DEUTERON ELECTRIC QUADRUPOLE MOMENT*

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The nuclear radio-frequency spectra of molecular hydrogen and deuterium, first observed by Rabi et al.,[1] were reinvestigated by Ramsey et al.[2] From these experiments the value of the quadrupole coupling constant eQq, in the $v=0$, $J=1$ vibrational-rotational level of the electronic ground state of D_2, was determined with an estimated accuracy of better than 1 part in 10^3.

An accurate value for the deuteron electric quadrupole moment Q can be derived from this result if q, the electric field gradient along the molecular axis at one deuteron, is evaluated theoretically. This was done by Nordsieck[3] and later by Newell[4] using a trial molecular wave function which gave a molecular binding energy D_e of 4.566 ev.[5]

The present author has calculated q from a trial function which gives $D_e = 4.728$ ev. This is much closer to the experimental value[6] of 4.747 ev. The trial function was constructed in the framework of the Born-Oppenheimer approximation. Its electronic part consisted of an expansion in the electronic coordinates and the interelectronic distance, of the type first investigated by James and Coolidge,[7] and recently by Kolos and Roothaan.[8]

The value of q obtained from this function yields $Q = 2.82 \times 10^{-27}$ cm^2. This is about 3% larger than the currently accepted value based on Newell's result.

The discrepancy is larger than the estimate given by Newell.[4] Newell, however, obtained this estimate by an admittedly crude procedure. In addition it should be noted that q, in these calculations, is not stationary. Consequently no rigorous estimate of the error in q can actually be made.

The details of this calculation will be given in a forthcoming publication.

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POSSIBLE EXISTENCE OF A NEW K' MESON*

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It has been experimentally established that the Λ particles produced in the reaction

$$p+\pi^- \to K^0+\Lambda \tag{1}$$

are strongly peaked backward in the c.m. system. Pais[1] has tried to explain this result by assuming the existence of a $KK\pi$ interaction and that the main contribution to reaction (1) comes from the Feynman graph of Fig. 1, assuming χ^+ to be a K^+ meson. He has obtained a reasonable qualitative agreement with the available experimental data at 1.1 Bev. However, his scheme, supposing opposite parities for K^+ and K^0, leads to many problems of difficult solution, arising from the failure of charge independence of the π interaction. One such difficulty results from the lack of a $KK\pi^0$ interaction, which gives rise to a mass of charged π's smaller than that of π^0.[2]

In the present paper we shall try, maintaining the convenient features of the Pais scheme, to