Research Institute for Fundamental Physics
Kyoto University

基礎理論討論会　56年度 第5回　　June 5, 1956

1. 尾崎：場の理論の非摂動的方法.

const. el. mg. field

(Euler-Heisenberg :)

$$H = \pi^2 + (\nabla\varphi)^2 + \kappa^2\varphi^2 + \lambda\varphi^4$$

$$H_{int} = \frac{\lambda'}{V}\sum q_k q_l q_m q_{-(k+l+m)}$$

$k = l = m = 0$

$$H = \frac{1}{2}\{p^2 + \omega^2 q^2 + \lambda' q^4\}$$

→ path integral

$$K = \int \exp \frac{i}{2}\int_{t_1}^{t_2}\{\dot{q}^2 - \omega^2 q^2 - 2\lambda' q^4\}dt\,\mathcal{D}q$$

$$e^{-i\lambda\int q^4 dt} = \int e^{i\lambda\int(x^2 - 2xq^2)dt}\,\mathcal{D}x$$

2. 原：Charge Independence の概念の拡張

$I + J$　　$J_3 = S/2$

$$\frac{\Lambda_0 \to p + \pi^-}{\Lambda_0 \to n + \pi^0} = 2 \qquad \frac{\theta_0 \to \pi^+ + \pi^-}{\theta_0 \to 2\pi^0} = 2$$

θ_0 : even, even

weak interaction ;　$\Delta I = 1/2$

Steinberger : Kochester Conf.

$\pi^-(1.3\,\mathrm{BeV}) + P$ →
(bubble chamber

(exp.)

		cases
$\Lambda^0 + \theta^0$		(37 ~~cases~~)
$\Lambda^0 + \theta^0$		15
Λ^0		19
	θ^0	3

(observe ratio)　Λ^0 : 2/3　　life が長い
θ^0 : 1/3　($\to 2\pi$, $2\pi + \gamma$)

total number 47 : .:. $(37 + x)\times\frac{2}{9} = x$　　$x = 10$

(theory)

$\Lambda^0 + \theta^0$: 11

Λ^0 : 21

θ^0 : 5

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$\tau^{\pm} \to \pi^{\pm} + \pi^{+} + \pi^{-}$

$\tau' \to \pi^{\pm} + 2\pi^{0}$

$\frac{1}{4} < \frac{\tau'}{\tau} < 1$

3. 中野： Boson と電磁場の相互作用.

spin 0

$f_{\mu\nu} S_{\mu\nu}$ $\qquad S_{\mu\nu} = \frac{1}{i}[\beta_\mu, \beta_\nu]$ $= 0$ in rest system

π-electron interaction

$D_k U_k - \varkappa^2 U = 0$

$D_k U - U_k + \frac{ie}{\varkappa} f_{kl} U_l = 0$

$D_k = \frac{\partial}{\partial x_k} - ieA_k$

$f_{kl}(U_k^* U_l - U_k^* U_k)$

4. 内山：輸動論,

宮城： 〃

5. 早川：反陽子の世界

antiproton capture: $\sigma_c \simeq \pi \left(\frac{2\hbar^2}{Me^2}\right)^2 \simeq 10^{-23} cm^2$

$v\sigma\rho_p \simeq 10^{-17} \rho_p \, sec^{-1}$

$v \sim 10^5 cm/sec$ (galaxy) $\rho_p \to 1/cc$

$E \geq 10^{11} eV$; $I \simeq 10^{-2} cm^{-2} sec^{-1}$

$\sigma_{pp} \simeq 5 \times 10^{-26} cm^2$

$n_\pi \simeq 5$

$f_{\bar{p}} \simeq 0.1$

antiproton prod. rate, $\quad 3 \times 10^{-28} sec^{-1}$

density in galaxy $\quad 3 \times 10^{-11}/cc$

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energy density : 0.06 eV/cc
(total energy density ~ 1 eV/cc

6. 究境：とまった核子の中間子論

1. static model
2. no π-π int
3. p.v.

$\langle q_0, q | S | k_0, k' \rangle = \frac{k'}{k} \langle q_0, q | S | k_0, k \rangle$
virtual

dispersion relation

$S(k_0) = \frac{f^2}{\mu^2}\frac{1}{k_0} + \int \frac{\sigma(p)}{k_0 - \omega_p} dp$

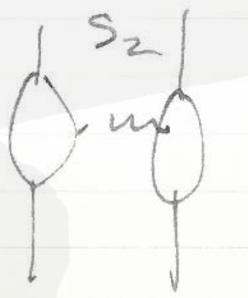
は $k_0 < \mu$ でもよいはず。

magnetic moment

$\mu = f^2 \int \cdots + \int \frac{\sigma}{\cdots}$

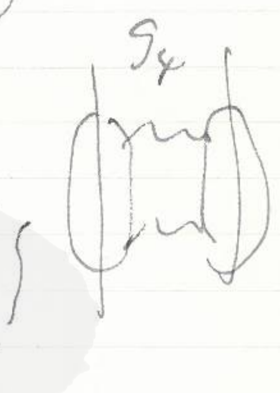
多体問題：二体の核力

$S = S_0 + S_2 + S_4$



$S_2 \to V_2 = \frac{f_r^2}{4\pi} \tau\tau \, \sigma\nabla\sigma\nabla \frac{e^{-\mu r}}{r}$

$S_4 \to V_4 =$ $\frac{f_r}{\mu} \tau \sigma k$



electron-neutron interaction
S-wave

解決済：1. proton's charge density → Suura
2. electron-neutron interaction → S-wave 不足
3. 三体力 → 不大

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4. Deuteron の meson-disintegration

5. exchange moment

6. ..

7.  が核力にどの位きくか？

⋮

12. nucleon が動く場合 ?
dispersion formula

7. 細田 : Lehmann の方法について.
1. covariance
2. 漸近條件
3. complete set
4. charge conj.
5. 積分方程式の可能性
6. microscopic causality
7. 発散量を有限量の如く扱う.
8. bound state の寄与はない.

1. consistency
2. $\delta\mu^2$, δm, Z_2^{-1}, Z_3^{-1} の発散次数,

$$g_{ob}^2 = f(Z)\, g_{ren}^2$$

{ $\delta\mu^2$: 高々二次
{ δm : 高々一次
{ Z_2^{-1}, Z_3^{-1} : 高々 log

ps-ps theory の consistency