Notations

$$\Phi = \phi + \sqrt{2}\lambda\theta + F\theta^2$$

$$V = -\overline{\theta\sigma_\mu}\theta A_\mu + i\theta^2\overline{\theta\lambda} + i\overline{\theta^2}\theta\lambda - \frac{i}{2}\theta^2\overline{\theta}^2 D$$

$$W^\alpha = -\lambda^\alpha + \theta^\alpha D + \frac{1}{2}\left[\sigma_\mu\overline{\sigma}_\nu\theta\right]^\alpha F_{\mu\nu} - \theta^2 i\overline{\not{D}}^{\alpha\dot{\alpha}}\overline{\lambda}_{\dot{\alpha}}$$

$$\sigma_\mu^{\alpha\dot{\alpha}} = \begin{pmatrix} 1, & -i\tau^a \end{pmatrix}, \qquad \overline{\sigma}_{\mu\dot{\alpha}\alpha} = \begin{pmatrix} 1, & i\tau^a \end{pmatrix}$$

$$D^\alpha = \partial^\alpha - i\not{\partial}^{\alpha\dot{\alpha}}\overline{\theta}_{\dot{\alpha}} \quad \epsilon_{\alpha\beta} = \epsilon_{\dot{\alpha}\dot{\beta}} = \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix} \quad \psi_\alpha = \epsilon_{\alpha\beta}\psi^\beta \quad \overline{\psi}_{\dot{\alpha}} = \epsilon_{\dot{\alpha}\dot{\beta}}\overline{\psi}^{\dot{\beta}}$$

$$\overline{D}_{\dot{\alpha}} = \overline{\partial}_{\dot{\alpha}} - i\overline{\not{\partial}}_{\dot{\alpha}\alpha}\theta^\alpha \quad \epsilon^{\alpha\beta} = \epsilon^{\dot{\alpha}\dot{\beta}} = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} \quad \psi^\alpha = \epsilon^{\alpha\beta}\psi_\beta \quad \overline{\psi}^{\dot{\alpha}} = \epsilon^{\dot{\alpha}\dot{\beta}}\overline{\psi}_{\dot{\beta}}$$

$$W^2 = W_\alpha W^\alpha, \qquad \overline{W}^2 = \overline{W^{\dot{\alpha}}W_{\dot{\alpha}}}$$

$$\overline{W}_{\dot{\alpha}} = -\overline{\lambda}_{\dot{\alpha}} + \overline{\theta}_{\dot{\alpha}} D - \frac{1}{2}\left[\overline{\sigma}_\mu\sigma_\nu\overline{\theta}\right]_{\dot{\alpha}} F_{\mu\nu} - \overline{\theta}^2(i\overline{\not{D}}\lambda)_{\dot{\alpha}}$$

$$x_L \equiv y \equiv x_\mu + i\overline{\theta\sigma_\mu}\theta, \qquad \Phi = \Phi(y), \qquad \overline{\Phi} = \overline{\Phi}(x_R)$$

$$\nabla_\mu = \partial_\mu - iA_\mu^a\frac{\tau^2}{2}, \quad \text{for SU(2)}$$

$$V(y) = -\overline{\theta\sigma_\mu}\theta A_\mu(y) + i\theta^2\overline{\theta\lambda}(y) + i\overline{\theta}^2\theta\lambda(y) - \frac{i}{2}\theta^2\overline{\theta}^2\left[D(y) - \partial_\mu A^\mu(y)\right]$$

$$W^\alpha = -\frac{i}{4}\overline{DD}D^\alpha V \qquad \left(\text{has to be renormalized for } e^{-2V} \text{ in the chiral representation}\right)$$

Shift: $x_L \rightarrow x$ is $e^{-i\overline{\theta\not{\partial}}\theta}$

Useful formulae

$$\theta^\alpha\theta^\beta = \tfrac{1}{2}\theta^2\epsilon^{\alpha\beta} \qquad \theta^1\theta^2 = -\tfrac{1}{2}\theta^2$$

$$\theta_\alpha\theta_\beta = -\tfrac{1}{2}\theta^2\epsilon_{\alpha\beta} \qquad \theta_1\theta_2 = -\tfrac{1}{2}\theta^2$$

$$\overline{\theta^{\dot\alpha}\theta^{\dot\beta}} = -\tfrac{1}{2}\overline{\theta}^2\epsilon^{\dot\alpha\dot\beta} \qquad \overline{\theta^{\dot 1}\theta^{\dot 2}} = \tfrac{1}{2}\overline{\theta}^2$$

$$\overline{\theta_{\dot\alpha}\theta}_{\dot\beta} = \tfrac{1}{2}\overline{\theta}^2\epsilon_{\dot\alpha\dot\beta} \qquad \overline{\theta_{\dot 1}\theta}_{\dot 2} = \tfrac{1}{2}\overline{\theta}^2$$

$$\theta\lambda\,\theta\psi = -\tfrac{1}{2}\,\theta^2\lambda\psi \qquad \overline{\theta\lambda}\,\overline{\theta\psi} = -\tfrac{1}{2}\,\overline{\theta}^2\overline{\lambda\psi}$$

$$\sigma_\mu\,\overline{\sigma}_\nu\,\sigma_\rho = \eta_{\mu\nu}\,\sigma_\rho + \eta_{\nu\rho}\,\sigma_\mu - \eta_{\mu\rho}\,\sigma_\nu - \epsilon_{\mu\nu\rho\lambda}\,\sigma_\lambda$$

$$\sigma_\mu^{\beta\dot\beta}\,\overline{\sigma}^\mu_{\dot\alpha\alpha} = 2\delta_\alpha{}^\beta\delta_{\dot\alpha}{}^{\dot\beta}$$

$$\overline{\sigma}_\mu\,\sigma_\nu\,\overline{\sigma}_\rho = \eta_{\mu\nu}\,\overline{\sigma}_\rho + \eta_{\nu\rho}\,\overline{\sigma}_\mu - \eta_{\mu\rho}\,\overline{\sigma}_\nu + \epsilon_{\mu\nu\rho\lambda}\,\overline{\sigma}_\lambda$$

$$Tr\,(\overline{\sigma}^\mu\sigma^\nu) = 2\eta^{\mu\nu} \qquad \overline{\theta\sigma}^\mu\theta\overline{\theta\sigma}^\nu\theta = \tfrac{1}{2}\theta^2\overline{\theta}^2\eta^{\mu\nu}$$

$$\partial_\alpha\theta_\beta = \epsilon_{\alpha\beta} \qquad \overline{\partial^{\dot\alpha}\theta^{\dot\beta}} = \epsilon^{\dot\alpha\dot\beta}$$

$$\partial^\alpha\theta^2 = 2\theta^\alpha \qquad \overline{\partial}_{\dot\alpha}\overline{\theta}^2 = 2\overline{\theta}_{\dot\alpha}$$

$$\partial^2\theta^2 = -4 \qquad \overline{\partial^2\theta^2} = -4$$

$$\epsilon_{\alpha\gamma}\epsilon^{\gamma\beta} = \delta_\alpha^\beta \qquad \epsilon_{\dot\alpha\dot\gamma}\epsilon^{\dot\gamma\dot\beta} = \delta_{\dot\alpha}^{\dot\beta}$$

$$\epsilon^{\alpha\gamma}\epsilon_{\gamma\beta} = \delta_\beta^\alpha \qquad \epsilon^{\dot\alpha\dot\gamma}\epsilon_{\dot\gamma\dot\beta} = \delta_{\dot\beta}^{\dot\alpha}$$

$$\sigma^{(\mu}\overline{\sigma}^{\nu)} = 2\eta^{\mu\nu} \qquad \partial\!\!\!/\overline{\partial\!\!\!/} = \overline{\partial\!\!\!/}\partial\!\!\!/ = \Box$$

$$D_\alpha D^\alpha = \partial^2 - 2\,i\partial_\alpha\partial\!\!\!/^{\alpha\dot\beta}\overline{\theta}_{\dot\beta} + \Box\overline{\theta}^2$$

$$\overline{D^{\dot\alpha}D}_{\dot\alpha} = \overline{\partial}^2 + 2i\overline{\partial\!\!\!/}_{\dot\alpha\alpha}\theta^\alpha\overline{\partial}^{\dot\alpha} + \theta^2\Box$$

$$\left\{D^\alpha\,\overline{D}^{\dot\alpha}\right\} = 2i\,\partial\!\!\!/^{\alpha\dot\alpha}$$

Chiral Superfields

$$
\begin{aligned}
\Phi(y) &= \phi(y) + \sqrt{2}\,\psi\,\theta + F\,\theta^2\,, \qquad & y^\mu &= x^\mu + i\,\overline{\theta\sigma}^\mu\theta \\
\overline{\Phi}(\overline{y}) &= \overline{\phi}(\overline{y}) + \sqrt{2}\,\overline{\psi\,\theta} + \overline{F\,\theta}^2\,, \qquad & \overline{y}^\mu &= x^\mu - i\,\overline{\theta\sigma}^\mu\theta
\end{aligned}
$$

$$
\begin{aligned}
\Phi(y) &= \phi(x) + \sqrt{2}\,\theta\psi + \theta^2 F + i\,\overline{\theta\partial\!\!\!/}\,\theta\,\phi - i\,\frac{\sqrt{2}}{2}\,\theta^2\,\overline{\theta\partial\!\!\!/}\,\psi - \frac{1}{4}\,\theta^4\,\Box\phi \\
\overline{\Phi}(\overline{y}) &= \overline{\phi}(x) + \sqrt{2}\,\overline{\theta\psi} + \overline{\theta}^2\overline{F} + i\,\theta\partial\!\!\!/\,\overline{\theta}\,\overline{\phi} - i\,\frac{\sqrt{2}}{2}\,\overline{\theta}^2\,\theta\partial\!\!\!/\,\overline{\psi} - \frac{1}{4}\,\theta^4\,\Box\overline{\phi}
\end{aligned}
$$

$$
\begin{aligned}
\int d^4\theta &= \frac{1}{16}\,D^2\,\overline{D}^2\Big| \qquad & \int d^4\theta &= \frac{1}{16}\,\overline{D}^2\,D^2\Big| \\
\int d^2\theta &= -\,\frac{1}{4}\,D^2\Big| \qquad & \int d^2\overline{\theta} &= -\,\frac{1}{4}\,\overline{D}^2\Big|
\end{aligned}
$$

$$
\begin{aligned}
D^\alpha\Phi\Big| &= \sqrt{2}\psi^\alpha & \overline{D_{\dot\alpha}\Phi}\Big| &= \sqrt{2}\overline{\psi}_{\dot\alpha} \\
D^2\Phi\Big| &= -\,4\,F & \overline{D^2\Phi}\Big| &= -\,4\,\overline{F} \\
\overline{D}^{\dot\alpha}D^\alpha\Phi &= 2i\,\partial\!\!\!/^{\alpha\dot\alpha}\Phi & D^\alpha\overline{D}^{\dot\alpha}\overline{\Phi} &= 2i\,\partial\!\!\!/^{\alpha\dot\alpha}\overline{\Phi} \\
\overline{D}_{\dot\alpha}D^2\Phi &= 4i\,\overline{\partial\!\!\!/}_{\dot\alpha\beta}D^\beta\Phi & D^\alpha\overline{D}^2\overline{\Phi} &= 4i\,\partial\!\!\!/^{\alpha\dot\beta}\overline{D_{\dot\beta}\Phi} \\
\overline{D}_{\dot\alpha}D^2\Phi\Big| &= 4\sqrt{2}i\,\overline{\partial\!\!\!/}_{\dot\alpha\beta}\psi^\beta & D^\alpha\overline{D}^2\overline{\Phi}\Big| &= 4\sqrt{2}i\,\partial\!\!\!/^{\alpha\dot\beta}\overline{\psi}_{\dot\beta} \\
\overline{D}^2D^2\Phi &= -\,16\,\Box\Phi & D^2\overline{D}^2\overline{\Phi} &= -\,16\,\Box\overline{\Phi}
\end{aligned}
$$

$$
\begin{aligned}
\ln\,\Phi(y) &= \ln\,\phi + \sqrt{2}\,\theta\,\psi/\phi + \theta^2\left(F/\phi + \frac{1}{2}\Big(\psi/\phi\Big)^2\right) \\
\ln\,\overline{\Phi}(\overline{y}) &= \ln\,\overline{\phi} + \sqrt{2}\,\overline{\theta\,\psi}/\overline{\phi} + \overline{\theta}^2\left(\overline{F}/\overline{\phi} + \frac{1}{2}\Big(\overline{\psi}/\overline{\phi}\Big)^2\right)
\end{aligned}
$$

$\mathcal{N} = 1$ Supersymmetry Transformations

$$\begin{aligned} Q^\alpha &= \partial^\alpha + i\partial\!\!\!/^{\alpha\dot\alpha}\overline{\theta}_{\dot\alpha} \\ \overline{Q}_{\dot\alpha} &= \overline{\partial}_{\dot\alpha} + i\overline{\partial\!\!\!/}_{\dot\alpha\alpha}\theta^\alpha \end{aligned}$$

$$\begin{aligned} \delta\phi &= \sqrt{2}\,\epsilon\,\psi & \delta\overline{\phi} &= \sqrt{2}\,\overline{\epsilon\,\psi} \\ \delta\psi_\alpha &= i\sqrt{2}\,\overline{\epsilon^{\dot\alpha}\partial\!\!\!/}_{\dot\alpha\alpha}\phi \quad + \quad \sqrt{2}\,\epsilon_\alpha F & \delta\overline{\psi}^{\dot\alpha} &= i\sqrt{2}\,\epsilon_\alpha\partial\!\!\!/^{\alpha\dot\alpha}\overline{\phi} \quad + \quad \sqrt{2}\,\overline{\epsilon^{\dot\alpha}\,F} \\ \delta F &= -\,i\sqrt{2}\,\overline{\epsilon\,\partial\!\!\!/}\psi & \delta F &= -\,i\sqrt{2}\,\epsilon\partial\!\!\!/\overline{\psi} \end{aligned}$$

Formulae for Two Dimensions

$$\partial_R = \partial_0 + i\,\partial_3 \qquad \partial_L = \partial_0 - i\,\partial_3$$

$$\not\partial = \begin{pmatrix} \partial_L & \\ & \partial_R \end{pmatrix}^{\alpha\dot\alpha} \qquad \overline{\not\partial} = \begin{pmatrix} \partial_R & \\ & \partial_L \end{pmatrix}_{\dot\alpha\alpha}$$

$$\xi_1 \equiv \xi_R \qquad \overline{\xi}_1 \equiv \overline{\xi}_R \qquad \epsilon\,\xi = -\,\epsilon_{[R}\,\xi_{L]} \qquad \xi^1 = -\,\xi_L$$

$$\xi_2 \equiv \xi_L \qquad \overline{\xi}_2 \equiv \overline{\xi}_L \qquad \overline{\epsilon\,\xi} = \overline{\epsilon_{[R}\,\xi_{L]}} \qquad \xi^2 = \xi_R$$

$$\theta^2 = -\,2\,\theta_R\,\theta_L \qquad D^2 = -\,2\,D_R\,D_L$$

$$\overline{\theta}^2 = 2\,\overline{\theta_R\,\theta_L} \qquad \overline{D}^2 = 2\,\overline{D_R\,D_L}$$

$$D_R \equiv D^1 \qquad \overline{D}_R \equiv \overline{D}_{\dot 2} = -\,\overline{D}^{\dot 1}$$

$$D_L \equiv D^2 \qquad \overline{D}_L \equiv -\,\overline{D}_{\dot 1} = -\,\overline{D}^{\dot 2}$$

$$\left\{\overline{D}_R\,D_L\right\} = 0 \qquad \left\{\overline{D}_R\,D_R\right\} = -\,2i\,\partial_L$$

$$\left\{\overline{D}_L\,D_R\right\} = 0 \qquad \left\{\overline{D}_L\,D_L\right\} = -\,2i\,\partial_R$$

$$\vartheta_R = {}^{\partial}\!/_{\partial\theta_R} \qquad \vartheta_L = {}^{\partial}\!/_{\partial\theta_L}$$

$$\overline{\vartheta}_R = {}^{\partial}\!/_{\partial\overline{\theta}_R} \qquad \overline{\vartheta}_L = {}^{\partial}\!/_{\partial\overline{\theta}_L}$$

$$D_R = \vartheta_R - i\,\overline{\theta}_R\,\partial_L \qquad \overline{D}_R = \overline{\vartheta}_R - i\,\theta_R\,\partial_L$$

$$D_L = \vartheta_L - i\,\overline{\theta}_L\,\partial_R \qquad \overline{D}_L = \overline{\vartheta}_L - i\,\theta_L\,\partial_R$$

$$\sigma_\mu^{\beta\dot\beta}\,\overline{\sigma}^\mu_{\dot\alpha\alpha} = 2\,\delta_\alpha{}^\beta\delta_{\dot\alpha}{}^{\dot\beta}\cdot\delta_{\alpha\dot\alpha}\,, \qquad \mu = 0,\,3$$

$$\sigma_k^{\beta\dot\beta}\,\overline{\sigma}^k_{\dot\alpha\alpha} = 2\,\delta_\alpha{}^\beta\delta_{\dot\alpha}{}^{\dot\beta}\cdot\epsilon_{\alpha\dot\alpha}\,, \qquad k = 1,\,2$$

$$\theta_\alpha\overline{\theta}_{\dot\alpha} = \frac{1}{2}\,\theta\sigma_\mu\overline{\theta}\cdot\overline{\sigma}^\mu_{\dot\alpha\alpha}$$

Chiral superfields

$$\begin{aligned}
\Phi(y) &= \phi(y) - \sqrt{2}\,\theta_R\psi_L + \sqrt{2}\,\theta_L\psi_R - 2\,\theta_R\theta_L\,F \\
\Phi(\overline{y}) &= \overline{\phi}(\overline{y}) + \sqrt{2}\,\overline{\theta_R\psi}_L - \sqrt{2}\,\overline{\theta_L\psi}_R + 2\,\overline{\theta_R\theta}_L\,\overline{F}
\end{aligned}$$

$$\begin{aligned}
y^0 &= x^0 + i\left(\overline{\theta}_R\theta_R + \overline{\theta}_L\theta_L\right) & \qquad y^3 &= x^3 + \left(\overline{\theta}_R\theta_R - \overline{\theta}_L\theta_L\right) \\
\overline{y}^0 &= x^0 - i\left(\overline{\theta}_R\theta_R + \overline{\theta}_L\theta_L\right) & \qquad \overline{y}^3 &= x^3 - \left(\overline{\theta}_R\theta_R - \overline{\theta}_L\theta_L\right)
\end{aligned}$$

Twisted Chiral superfields

$$\begin{aligned}
\Sigma(\widetilde{y}) &= \sigma(\widetilde{y}) - \sqrt{2}\,\theta_R\overline{\lambda}_L + \sqrt{2}\,\overline{\theta}_L\lambda_R + \sqrt{2}\,\theta_R\overline{\theta}_L\left(D - i\,F_{03}\right) \\
\overline{\Sigma}(\overline{\widetilde{y}}) &= \overline{\sigma}(\overline{\widetilde{y}}) - \sqrt{2}\,\theta_L\overline{\lambda}_R + \sqrt{2}\,\overline{\theta}_R\lambda_L + \sqrt{2}\,\theta_L\overline{\theta}_R\left(D + i\,F_{03}\right)
\end{aligned}$$

$$\begin{aligned}
\widetilde{y}^\mu &= x^\mu + i\,\overline{\theta}\overline{\widetilde{\sigma}}_\mu\theta & \qquad \widetilde{\sigma}_0 &= i\,\sigma_3 & \qquad \widetilde{\sigma}_3 &= -\,i\,\sigma_0 \\
\overline{\widetilde{y}}^\mu &= x^\mu + i\,\theta\widetilde{\sigma}_\mu\overline{\theta} & \qquad \overline{\widetilde{\sigma}}_0 &= i\,\overline{\sigma}_3 & \qquad \overline{\widetilde{\sigma}}_3 &= -\,i\,\overline{\sigma}_0
\end{aligned}$$

$$\begin{aligned}
\widetilde{y}^0 &= x^0 + i\left(\overline{\theta}_R\theta_R - \overline{\theta}_L\theta_L\right) & \qquad \widetilde{y}^3 &= x^3 + \left(\overline{\theta}_R\theta_R + \overline{\theta}_L\theta_L\right) \\
\overline{\widetilde{y}}^0 &= x^0 - i\left(\overline{\theta}_R\theta_R - \overline{\theta}_L\theta_L\right) & \qquad \overline{\widetilde{y}}^3 &= x^3 - \left(\overline{\theta}_R\theta_R + \overline{\theta}_L\theta_L\right)
\end{aligned}$$

$$\widetilde{\not\partial} = \begin{pmatrix} \partial_L & \\ & -\partial_R \end{pmatrix}^{\alpha\dot{\alpha}} \qquad\qquad \overline{\widetilde{\not\partial}} = \begin{pmatrix} -\partial_R & \\ & \partial_L \end{pmatrix}_{\dot{\alpha}\alpha}$$

$$D_R = \partial/\partial\theta_R - 2i\overline{\theta}_R\partial_L\Big|_{\widetilde{y}} = \partial/\partial\theta_R\Big|_{\overline{\widetilde{y}}} \qquad \overline{D}_R = \partial/\partial\overline{\theta}_R\Big|_{\widetilde{y}} = \partial/\partial\overline{\theta}_R - 2i\theta_R\partial_L\Big|_{\overline{\widetilde{y}}}$$

$$D_L = \partial/\partial\theta_L\Big|_{\widetilde{y}} = \partial/\partial\theta_L - 2i\overline{\theta}_L\partial_R\Big|_{\overline{\widetilde{y}}} \qquad \overline{D}_L = \partial/\partial\overline{\theta}_L - 2i\theta_L\partial_R\Big|_{\widetilde{y}} = \partial/\partial\overline{\theta}_L\Big|_{\overline{\widetilde{y}}}$$

$$
\begin{aligned}
\int d^4\theta &= \frac{1}{4}\,\overline{D}_R\,D_R\,\overline{D}_L\,D_L\Big| &\qquad \int d^4\theta &= -\,\frac{1}{4}\,\overline{D}_R\,D_L\,\overline{D}_L D_R\Big| \\
\int d^2\widetilde{\theta} &= \frac{1}{2}\,\overline{D}_L\,D_R\Big| &\qquad \int d^2\overline{\widetilde{\theta}} &= \frac{1}{2}\,\overline{D}_R\,D_L\Big|
\end{aligned}
$$

$$
\begin{aligned}
D_R\,\sqrt{2}\,\Sigma\Big| &= -\,2\,\overline{\lambda}_L &\qquad \overline{D}_R\,\sqrt{2}\,\overline{\Sigma}\Big| &= +\,2\,\lambda_L \\
\overline{D}_L\,\sqrt{2}\,\Sigma\Big| &= +\,2\,\lambda_R &\qquad D_L\,\sqrt{2}\overline{\Sigma}\Big| &= -\,2\,\overline{\lambda}_R \\
\frac{1}{2}\,\overline{D}_L D_R\,\sqrt{2}\,\Sigma\Big| &= D\,-\,iF_{03} &\qquad \frac{1}{2}\,\overline{D}_R D_L\,\sqrt{2}\,\overline{\Sigma}\Big| &= D\,+\,iF_{03}
\end{aligned}
$$

$$
\begin{aligned}
\ln\,\Sigma(\widetilde{y}) &= \ln\,\sigma\;-\;\sqrt{2}\,\theta_R\overline{\lambda}_L/\sigma\;+\;\sqrt{2}\,\overline{\theta}_L\lambda_R/\sigma\;+\;\theta_R\overline{\theta}_L\left(\frac{\sqrt{2}\;(D\,-\,iF_{03})}{\sigma}\;-\;2\frac{\overline{\lambda}_L}{\sigma}\,\frac{\lambda_R}{\sigma}\right) \\
\ln\,\overline{\Sigma}(\overline{\widetilde{y}}) &= \ln\,\overline{\sigma}\;-\;\sqrt{2}\,\theta_L\,\overline{\lambda}_R/\overline{\sigma}\;+\;\sqrt{2}\,\overline{\theta}_R\,\lambda_L/\overline{\sigma}\;+\;\theta_L\overline{\theta}_R\left(\frac{\sqrt{2}\;(D\,+\,iF_{03})}{\overline{\sigma}}\;-\;2\frac{\overline{\lambda}_R}{\overline{\sigma}}\,\frac{\lambda_L}{\overline{\sigma}}\right)
\end{aligned}
$$

Twisted Chiral Superfield $\boldsymbol{S}$

$$S = \frac{i}{2}\,\overline{D}_R D_L\,\ln\sqrt{2}\,\overline{\Sigma} \qquad \overline{S} = \frac{i}{2}\,\overline{D}_L D_R\,\ln\sqrt{2}\,\Sigma$$

$$S\Big| = \frac{\sqrt{2}\overline{\sigma}\,(iD - F_{03}) - 2\,i\,\overline{\lambda}_R\lambda_L}{\left(\sqrt{2}\,\overline{\sigma}\right)^2} \qquad \overline{S}\Big| = \frac{\sqrt{2}\sigma\,(iD + F_{03}) - 2\,i\,\overline{\lambda}_L\lambda_R}{\left(\sqrt{2}\,\sigma\right)^2}$$

$$D_R\,S = \partial_L\,\frac{D_L\,\sqrt{2}\,\overline{\Sigma}}{\sqrt{2}\,\overline{\Sigma}} \qquad D_R\,S\Big| = -\,2\,\partial_L\,\frac{\overline{\lambda}_R}{\sqrt{2}\overline{\sigma}}$$

$$\overline{D_R\,S} = -\,\partial_L\,\frac{\overline{D}_L\,\sqrt{2}\,\Sigma}{\sqrt{2}\,\Sigma} \qquad \overline{D_R\,S}\Big| = -\,2\,\partial_L\,\frac{\lambda_R}{\sqrt{2}\sigma}$$

$$\overline{D}_L S = -\,\partial_R\,\frac{\overline{D_R\,\sqrt{2}\,\Sigma}}{\sqrt{2}\,\overline{\Sigma}} \qquad \overline{D}_L S\Big| = -\,2\,\partial_R\,\frac{\lambda_L}{\sqrt{2}\overline{\sigma}}$$

$$D_L\,\overline{S} = \partial_R\,\frac{D_R\,\sqrt{2}\,\Sigma}{\sqrt{2}\,\Sigma} \qquad D_L\,\overline{S}\Big| = -\,2\,\partial_R\,\frac{\overline{\lambda}_L}{\sqrt{2}\sigma}$$

$$\frac{1}{2}\,\overline{D}_L D_R\,S = -\,i\,\Box\,\ln\sqrt{2}\,\overline{\Sigma} \qquad \frac{1}{2}\,\overline{D}_L D_R\,S\Big| = -\,i\,\Box\,\ln\sqrt{2}\overline{\sigma}$$

$$\frac{1}{2}\,\overline{D}_R D_L\overline{S} = -\,i\,\Box\,\ln\sqrt{2}\Sigma \qquad \frac{1}{2}\,\overline{D}_R D_L\overline{S}\Big| = -\,i\,\Box\,\ln\sqrt{2}\sigma$$

Vector superfield

$$
\begin{aligned}
V(x) \;=\; & - \; A_L\,\overline{\theta}_R\theta_R \;-\; A_R\,\overline{\theta}_L\theta_L \;-\; i\sqrt{2}\,\sigma\,\overline{\theta}_R\theta_L \;-\; i\sqrt{2}\,\overline{\sigma\,\theta}_L\theta_R \;- \\
& - \; 2\,i\,\theta_R\theta_L\,\overline{\theta_{[R}\lambda_{L]}} \;-\; 2\,i\,\overline{\theta_R\theta}_L\,\theta_{[R}\lambda_{L]} \;-\; 2\,i\,\overline{\theta}_R\theta_R\overline{\theta}_L\theta_L\,D(x)
\end{aligned}
$$

$$
\begin{aligned}
V(x) \;=\; & - \; A_L\,\overline{\theta}_R\theta_R \;-\; A_R\,\overline{\theta}_L\theta_L \;-\; i\sqrt{2}\,\sigma\,\overline{\theta}_R\theta_L \;-\; i\sqrt{2}\,\overline{\sigma\,\theta}_L\theta_R \;- \\
& - \; 2\,i\,\theta_R\theta_L\,\overline{\theta_{[R}\lambda_{L]}} \;-\; 2\,i\,\overline{\theta_R\theta}_L\,\theta_{[R}\lambda_{L]} \;-\; 2\,i\,\overline{\theta}_R\theta_R\overline{\theta}_L\theta_L\,\Big(D \mp i\,F_{03}\Big)_{\widetilde{y},\,\overline{\widetilde{y}}}
\end{aligned}
$$

$$
\begin{aligned}
A_R &= A_0 + i\,A_3 \\
A_L &= A_0 - i\,A_3
\end{aligned}
\qquad\qquad
\sigma \;=\; -\,\frac{A_1 + iA_2}{\sqrt{2}}
\qquad\qquad
\partial_{[R}A_{L]} \;=\; -\,2iF_{03}
$$

$$
\Sigma \;=\; \frac{i}{\sqrt{2}}\,D_L\,\overline{D}_R\,V
\qquad\qquad
\overline{\Sigma} \;=\; \frac{i}{\sqrt{2}}\,D_R\,\overline{D}_L\,V
$$

Vortices

$$e^{i\alpha n\overline{n}}\cdot\hat{M}\cdot e^{-i\alpha n\overline{n}} \;=\; \hat{M} \;+\; i\sin\alpha\left[\,n\overline{n},\,\hat{M}\,\right] \;-\; (1\;-\;\cos\alpha)\left[\,n\overline{n}\left[\,n\overline{n},\,\hat{M}\,\right]\right]$$

Profiles

$$A_{\pm}^{\mathrm{U(1)}} \;=\; \mp\, i\,\frac{x^{\pm}}{r^2}\,\frac{1}{N}\,f(r)$$

$$A_{\pm}^{\mathrm{SU(N)}} \;=\; \mp\, i\,\frac{x^{\pm}}{r^2}\,f_N(r)\;\Big(n\overline{n}\;-\;1/N\Big)$$

$$\partial_r\left(\phi_1\,\phi_2^{N-1}\right) \;=\; \frac{f}{r}\cdot\phi_1\,\phi_2^{N-1}$$

$$\partial_r\,\frac{\phi_1}{\phi_2} \;=\; \frac{f_N}{r}\,\frac{\phi_1}{\phi_2}$$

$\boldsymbol{F}$-term Profiles

$$q^f \;=\; \begin{pmatrix} \frac{\phi}{\sqrt{2}} & \frac{\phi}{\sqrt{2}} \end{pmatrix} \qquad \overline{q}_f \;=\; \begin{pmatrix} \frac{\phi^\dagger}{\sqrt{2}} & \frac{\phi^\dagger}{\sqrt{2}} \end{pmatrix}$$

$$q_f \;=\; \begin{pmatrix} \frac{\phi}{\sqrt{2}} & -\,\frac{\phi}{\sqrt{2}} \end{pmatrix} \qquad \overline{q}^f \;=\; \begin{pmatrix} -\,\frac{\phi^\dagger}{\sqrt{2}} & \frac{\phi^\dagger}{\sqrt{2}} \end{pmatrix}$$

Gauge Field Normalization

$$\hat{\mu}_1 \;=\; \sqrt{\frac{2}{N}}\,\mu_1 \qquad \hat{A}^a \;=\; \frac{1}{\sqrt{2N}}\,A^a \qquad \hat{T}^a \;=\; \sqrt{2N}\,T^a$$

Slashed Vectors

$$\not{a} \;=\; \begin{pmatrix} a_L & -\,i\,a_- \\ -\,i\,a_+ & a_R \end{pmatrix} \qquad \overline{\not{a}} \;=\; \begin{pmatrix} a_R & i\,a_- \\ i\,a_+ & a_L \end{pmatrix}$$

$$a_{R,L} \;=\; a_0 \;\pm\; i\,a_3 \qquad a_{\pm} \;=\; a_1 \;\pm\; i\,a_2$$