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شبكة المعلومات الجامعية

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جامعة عين شمس

التوثيق الالكتروني والميكرو فيلم

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لم ترد بالأصل



Faculty of Science
Physics Department

Core of Nucleon-Nucleon Interaction

A THESIS

Submitted to the Faculty of Science (Sohag),
South Valley University

In Partial Fulfillment of the Requirements
for the Degree of Master of Science
(Physics)

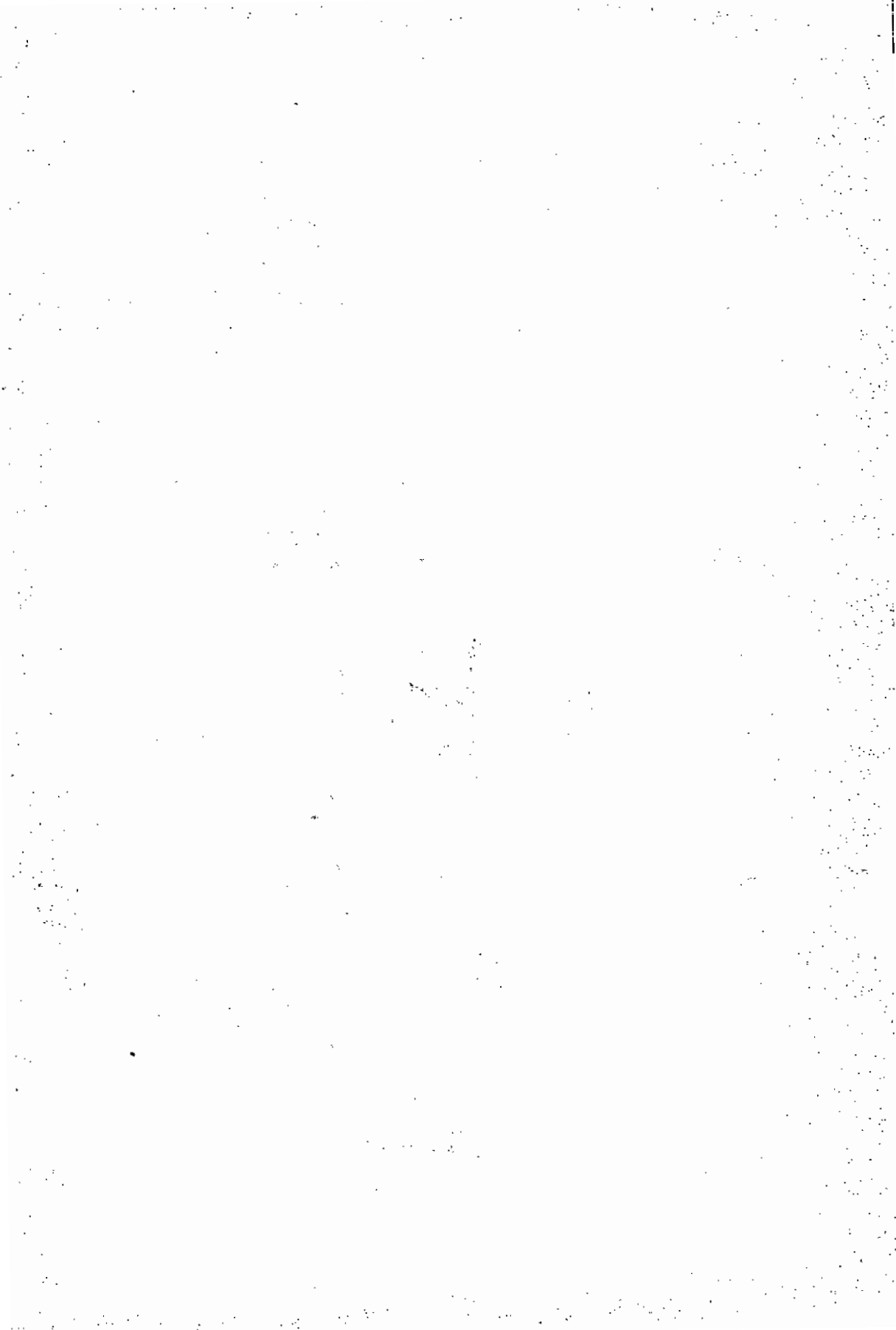
By

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B. Sc. Physics (1994)

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1419-1998



بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

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اللَّهُ

عَلَيْكَ عَظِيمًا



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ABSTRACT

Thesis's title: Core of Nucleon-Nucleon Interaction.

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We investigated the argument of Vinh Mau *et al.* [1991] that the good description of the nucleon-nucleon NN interaction at short distances by quark models could be questioned. The quark model is simulated at short distances by a repulsive short range nonlocality. For larger radii, the one pion exchange potential OPEP is used. We found that the quark model alone at the core region can only reproduce the deuteron binding energy, but fitting other NN properties needs high *local* repulsion.

Key Words

quark model , hard-core , core region , deuteron, nucleon-nucleon interaction, $^3S_1 - ^3D_1$.

List of Tables

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- 1 Deuteron properties and the low energy parameters of the truncated potentials with different cut-off radii R_{cut} and no hard-core radius r_C is assumed where, the potential is nonlocal in the region $r_C < r < R_{cut}$ with strength parameter λ and it is OPEP in the region $r > R_{cut}$. In each case, the binding energy of the deuteron $E_b = -2.22464 \text{ MeV}$. The number of nodes found in the radial deuteron wave functions is N . 34
- 2 Deuteron properties and the low energy parameters of truncated potentials with different cut-off radii R_{cut} and constant hard-core radius r_C where, the potential is nonlocal in the region $r_C < r < R_{cut}$ with strength parameter λ and it is OPEP in the region $r > R_{cut}$. In each case, the binding energy of the deuteron $E_b = -2.22464 \text{ MeV}$. The number of nodes found in the radial deuteron wave functions is N . 51
- 3 a- The values of the hard-core radius r_C and the cut-off radius R_{cut}^o . These values are obtained by fitting, use the least-square method, all pairs of (λ, R_{cut}) of tables (1) and (2) when the r_C is constant at different values. R_{cut}^o is equal to a_o when $\lambda = 0 \text{ fm}^{-3}$ in the equation 4.1. 70
 b- The coefficients of the two polynomials with an order n in r_C which are obtained by fitting the values of (R_{cut}^o, r_C) which are given in table 3-a. These polynomials are used to draw the curve of figure 7. The first row corresponds to the values of r_C from 0 to 0.25fm and the other from 0.25 to 0.46fm and the extrapolation to higher values.