Capitolo 5 Lezione

$\phi_+|0\rangle = 0$ | $\langle 0|\phi_- = 0$

$T[\phi(x_1)\phi(x_2)]$

$T[\phi_+(x_1)\phi_+(x_2)]$

$\phi(x_1)\phi(x_2) = \phi_+(x_1)\phi_+(x_2) + \phi_-(x_1)\phi_-(x_2)$
$+ \phi_+(x_1)\phi_-(x_2) + \phi_-(x_1)\phi_+(x_2)$

$= \phi_+(x_1)\phi_+(x_2) + \phi_-(x_1)\phi_-(x_2) + \phi_+(x_1)\phi_+(x_2) + \phi_-(x_2)\phi_+(x_1)$ (anche $=0$)
$+ \phi_+(x_1)\phi_-(x_2) - \phi_-(x_2)\phi_+(x_1)$

$= :\phi(x_1)\phi(x_2): + [\phi_+(x_1), \phi_-(x_2)]$

$= :\phi(x_1)\phi(x_2): + [\phi_+(x_1), \phi_-(x_2)]\langle 0|0\rangle$

$= :\phi(x_1)\phi(x_2): + \langle 0|[\phi(x_1), \phi_-(x_2)]|0\rangle$

$= :\phi(x_1)\phi(x_2): + \langle 0|\phi_+(x_1)\phi_-(x_2)|0\rangle$

$\phi(x_1)\phi(x_2) = \langle 0|\phi_+(x_1)\phi_-(x_2)|0\rangle$

$\langle 0|\phi(x_1)\phi(x_2)|0\rangle = \langle 0|(\phi_+(x_1)+\phi_-(x_2))(\phi_+(x_1)+\phi_-(x_2))|0\rangle$
$= \langle 0|\phi_+(x_1)\phi_-(x_2)|0\rangle$

$\phi(x_1)\phi(x_2) = :\phi(x_1)\phi(x_2): + \langle 0|\phi(x_1)\phi(x_2)|0\rangle$

$$T[\phi(x_1)\phi(x_2)] = \theta(t_1-t_2)\phi(x_1)\phi(x_2) + \theta(t_2-t_1)\phi(x_2)\phi(x_1)$$

$$= \theta(t_1-t_2):\phi(x_1)\phi(x_2): + \theta(t_2-t_1):\phi(x_2)\phi(x_1):$$
$$+\theta(t_1-t_2)\langle 0|\phi(x_1)\phi(x_2)|0\rangle + \theta(t_2-t_2)\langle 0|\phi(x_2)\phi(x_1)|0\rangle$$

$$:\phi(x_2)\phi(x_1): = (\phi_+(x_2)\phi_+(x_1) + \phi_-(x_2)\phi_-(x_1) + \phi_+(x_2)\phi_-(x_1) + \phi_-(x_2)\phi_+(x_1))$$
$$:\phi(x_1)\phi(x_2): = (\phi_+(x_1)\phi_+(x_2) + \phi_-(x_1)\phi_-(x_2) + \phi_-(x_1)\phi_+(x_2))$$

$$:\phi(x_2)\phi(x_1): = \phi_+(x_2)\phi_+(x_1) + \phi_-(x_2)\phi_-(x_1) + \phi_-(x_2)\phi_+(x_1) + \phi_-(x_2)\phi_+(x$$

$$= \phi_+(x_1)\phi_+(x_2) + \phi_-(x_1)\phi_-(x_2) + \phi_-(x_1)\phi_+(x_2) + \phi_-(x_2)\phi_+(x_1)$$
$$= :\phi(x_1)\phi(x_2):$$

$$T[\phi(x_1)\phi(x_2)] = [\theta(t_1-t_2) + \theta(t_2-t_1)]:\phi(x_1)\phi(x_2):$$
$$+\langle 0|\theta(t_1-t_2)\phi(x_1)\phi(x_2) + \theta(t_2-t_1)\phi(x_2)\phi(x_1)|0\rangle$$
$$= :\phi(x_1)\phi(x_2): + \langle 0|T[\phi(x_1)\phi(x_2)]|0\rangle$$