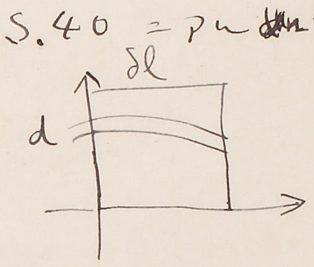
M. P. I. ~~[illegible]~~ 5, 25, 34.

Heisenberg ト Pauli ノ Quantenelektrodynamik ニ於テハ、某点ニ於ケル電場又ハ磁場ノ強サガイクラデモ精密ニ与ヘラレルモノト考ヘラレテ居ル。

空間ノ ~~一点ノ~~ 一点ノ

~~即チ E 又ハ H ノ一方丈ナラバ空間坐標ノ schema ニ於ケル diagonal matrix トシテアラハスコトガ出来ルト考ヘラレテ居ル。~~ 之ハ Lagrange 函数ヲ古典ノ Potential ノ函数トシテアラハ~~セ~~シ、ソレカラ之ニ Potential ニ conjugate ナ impulse ヲ決定シ、ソノ間ニ V.-R. ヲ仮定スル Quantenmechanics ノ general schema ニ従ッテスレバ出テクル当然ノ帰結デアル。

所ガ Heisenberg: Die phys. Prinzipien der Quantentheorie S.40 ニアル如ク、Messanordnung デハ $\frac{ed}{(\delta l)^3}$ ノ order 以上ノ ~~ungen~~ Ungenauigkeit $\Delta E_x, \Delta H_z$ ハナイ。



又最近ノ Jordan und Fock (Zs. 66, 206, 1930) ニヨレバ、一般ニ電荷ガ

$$-e\bar{E}_x = \frac{dp_x}{dt}$$

ニヨッテ決定サレルナラバ Δt 時間ノ平均値ハ

$$-e\bar{E}_x\Delta t = p_x(t+\Delta t) - p_x(t)$$

∴ $\bar{E}_x$ ノ Ungenauigkeit ハ

$$e\Delta\bar{E}_x\Delta t \sim \Delta p_x$$

所ガ ~~p_x ノ~~ $\Delta p_x \sim \frac{h}{\Delta x}$ デアルカラ、$\bar{E}_x$ ヲ $\Delta t, \Delta x$ ノ間ノ平均値ト考ヘレバ、ソノ Ungenauigkeit ハ

$$\Delta\bar{E}_x \sim \frac{h}{e}\frac{1}{\Delta x\Delta t}$$

トナリ、一点ニ於ケル ~~Feld~~ 電場ノ決定ハ不可能トナル。但シ非常ニ長イ時間ノ平均ヲ考ヘレバ、非常ニ正確ニ求メ得ル。 一点ノ附近ノ狭イ空間範囲時間ノ ~~[illegible]~~ 平均

同様ニシテ

$$\Delta\bar{H}_x \sim \frac{hc}{e}\frac{1}{\Delta y\Delta z}$$

従ッテ

$$\Delta\bar{E}_x\Delta\bar{H}_x \sim \frac{h^2c}{e^2(\Delta x\Delta y\Delta z\Delta t)}$$

コノ場合ニ用ヰタ particle ノ charge ガ −e デアル以外ニハ、何ノ仮定モサレテ居ナイ。 ニツイテ

~~Selbstenergie~~ des Strahlungsfeldes
Nullpunktsenergie

$M = E + iH.$
$M^{\dagger} = E - iH.$

$M^{\dagger}M = E^2 + H^2 + i(EH - HE)$

$M = \sum b_{\lambda\mu\nu} e^{\lambda x + \mu y + \nu z}$ $\qquad M^{\dagger}M' - M'M^{\dagger} = 2\delta(x, x')$
$M^{\dagger} = \sum b^{\dagger}_{\lambda\mu\nu} e^{-(\lambda x + \mu y + \nu z)}$

$\int M^{\dagger}M\, dv = \sum b^{\dagger}_{\lambda\mu\nu} b_{\lambda\mu\nu}.$

$\left\{ \begin{array}{l} b = \cancel{p + iq}\ q + ip \\ b^{\dagger} = \cancel{p - iq}\ q - ip \end{array} \right.$ $\quad b^{\dagger}b = p^2 + q^2 + i(qp - pq) = \sum_{r=1,2,3} (p_r^2 + q_r^2 - \frac{h}{2\pi})$
$\qquad b b^{\dagger} = \sum (p_r^2 + q_r^2 + \frac{h}{2\pi})$

$E = q_{\lambda\mu\nu} \cos(\lambda x + \mu y + \nu z) + p_{\lambda\mu\nu} \sin(\lambda x + \mu y + \nu z)$
$H = p_{\lambda\mu\nu} \sin(\quad '' \quad) + q_{\lambda\mu\nu} \cos(\quad '' \quad)$

$\cancel{[E \times H]} = (E_{\lambda\mu\nu} H_{\lambda\mu\nu}) = (q^2_{\lambda\mu\nu} - p^2_{\lambda\mu\nu}) \sin(\ ) \cos(\ ) + (q_{..} p_{..} \sin^2(\ ) - p_{..} q_{..} \cos^2(\ ))$

$q^2_{\lambda\mu\nu} = p^2_{\lambda\mu\nu}$ $\qquad qp = 0$ or $pq = 0$ ~~ナレバ~~ヨイ

(EH) ハ一般ニ0ナラヌ. 但シ classical ナ場合ノ limit ニ於テ
$qp = 0 = pq$
(EH) = 0 トナル。

ト[illegible]
[illegible]

$q_{\lambda\mu\nu}$

$G(q_p, q_{p'}) = \Sigma$

$[\Sigma p_n, \frac{1}{N}\Sigma q_n] = \frac{h}{2\pi i}$

$\varphi_n(P) = \lambda_n \int K^{(P,P')} \varphi_n(P')$

$E_{mn} \mp iH_{mn}$

$E_{mn} + iH_{mn}$

$\overline{E_{nm} - iH_{nm}}$

$E_{nm} - iH_{nm}$

$\sum \frac{\varphi_n(P')\varphi_n(P)^*}{\lambda_n} = \sum_n \int \varphi_n(P')K(P',P'')\varphi_n(P'')$

$= G(P, P')$

$\Psi = E + iH$

$b = -$

$b = p + iq.$

$E = p\cos^{(\cdot)} \mp q\sin^{(\cdot)}$

$H = p\sin^{(\cdot)} + q\cos^{(\cdot)}$

$\Psi = \Sigma b \, e^{+(\cdot)} \, \cancel{\cos \sin} \, \sin,$

$b^+ = p - iq$

$\Psi^+ = \Sigma b^+ e^{-(\cdot)} \cos \sin \sin,$

$\rightarrow E = p\cos - q\sin$

$H = p\sin + q\cos$

$\cos(kx + ly + mz)$

$\int \Psi^+ \Psi \, dv = \Sigma b^+ b.$

$\overline{M}M$

$E = p\cos kx \cos ly \cos mz$

$- p\cos kx \sin ly \sin mz$

$- p\sin kx \cos ly \sin mz$

$- p\sin kx \sin ly \cos mz$

$- q\cos kx \, \cancel{\cos} \, ly \sin mz$ (sin)

$- q$

$- q\sin$

$+ q\sin \quad \sin \quad \sin$

$(p_0 + \alpha p)\Phi$

~~Our~~ Angular Momenta in the theory of H.F.S.

The theory of the H.F.S. of one electron spectra ~~system~~ has recently been treated (by Fermi and ~~other~~) by means of the relativistic ~~wave~~ equation of Dirac. ~~We~~ The writer wishes to show that in this case, the angular momenta of electron ~~does not~~ are no more constant, but the total angular momenta consisting of ~~the~~ ~~electronic angular momenta~~ of the electron, as well as ~~and~~ ~~of~~ nuclear spin ~~ang. mom~~ momenta are constant ~~still~~ conserve. The prove is very simple.

According to the ordinary notation, the Hamiltonian ~~in this case~~ is written ~~in the form~~ ~~by~~ in the form

In this case, ~~not~~ the angular momenta of the electron commute with the terms of the Hamiltonian, except the nuclear spin-term.

which does not commute ; for

So the angular momenta of ~~the~~ electron ~~does~~ not conserve,
Now we consider the quantity

~~from which the~~ for which the formula

~~this~~ is easily deduced.

Of course, ~~As~~ The orbital angular momenta of the nucleus does not ~~occur~~ appears in this case ~~for~~ as it is fixed in the centre, but ~~still~~ the spin angular momenta take ~~their place~~ their rôle still ~~the~~ in the total angular momenta. expression of the