kalibrační pole

trivializace E_A^M ∂

$$D_{\underline{m}} m^\alpha = \partial_{\underline{m}} m^\alpha + [A_b, m]^\alpha$$

$$A_m^\alpha \qquad F_{mn}^\alpha = \partial_m \wedge A_n^\alpha + [A_m, A_n]^\alpha$$

$$D_m \wedge D_n m^\alpha = [F_{mn}, m]^\alpha$$

$$S_{KP}[D, g] = -\frac{1}{4}\varepsilon_{KP}\int F_{mn}^\alpha F_{kl}^\beta k_{\alpha\beta} g^{mk} g^{nl} g^{\frac{1}{2}}$$

δS $D \wedge \delta A$ F

$$\frac{\delta S_{KP}}{\delta D_m^\alpha} = \varepsilon_{KP} k_{\alpha\beta} g^{mn} (D_k F_{kn}^\beta) g^{kl} g^{\frac{1}{2}}$$

$$\frac{1}{g^{\frac{1}{2}}}\frac{\delta S_{int}}{\delta D_m^\alpha} = J^m_{KP\alpha} \qquad g^{kl}(D_k F_{ml}^\alpha) = \frac{1}{\varepsilon_{SK}} J_m^\alpha$$

$$D \wedge F = 0 \qquad D_m J^m_\alpha = 0$$

$$T_{mn} = \varepsilon_{KP}\left[F_{mk}^\kappa F_{nl}^\nu k_{\kappa\nu} g^{kl} - \frac{1}{4} g_{mn} F_{ab}^\kappa F_{cd}^\nu k_{\kappa\nu} g^{ac} g^{bd}\right]$$

látkové pole

D na $gM \longrightarrow$ na AM

$$D_m t_\kappa{}^A{}_B = 0 \qquad D_m H_{AB} = 0$$

$$S_{YM}[\Phi, D, g] = -\frac{1}{2}\int \left(D_m \Phi^A D_n \Phi^B H_{AB} g^{mn} + M^2 \Phi^A \Phi^B H_{AB}\right) g^{\frac{1}{2}}$$

$$\frac{\delta S_{YM}}{\delta \Phi^A} = -g^{\frac{1}{2}}\left(-g^{mn} D_m D_n \Phi^B + M^2 \Phi^B\right) H_{BA}$$

$$\frac{1}{g^{\frac{1}{2}}}\frac{\delta S_{int}}{\delta \Phi^A} = J_{SP\,A} \qquad \left[-g^{mn} D_m D_n + M^2\right]\Phi^A = J^B_{SP}$$

$$J_{KP\,\kappa}{}^n = -t_\kappa{}^M{}_K \Phi^K D_n \Phi^N H_{MN} g^{mn}$$

$$T_{mn} = D_m \Phi^A D_n \Phi^B H_{AB} - \frac{1}{2} g_{mn}\left(D_k \Phi^A D_l \Phi^B H_{AB} g^{kl} + M^2 \Phi^A \Phi^B H_{AB}\right)$$

kalibrační a látková pole

GM lokální kal. grupa

gM lokální kal. algebra

$C_{\mu\nu}{}^\kappa \qquad k_{\alpha\beta}$

D kalibrační pole

kov. der. na gM $DC = 0$

AM asoc. vekt. bundl

$T_m{}^A{}_B \qquad t_m{}^A{}_B = m^\alpha t_\alpha{}^A{}_B$

H_{AB} metr. (sk. součin)

$t_m^+ = -t_m$

Φ^A látkové pole $\in$ Sect AM

$$A_m{}^k{}_l = A_m^\kappa t_\kappa{}^k{}_l$$

kalibrační pole

trivializace E^{M}_{A} $\quad \partial$

$$D_{\underline{m}} m^{\alpha} = \partial_{\underline{m}} m^{\alpha} + [\mathcal{A}_{\underline{m}}, m]^{\alpha}$$

$$\mathcal{A}^{\alpha}_{\underline{m}} \qquad F^{\alpha}_{\underline{mn}} = \partial_{\underline{m}} \wedge \mathcal{A}^{\alpha}_{\underline{n}} + [\mathcal{A}_{\underline{m}}, \mathcal{A}_{\underline{n}}]^{\alpha}$$

$$D_{\underline{m}} \wedge D_{\underline{n}} m^{\alpha} = [F_{\underline{mn}}, m]^{\alpha}$$

$$S_{KP}[D, g] = -\frac{1}{4} \varepsilon_{KP} \int F^{\alpha}_{\underline{mn}} F^{\beta}_{\underline{kl}} k_{\alpha\beta} g^{mk} g^{nl} g^{\frac{1}{2}}$$

$$\delta S \qquad D \wedge \delta\mathcal{A} \quad F$$

$$\frac{\delta S_{KP}}{\delta D^{\alpha}_{\underline{m}}} = \varepsilon_{KP} k_{\alpha\beta} g^{mn} \left(D_{\underline{k}} F^{\beta}_{\underline{ln}}\right) g^{kl} g^{\frac{1}{2}}$$

$$\frac{1}{g^{\frac{1}{2}}} \frac{\delta S_{ext}}{\delta D^{\alpha}_{\underline{m}}} = J^{\underline{m}}_{KP\underline{\alpha}} \qquad g^{kl}\left(D_{\underline{k}} F^{\alpha}_{\underline{ml}}\right) = \frac{1}{\varepsilon_{st}} J^{\alpha}_{\underline{m}}$$

$$D \wedge F = 0 \qquad D_{\underline{m}} J^{\underline{m}}_{\underline{\alpha}} = 0$$

$$T_{\underline{mn}} = \varepsilon_{KP}\left[F^{\mu}_{\underline{mk}} F^{\nu}_{\underline{nl}} k_{\mu\nu} g^{kl} - \frac{1}{4} g_{\underline{mn}} F^{\mu}_{\underline{ab}} F^{\nu}_{\underline{cd}} k_{\mu\nu} g^{ac} g^{bd}\right]$$

látkové pole

D ma $gM \longrightarrow$ ma $A\Gamma$

$$D_{\underline{m}} t_{\underline{\kappa}}{}^{\underline{A}}{}_{\underline{B}} = 0 \qquad D_{\underline{m}} H_{\underline{AB}} = 0$$

$$S_{YM}[\Phi, D, g] = -\frac{1}{2}\int \left(D_{\underline{m}}\Phi^{\underline{A}} D_{\underline{n}}\Phi^{\underline{B}} H_{\underline{AB}} g^{\underline{mn}} + M^2 \Phi^{\underline{A}}\Phi^{\underline{B}} H_{\underline{AB}} \right) g^{\frac{1}{2}}$$

$$\frac{\delta S_{YM}}{\delta \Phi^{\underline{A}}} = -g^{\frac{1}{2}}\left(-g^{\underline{mn}} D_{\underline{m}} D_{\underline{n}} \Phi^{\underline{B}} + M^2 \Phi^{\underline{B}} \right) H_{\underline{BA}}$$

$$\frac{1}{g^{\frac{1}{2}}}\frac{\delta S_{ost}}{\delta \Phi^{\underline{A}}} = J_{SP\,\underline{A}} \qquad \left[-g^{\underline{mn}} D_{\underline{m}} D_{\underline{n}} + M^2 \right] \Phi^{\underline{A}} = J_{SP}^{\underline{A}}$$

$$\boxed{A_{\underline{m}}{}^{\underline{k}}{}_{\underline{l}} = \Omega_{\underline{m}}^{\kappa}\, t_{\kappa}{}^{\underline{k}}{}_{\underline{l}}}$$

$$J_{KP\,\underline{\mu}}{}^{\underline{n}} = -t_{\underline{\mu}}{}^{\underline{M}}{}_{\underline{K}}\, \Phi^{\underline{K}} D_{\underline{n}} \Phi^{\underline{N}} H_{\underline{MN}}\, g^{\underline{mn}}$$

$$T_{\underline{mn}} = D_{\underline{m}}\Phi^{\underline{A}} D_{\underline{n}}\Phi^{\underline{B}} H_{\underline{AB}} - \frac{1}{2} g_{\underline{mn}} \left(D_{\underline{k}}\Phi^{\underline{A}} D_{\underline{l}}\Phi^{\underline{B}} H_{\underline{AB}} g^{\underline{kl}} + M^2 \Phi^{\underline{A}}\Phi^{\underline{B}} H_{\underline{AB}} \right)$$