OT AND C. A. TEN SELDAM

7 and 8 atomic units, and S o m m e rupplied the formula (12) to  $r_0 = 3$  and 4

the sums, occurring in the expressions (12), simplified, because it can be shown that they ial integral, that has been tabulated 5). To be stated that the sums of equations (12) and

$$= \sum_{\tau=1}^{\infty} \frac{x^{\tau}}{\tau(\tau+m)!} \,. \tag{15}$$

qual to

$$f_2(x) - f_1(x) + \frac{1}{2}x.$$
 (16)

e connected to the general "exponential inteed here by the symbol *Fi* :

$$f_m(x) = \int_{1}^{x} f^x x^{-m} dx, \qquad (17)$$

 $m(x) - (m!)^{-1} \cdot \ln x$  +  $f_m(1) - g_m(1)$ , (18)  $x^{-1}$ :

$$= \sum_{\tau=1}^{m} \frac{1}{\tau(m-\tau)! x^{\tau}}.$$
 (19)

derived by developing the exponential under grating by terms. nts; for instance:

= 0.19066925 and  $f_3(1) = 0.04635136$  (20)

to a recursion formula for the functions Fi

$$(x) = Fi_m(x) - e^x x^{-m} + e, (21)$$

sed with  $Fi_1$  and elementary transcendent part from an additive constant, equal to the tegral  $\overline{Ei}$ :

$$-\overline{Ei}(1) = \overline{Ei}(x) - 1.895168.$$
 (22)

$$\prod_{0}^{\infty} \left( \int_{-\infty}^{-\epsilon} t^{-1} dt + \int_{+\epsilon}^{\infty} e^{t} t^{-1} dt \right).$$
(23)

nable a simple calculation of the expressions

## ON THE ENERGIES OF A MODEL OF THE COMPRESSED H-ATOM 673

In the region of large x it is sometimes convenient, in view of the slow convergence of the series (12)-(14) and the occurance of nearly equal terms of opposite sign in (18) to use the known semi-convergent asymptotic expansions of the exponential integral.

Table 1 contains the results of the calculations. In figures 1 and 2 the energy E is plotted as function of the radius  $r_0$  of the sphere in which the hydrogen atom lives. The dotted lines represent the asymptotic approximations of this paragraph.

TA	R	E	T
T T F	~		

ro	E	E	E
	1s level	2s level	2p level
00	1/2	1/8	1/8
20		-0.12499	0.12500
15		-0.12451	-0.12477
10		-0.1162	-0.1194
9		-0.1118	-0.1169
8	-0.49997 1)	0.1055	-0.1124
7	-0.49986 <sup>1</sup> )	0.0974	-0.1058
6	0.49927.1)	_	
5	-0.49655 <sup>1</sup> )		
4	0.4852 2)		
3	-0.4475 2)		



Fig.1. Detail of the  $(E, r_0)$ -curve for the 1s level. The dotted line indicates the asymptote found by the method of Michels. De Boerand B ij 1. The line E = -0.5 is also an asymptote.

The exact curves that will be calculated in next section are indicated by the symbols 1s, 2s and 2p. The deviations of the asymptotes calculated here from the real curve show where the approximative method is valid, when a certain accuracy is chosen. For the 2s and 2p levels the approximation is only applicable down to a value of  $r_0$ , much larger than that for the 1s level.

Physica XII

43