

Yukawa interactions

$$\begin{aligned}
 & \begin{array}{c} H^0 \\ | \\ u_i \rightarrow \quad \leftarrow u_i \\ \gamma_{ii} \end{array} = \frac{-iy_u}{\sqrt{2}} \delta_{color}^{ab} \\
 & \begin{array}{c} H^0 \\ | \\ d_i \rightarrow \quad \leftarrow d_i \\ \gamma_{ii} \end{array} = \frac{-iy_d}{\sqrt{2}} \delta_{color}^{ab} \\
 & \begin{array}{c} H^0 \\ | \\ e_i \rightarrow \quad \leftarrow e_i \\ \gamma_{ii} \end{array} = \frac{-iy_e}{\sqrt{2}}
 \end{aligned}$$

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$$\begin{array}{c} \phi^+ \\ | \\ d_g \rightarrow \quad \leftarrow u_f \\ \gamma_{gf} \end{array} = i \left[ (Y_u V_{ckm})_{fg} \hat{P}_L - (V_{ckm} Y_d)_{fg} \hat{P}_R \right] \delta_{color}^{ab}$$

$$\begin{array}{c} \phi^- \\ | \\ u_g \rightarrow \quad \leftarrow d_f \\ \gamma_{gf} \end{array} = i \left[ (V_{ckm}^\dagger Y_u)_{fg} \hat{P}_R - (Y_d V_{ckm}^\dagger)_{fg} \hat{P}_L \right] \delta_{color}^{ab}$$

$$\begin{aligned}
 & \begin{array}{c} \phi^0 \\ | \\ u_i \rightarrow \quad \leftarrow u_i \\ \gamma_{ii} \end{array} = \frac{-iy_u}{\sqrt{2}} \gamma_5 \delta_{color}^{ab} \\
 & \begin{array}{c} \phi^0 \\ | \\ d_i \rightarrow \quad \leftarrow d_i \\ \gamma_{ii} \end{array} = \frac{+iy_d}{\sqrt{2}} \gamma_5 \delta_{color}^{ab} \\
 & \begin{array}{c} \phi^0 \\ | \\ e_i \rightarrow \quad \leftarrow e_i \\ \gamma_{ii} \end{array} = \frac{+iy_e}{\sqrt{2}} \gamma_5
 \end{aligned}$$

$$\begin{array}{c} \phi^+ \\ | \\ e_g \rightarrow \quad \leftarrow \nu_f \\ \gamma_{gf} \end{array} = i \left[ (Y_\nu)_{fg} \hat{P}_L - (Y_e)_{fg} \hat{P}_R \right]$$

$$\begin{array}{c} \phi^- \\ | \\ \nu_g \rightarrow \quad \leftarrow e_f \\ \gamma_{gf} \end{array} = i \left[ (Y_\nu)_{fg} \hat{P}_R - (Y_e)_{fg} \hat{P}_L \right]$$