Research Institute for Fundamental Physics
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討論 101号室にて

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1: $\left(\Delta - \frac{1}{c^2}\frac{\partial^2}{\partial t^2}\right)\varphi = f(\varphi)$ 　 $\varphi$: real.

$$\varphi = c + \chi$$

$$\Box\chi = f(c+\chi) = f(c) + f'(c)\chi + \frac{1}{2}f''(c)\chi^2 + \cdots$$

$f(c) = 0$ 　 $c = c_1, c_2, \cdots c_n$.

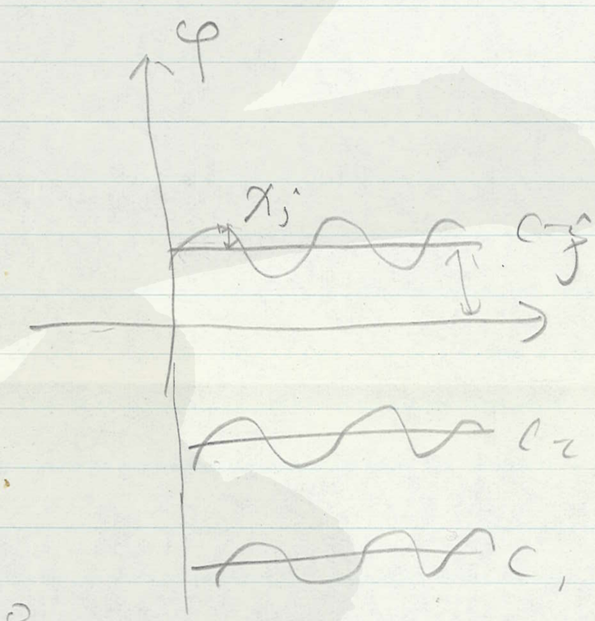
$f'(c_j) = m_j^2 \geq 0$: real mass

$\Box\chi_j \simeq m_j^2\chi_j$.

$$f(c) = a\prod_{j=1}^{n}(c - c_j)$$

$$f'(c) = a\sum_{k}\prod_{\neq k}'(c - c_k)$$

$$f'(c_j) = a\prod_{k\neq j}'(c_j - c_k)$$




$a > 0$:

$n$: even:

$j = 1$ 　 $f'(c_1) < 0$, $f'(c_2) > 0$,

$f'(c_3) < 0$, $\cdots\cdots$

$f'(c_n) > 0$

$n$: odd 　 $f'(c_1) > 0$

$f'(c_n) > 0$

real mass と imaginary mass が交互にあらわれる.

2: $\left(\Delta - \frac{1}{c^2}\frac{\partial^2}{\partial t^2}\right)\varphi = f(\varphi, \tilde{\varphi})$ 　 $\varphi$: complex

$\varphi = \psi + \chi$ 　 $\tilde{\varphi} = \tilde{\psi} + \tilde{\chi}$

$$\left(\Delta - \frac{1}{c^2}\frac{\partial^2}{\partial t^2}\right)\psi = f(\psi, \tilde{\psi})$$

$$\psi = u\, e^{i\omega t}$$

$$\left(\Delta + \frac{\omega^2}{c^2}\right)u = e^{-i\omega t} f(u e^{i\omega t}, \tilde{u} e^{-i\omega t})$$

$$= g(u, \tilde{u})$$

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$$\left(\Delta + \frac{\omega^2}{c^2}\right)\tilde{u} = \tilde{g}(\tilde{u}, u)$$

stationary base (basic state of the medium)

3: spinor or many component field