-44.3	1.6	-42.7	0.072	0.053
B′	-28.9	0.5	-28.4	0.022	0.014

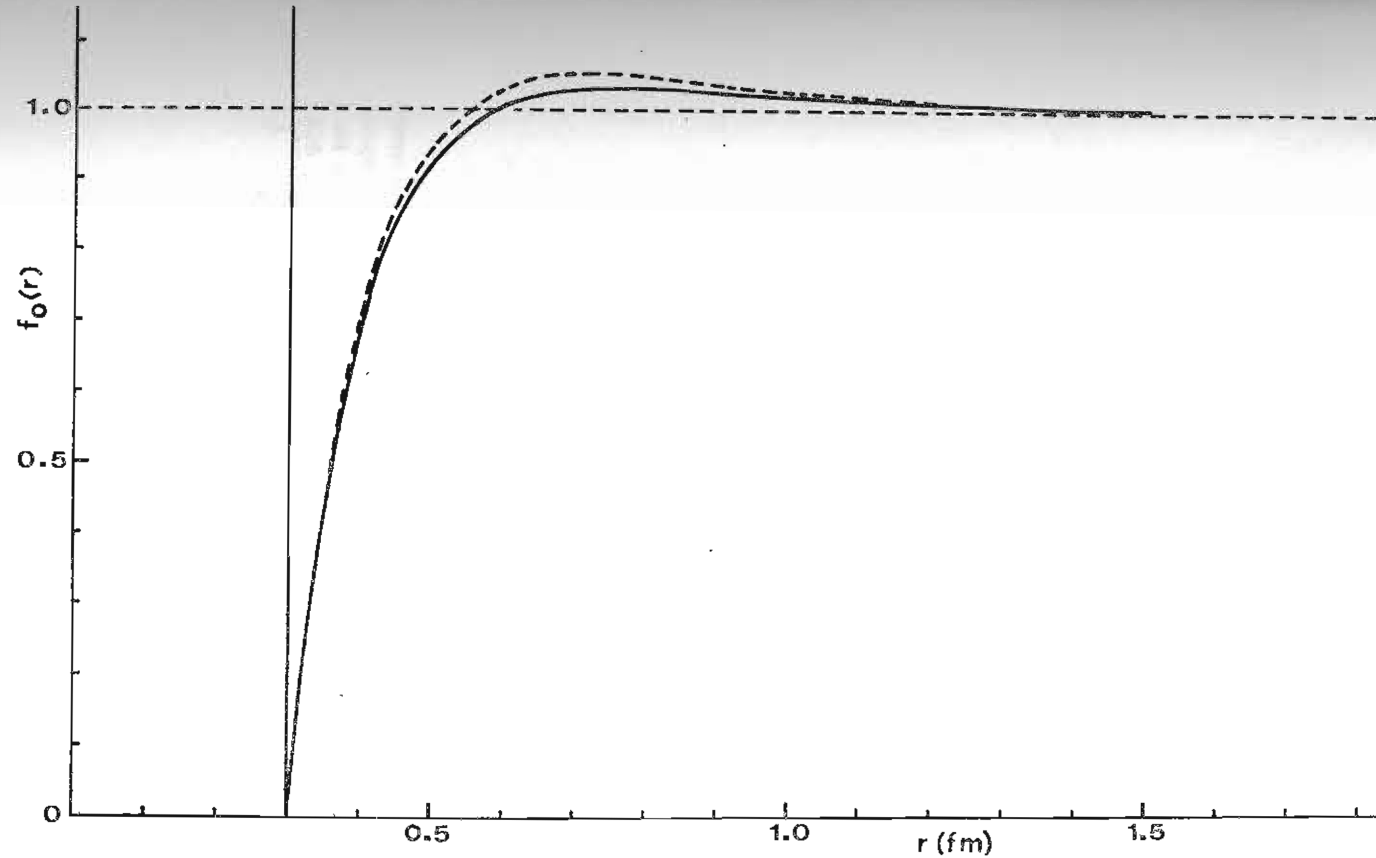

Fig. 1. The correlation function f_0 obtained with the BC choice for β_1. The g_2 nucleon-nucleon correlation function, the potential B' and the value $\varrho=0.172$ nucleons/fm^3 for the density of nuclear matter were used. (The solid line corresponds to the differential equation and the dashed line to the integrodifferential one). The choice B_1 for $G_{N\Lambda}$ and $\frac{\delta G_{N\Lambda}}{\delta f}$ was made.

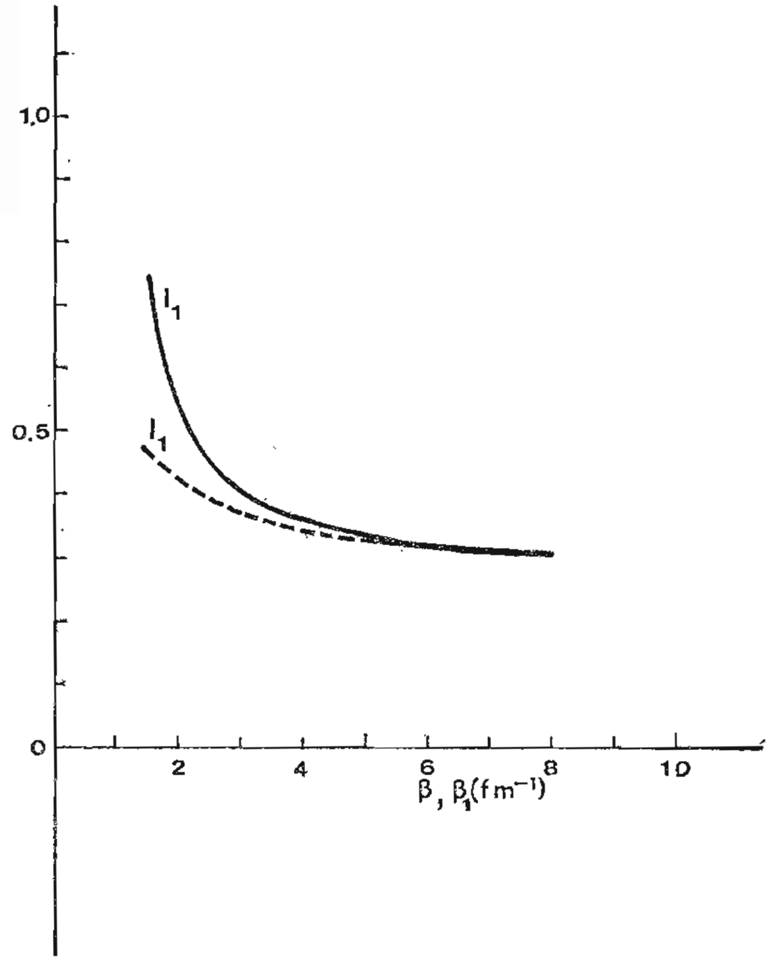

Fig. 2. The «healing integral» I_1 as a function of β (or β_1). (Nucleon-nucleon correlation function g_2, potential B', $\varrho=0{,}172$ nucleons/fm^3). The solid line corresponds to the I_1 obtained by using the differential equation and the dashed line to the I_1 obtained by using the integrodifferential one. The choice B_1 for $G_{N\Lambda}$ and $\frac{\delta G_{N\Lambda}}{\delta f}$ was made.

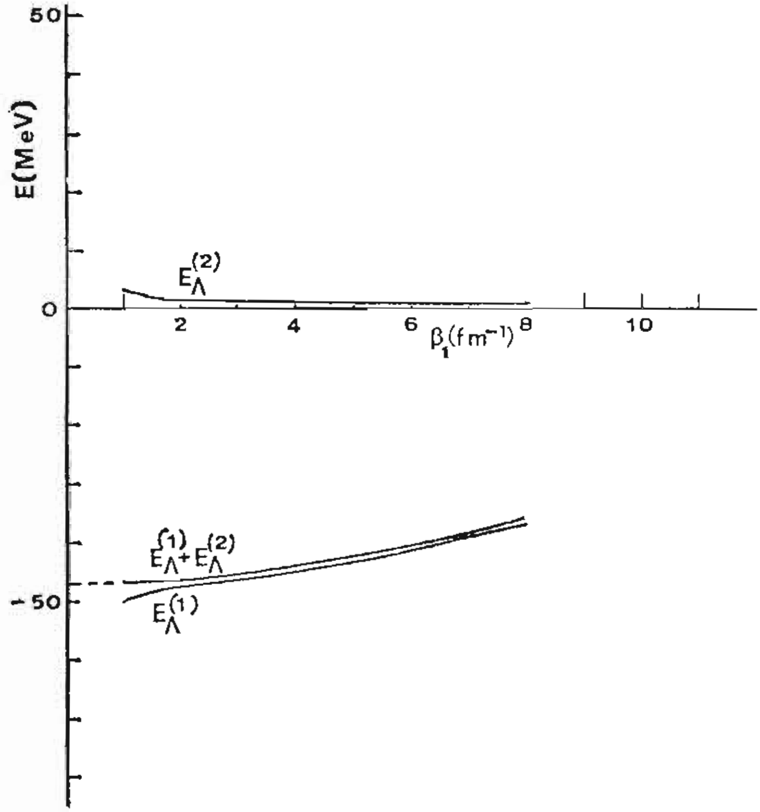

Fig. 3. The first and second order energies and their sum as functions of β_1. (Nucleon-nucleon correlation function g_2, potential B' and $\varrho=0.172$ nucleons/fm^3). The choice B_1 for $G_{N\Lambda}$ and $\frac{\delta G_{N\Lambda}}{\delta f}$ was made.

TABLE IX.

Values of $E_\Lambda^{(1)}$, $E_\Lambda^{(2)}$, $E_\Lambda^{(1)}+E_\Lambda^{(2)}$ and I_1 for values of β_1 which minimize $|E_\Lambda^{(2)}/E_\Lambda^{(1)}|$ (BC choice). The g_2 nucleon-nucleon correlation function, the potential B′ and the value ϱ=0.172 nucleons/fm^3 for the density of nuclear matter were used in solving the integrodifferential equation.

Case	$E_\Lambda^{(1)}$ (MeV)	$E_\Lambda^{(2)}$ (MeV)	$E_\Lambda^{(1)}+E_\Lambda^{(2)}$ (MeV)	I_1
A_1	-40.6	0.7	-39.9	0.031
A_2	-40.4	0.7	-39.7	0.031
B_1	-40.2	0.7	-39.5	0.031
B_2	-40.2	0.7	-39.5	0.031

TABLE X.

Values of $E_\Lambda^{(1)}$, $E_\Lambda^{(2)}$, $E_\Lambda^{(1)}+E_\Lambda^{(2)}$ and I_1 for values of β_1 which minimize $|E_\Lambda^{(2)}/E_\Lambda^{(1)}|$ (BC choiee). The g_2 nueleon-nucleon correlation function, the potential E′ and the value ϱ=0.172 nucleons/fm^3 for the density of nuclear matter werc used in solving the integrodifferential cquation.

Case	$E_\Lambda^{(1)}$ (MeV)	$E_\Lambda^{(2)}$ (MeV)	$E_\Lambda^{(1)}+E_\Lambda^{(2)}$ (MeV)	I_1
A_1	-68.3	4.7	-63.6	0.115
A_2	-67.8	5.1	-62.7	0.114
B_1	-67.6	5.0	-62.6	0.113
B_2	-67.5	5.1	-62.4	0.113

TABLE XI.

Values of $E_\Lambda^{(1)}$, $E_\Lambda^{(2)}$, $E_\Lambda^{(1)}+E_\Lambda^{(2)}$ and I_1 for values of β_1 whieh minimize $|E_\Lambda^{(2)}/E_\Lambda^{(1)}|$ (BC choice). The g_2' nucleon-nucleon correlation function, thc potential B′ and the value ϱ=0.166 nucleons/fm^3 for the density of nuclear matter were used in solving the integrodifferential equation.

Case	$E_\Lambda^{(1)}$ (MeV)	$E_\Lambda^{(2)}$ (MeV)	$E_\Lambda^{(1)}+E_\Lambda^{(2)}$ (MeV)	I_1
A_1	-39.2	0.6	-38.6	0.030
A_2	-39.1	0.6	-38.5	0.030
B_1	-39.0	0.6	-38.4	0.030
B_2	-39.0	0.6	-38.4	0.030

TABLE XII.

Values of $E_\Lambda^{(1)}$, $E_\Lambda^{(2)}$, $E_\Lambda^{(1)}+E_\Lambda^{(2)}$ and I_1 for values of β_1 which, minimize $|E_\Lambda^{(2)}/E_\Lambda^{(1)}|$ (BC choice). The g_2'' nucleon-nucleon correlation function, the potential B' and the value ϱ=0.121 nucleons/fm^3 for the density of nuclear matter were used in solving the integrodifferential equation.

Case	$E_\Lambda^{(1)}$ (MeV)	$E_\Lambda^{(2)}$ (MeV)	$E_\Lambda^{(1)}+E_\Lambda^{(2)}$ (MeV)	I_1
A_1	-28.6	0.4	-28.2	0.022
A_2	-28.6	0.4	-28.2	0.022
B_1	-28.5	0.4	-28.1	0.022
B_2	-28.5	0.4	-28.1	0.022

REFERENCES

1. Bodmer, A. R. and Rote, D. M., in Proceedings of the International Conference on Hypernuclear Physics, Argonne National Laboratory, 1969, edited by A. B. Bodmer and L. G. Hyman (Argonne National Laboratory, Argonne, Illinois), Vol. II, p. 521, (1969).
2. Dabrowski, J. and Hassan, M. Y. M., Phys. Rev. C1, 1883 (1970).
3. Ram, B. and Williams, W., Phys. Rev., C 3, 45. (1971)
4. Downs, B. W. and Grypeos, M. E., Nuovo Cimento, 44B, 306 (1966).
5. (a) Westhaus P. and Clark, J. W., Phys. Lett. 23. 109; (1966), (b) Westhaus, P., Ph. D. thesis, Washington University, St. Louis (unpublished) (1966).
6. Mueller G. and Clark, J. W., Nucl. Phys. B7, 227 (1968).
7. Clark, J. W. and Mueller, G. Nuovo Cimento, 64 B, 217. (1969).
8. Grypeos, M. E., Kok L. P. and Ali S., in Proceedings of the International Conference on Hypernuclear Physics, Argonne National Laboratory (see Ref. 1) Vol. II, p. 826 (1969).
9. Ali, S., Grypeos, M. E. and Kargas, B., Phys. Rev., C14, 285 (1976).
10. Greenless, G. W., Pyle, G. J. and Tang, Y. C., Phys. Rev. 171, 1115 (1968).
11. Kargas, B. C. aud Grypeos, M. E., Inter. Jour. Theor. Phys. 14, 211 (1975).
12. Herndon, R. C. and Tang, Y. C., Phys. Rev. 159, 853 (1967).
13. Tang, Y. C., in Proceedings of the International Conference on Hypernuclear Physics, Argonne National Laboratory (see Ref. 1), Vol. I, p.276 (1969).
14. Ohmura, T., Morita, M. and Yamada, M., Prog. Theor. Phys. (Kyoto) 15, 222 (1956).
15. Mavrommatis, E., private communication (1976-1977).

ΠΕΡΙΛΗΨΗ

ΥΠΟΛΟΓΙΣΜΟΙ ΕΠΙ ΤΗΣ ΥΠΕΡΠΥΡΗΝΙΚΗΣ ΥΛΗΣ

Ὑπὸ

Μ. Ε. ΓΡΥΠΑΙΟΥ καὶ Β. Κ. ΚΑΡΓΑ

Σπουδαστήριον Θεωρητικῆς Φυσικῆς Πανεπιστημίου Θεσσαλονίκης

Εἰς τὴν ἐργασίαν αὐτὴν ἀνακοινοῦνται ἀποτελέσματα διὰ τὴν ἐνέργειαν συνδέσεως ἑνὸς σωματίου Λ εἰς τὴν πυρηνικὴν ὕλην B_{Λ}, ληφθέντα ἐπὶ τῇ βάσει τῆς διαφορικῆς ἐξισώσεως διὰ τὴν συνάρτησιν ἀλληλοσυσχετίσεως Jastrow, f, διὰ τῆς χρήσεως κεντρικῶν δυναμικῶν καὶ τιμῶν διὰ τὴν πυκνότητα τῆς πυρηνικῆς ὕλης, αἱ ὁποῖαι εἶναι μικρότεραι ἀπὸ τὴν ἀρχικῶς χρησιμοποιηθεῖσαν (0.172 nucleons/fm^3) καὶ αἱ ὁποῖαι καθωρίσθησαν μεταγενεστέρως. Δίδονται ἐπίσης ἀποτελέσματα διὰ τῆς χρήσεως τῆς ὁλοκληροδιαφορικῆς ἐξισώσεως διὰ τὸν καθορισμὸν τῆς f καθὼς καὶ διαφόρων προσεγγιστικῶν ἐκφράσεων διὰ τὴν συνάρτησιν κατανομῆς σωματίου Λ-νουκλεονίου $G_{N\Lambda}(r)$ καὶ τὴν συναρτησιακὴν παράγωγον της.