Fundamental Notes.

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Particle	spin	charge	type of field	real/complex
π^0 meson		neutral		real
π^+/π^- meson		positive/negative		complex
Higgs boson	0	neutral	Scalar field (rank-0 tensor field)	real
K^+/K^- meson		positive/negative		complex
K^0 meson / anti-K^0 meson		neutral		complex.
~~phot~~ electron		negative		
proton	$\frac{1}{2}$	positive	Spinor field (rank-1/2 tensor field)	complex.
neutron		neutral		
μ^- (muon)		negative		
neutrino		neutral		
photon		neutral	Vector field (rank-1 tensor field)	real
W^+/W^- boson	1	positive/negative		complex
Z boson		neutral		real
gluon		neutral		real
Graviton	2	neutral	Symmetric (rank-2 tensor field).	real.

Common Field Lagrangian Densities in QFT.

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① Free scalar field.
spin: 0.
charge: neutral.
field: real-valued ϕ,
Lagrangian: $\mathcal{L} = \frac{1}{2}\partial_\mu\phi\,\partial^\mu\phi - \frac{1}{2}m^2\phi^2$
(derived to Klein-Gordon equation).
(examples of particles described: π^0 meson, Higgs boso

② Charged scalar field.
spin: 0.
charge: charged.
field: complex-valued ϕ.
Lagrangian: $\mathcal{L} = \partial_\mu\phi^*\partial^\mu\phi - m^2\phi^*\phi$.
(The complex nature allows for the inclusion of interactions with electromagnetic fields).
(examples of particles described: π^+/π^- meson. K^+/K^- meson).

③ Dirac spinor field.
spin: $\frac{1}{2}$.
charge: neutral / charged.
field: ψ (a spinor with four complex-valued components).
Lagrangian: $\mathcal{L} = \bar{\psi}(i\gamma^\mu\partial_\mu - m)\psi$.
(derived to Dirac equation).
(examples of particles described: electron, muon, tau lepton, quark).

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④ Electromagnetic Field.

spin: 1

charge: neutral.

field: the electromagnetic four-potential A_μ (with four real-valued components).

Lagrangian: $\mathcal{L} = -\frac{1}{4} F_{\mu\nu} F^{\mu\nu}$ with $F_{\mu\nu} = \partial_\mu A_\nu - \partial_\nu A_\mu$

(particle described: photon).

⑤ Yang-Mills Field.

spin: 1

field: Non-Abelian gauge group $A^\rho{}_\mu(x)$.

Lagrangian: $\mathcal{L} = -\frac{1}{4} F^\rho{}_{\mu\nu} F^{\rho\mu\nu}$

where $F^\rho{}_{\mu\nu} = \partial_\mu A^\rho{}_\nu - \partial_\nu A^\rho{}_\mu + g f^{\rho bc} A^b{}_\mu A^c{}_\nu$.

⑥ Gravitational Field.

spin: 2

charge: neutral.

field: metric tensor $g_{\mu\nu}$ (with real-valued components).

Lagrangian: $\mathcal{L} = \frac{R}{2\kappa}$, where $\kappa = 8\pi G$ and R is the Ricci scalar $R = g^{\mu\nu} R_{\mu\nu} = g^{\mu\nu} R^\rho{}_{\mu\rho\nu}$.

$\Gamma^\rho{}_{\mu\nu} = \frac{1}{2} g^{\rho\sigma} (\partial_\mu g_{\sigma\nu} + \partial_\nu g_{\sigma\mu} - \partial_\sigma g_{\mu\nu})$ Christoffel symbol

and $R^\sigma{}_{\mu\nu\rho} = \partial_\nu \Gamma^\sigma{}_{\mu\rho} - \partial_\mu \Gamma^\sigma{}_{\nu\rho} + \Gamma^\gamma{}_{\mu\rho} \Gamma^\sigma{}_{\nu\gamma}$

$- \Gamma^\gamma{}_{\nu\rho} \Gamma^\sigma{}_{\mu\gamma}$.