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YKS

Deuteron Polarizability

$$d = \alpha \, \varepsilon_0 \, E$$

- d ← EDM
- α ← Polarizability
- E ← Electric field
- ε_0 ← $8.85 \times 10^{-12} \frac{F}{m}$

$\alpha = 0.70 \pm 0.05 \ fm^3$

and assume

$E = 10 \ MV/m$

$\Rightarrow d = 0.7 \ fm^3 \ 8.9 \times 10^{-12} \frac{F}{m} \times 10^7 \frac{V}{m}$

$\Rightarrow d = 4 \times 10^{-29} \ e \cdot cm$

i.e. 4% of $10^{-27} \ e \cdot cm$

Interaction Energy $W = -\bar{d} \cdot \bar{E} = -\alpha \varepsilon_0 E^2$

↑ quadratic in E

1982
P. 909

Measurement of the Electric Polarizability of the Deuteron

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The electric polarizability of the deuteron has been determined by measuring deviations from the Rutherford scattering formula for deuteron elastic scattering from ^{208}Pb at energies from 3.0 to 7.0 MeV. The measured value of the electric polarizability, $\alpha = 0.70 \pm 0.05$ fm^3, is in fair agreement with theoretical predictions.

PACS numbers: 21.40.+d, 25.50.Dt, 27.10.+h

The scattering of projectiles from nuclei at energies far below the Coulomb barrier is described only approximately by the Rutherford expression. At sufficiently low energies residual nuclear effects resulting from the tail of the nuclear potential or from barrier penetration can be neglected, but in spite of this there can still be significant deviations from the Rutherford scattering law. From the point of view of nuclear physics, the most interesting effects are those which result from the internal degrees of freedom of the tar-

cross section for deuteron elastic scatteri low energies.

The primary reason for our interest in uring α is simply that the deuteron electri larizability is a fundamental property of tl bound state which, up until now, has not b measured. A measurement of the electric ization is also of importance because Coul stretching of the deuteron is closely relat the more general issue of the role of deut stretching and breakup in nuclear reaction

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Session B6 - Few-Body Physics and Nuclear Theory.
MIXED session, Thursday afternoon, October 29
Room 4b, Sweeney Convention Center

[B6.13] The Polarizability of the Deuteron

Jiunn-Wei Chen, Harald W. Grießhammer, Martin J. Savage (U. of Washington), Roxanne P. Springer (Duke University)

The scalar and tensor polarizabilities of the deuteron are calculated using the recently developed effective field theory that describes nucleon-nucleon interactions. Leading and next-to-leading order contributions in the perturbative expansion predict a scalar electric polarizability of \spol=0.595\ fm^3. The tensor electric polarizability receives contributions starting at next-to-leading order from the exchange of a single potential pion and is found to be \qpol=-0.062\ fm^3. We compute the leading contributions to the scalar and tensor magnetic polarizabilities, finding \Mspol = 0.067 \ fm^3 and \Mqpol = 0.195 \ fm^3.

▪ **Part B of program listing**