Real Scalar

$$\phi(x) = \int \frac{d^3p}{(2\pi)^3} \frac{1}{\sqrt{2\omega_{\vec{p}}}} \left[\hat{a}_{\vec{p}} e^{-ip_\mu x^\mu} + \hat{a}^\dagger_{\vec{p}} e^{ip_\mu x^\mu} \right]$$

$$\omega_{\vec{p}} = +\sqrt{|\vec{p}|^2 + m^2}$$

$$[\hat{a}_{\vec{p}}, \hat{a}^\dagger_{\vec{q}}] = (2\pi)^3 \delta^3(\vec{p} - \vec{q})$$

single-particle states:

$$|\vec{p}\rangle = \sqrt{2\omega_{\vec{p}}}\, \hat{a}^\dagger_{\vec{p}} |0\rangle$$

$$\langle \vec{p} | \vec{q} \rangle = (2\pi)^3\, 2\omega_{\vec{p}}\, \delta^3(\vec{p} - \vec{q})$$

Dirac Spinor

$$\psi_\alpha(x) = \sum_s \int \frac{d^3p}{(2\pi)^3 \sqrt{2\omega_{\vec{p}}}} \left[\hat{b}^s_{\vec{p}} u^s_\alpha(\vec{p}) e^{-ip_\mu x^\mu} + \hat{c}^{s\dagger}_{\vec{p}} v^s_\alpha(\vec{p}) e^{ip_\mu x^\mu} \right]$$

$$\{\hat{b}^s_{\vec{p}}, \hat{b}^{\dagger s'}_{\vec{q}}\} = \{\hat{c}^s_{\vec{p}}, \hat{c}^{s'\dagger}_{\vec{q}}\} = (2\pi)^3 \delta^{(3)}(\vec{p} - \vec{q})\, \delta^{ss'}$$

$$(\not{p} - m)_{\alpha\beta} u^s_\beta = 0 \qquad (\not{p} + m)_{\alpha\beta} v^s_\beta = 0$$