Sept. 28, 1955

[illegible]: Field group Seminar (1)

Zur Quantentheorie nichtlinearer Wellengleichungen
III. W. Heisenberg, F. Kortel und H. Mitter
(Z. f. Naturforsch. 10a (1955), 425)
(I. W. Heisenberg, Nachr. d. ~~G~~ Göttinger Akad. Wiss ~~195~~ 111 (1953); Z. f. Naturforsch. 9a (1954) 292.)

Ausgangsgl. $\gamma_\mu \frac{\partial \psi}{\partial x_\mu} + l^2 \psi (\psi^+ \psi) = 0$

propagation fn ~~(Schwing~~
$\delta(x^2)$, $\delta'(x^2)$ (Schwinger)
→ ヰイ く 現れ, δ, δ' [illegible]
(classical n. l. eq. の solution)
Lehmann の objection.

→ Hilbertraum III

II

——— Mg

I

$\langle \Phi_0 | \{ \psi_\alpha(x), \bar{\psi}_\beta(x') \} | \Phi_0 \rangle = \frac{1}{i} S_{\alpha\beta}(x-x')$

$\langle \Phi_0 | [\quad] | \Phi_0 \rangle = - S^{(1)}_{\alpha\beta}(x-x')$

$S^{(1)}(r,t) = \frac{1}{\pi} \int_{-\infty}^{\infty} \frac{dt'}{t'} S(r, t-t')$

$S^{(1)}(x-x') = \frac{\kappa^2}{4\pi} \gamma_\mu \frac{\partial}{\partial x_\mu} \mathrm{Im} \left\{ \frac{H_1^{(1)}(\kappa\sqrt{s})}{\kappa\sqrt{s}} + \frac{2i}{\pi\kappa^2 s} - \frac{i}{\pi} \log \frac{\gamma \kappa \sqrt{s}}{2} \right\}$

$- \frac{\kappa^3}{4\pi} \mathrm{Im} \left\{ \frac{H_1^{(1)}(\kappa\sqrt{s})}{\kappa\sqrt{s}} + \frac{2i}{\pi\kappa^2 s} \right\}$

$\langle 0 | T(\psi(x)\psi(x')) | \Psi \rangle \equiv \tau(x, x')$

$\tau(N+2) = \varphi(N+2) + \varphi(N) + \cdots$

Research Institute for Fundamental Physics
Kyoto University

$S_F = S^{(1)} + \frac{1}{i}\bar{S}$

$S_F = -Z \frac{\kappa^2}{4\pi} \frac{\gamma_\mu z_\mu}{z^2}$

Z : pure imaginary → $\left(\frac{i}{\pi}\right) \lg \frac{\gamma \kappa \sqrt{5}}{2}$ (↗ real)

$\gamma_\mu \frac{\partial \psi}{\partial x_\mu} = -l^2 \dot{\Gamma} \psi (\bar{\psi} \dot{\Gamma} \psi)$

$\Gamma = 1,\ \gamma_5,\ \gamma_\mu,\ \gamma_5\gamma_\mu,\ \frac{1}{2i}(\gamma_\mu\gamma_\nu - \gamma_\nu\gamma_\mu)$

$\frac{\partial \bar{\psi}}{\partial x_\mu}\gamma_\mu = +l^2 (\bar{\psi}\dot{\Gamma}\psi)\bar{\psi}\dot{\Gamma}$ $\qquad \bar{\psi} = \psi^* \gamma_4$

$\tau_{\alpha|\beta}(x_1|x_2) \equiv \langle 0 | T(\psi_\alpha(x_1), \bar{\psi}_\beta(x_2)) | \Psi \rangle$

$(\gamma_\mu)_{\sigma\alpha} \frac{\partial}{\partial x_\mu} \tau_{\alpha|\beta}(x_1|x_2) \equiv l^2 (\dot{\Gamma})_{\sigma\alpha} (\dot{\Gamma})_{\rho\delta}\, \tau_{\alpha\delta|\rho\beta}(x_1 x_1 | x_1 x_2)$

N=4 の近似.

$-\gamma_\mu \frac{\partial^2}{\partial z_\mu \partial z_\nu} S_F(z) \gamma_\nu = \frac{l^4}{4} [\dot{\Gamma} S_F(z) \ddot{\Gamma}$

$\mathrm{Spur}(S_F(z) \ddot{\Gamma} S_F(-z) \dot{\Gamma})$

$- \dot{\Gamma} S_F(z) \ddot{\Gamma} S_F(-z) \dot{\Gamma} S_F(z) \ddot{\Gamma}]$

$Z^2 < 0$

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