~~Weak CP~~

$$\bar{\psi}_i \psi_j (t, \bar{x}) \xrightarrow{CP} + \bar{\psi}_j \psi_i (t, -\bar{x})$$

$$\bar{\psi}_i \gamma^5 \psi_j (t, \bar{x}) \xrightarrow{CP} - \bar{\psi}_j \gamma^5 \psi_i (t, -\bar{x})$$

$$\bar{\psi}_i \cancel{A} \psi_j (t, \bar{x}) \longrightarrow + \bar{\psi}_j \cancel{A} \psi_i (t, -\bar{x})$$

$$\bar{\psi}_i \cancel{A} \gamma^5 \psi_j (t, \bar{x}) \longrightarrow + \bar{\psi}_j \cancel{A} \gamma^5 \psi_i (t, -x)$$

$\cancel{A}$

$$\mathcal{L}_{mix} = \frac{e}{\sqrt{2}\, s\vartheta} \left[\bar{u}_L V \cancel{W}^+ d_L + \underbrace{\bar{d}_L V^+ W^- u_L}_{h.c.} \right]$$

$$\psi_{L/R} = \frac{1}{2} (1 \pm \gamma_5) \psi$$

$$= \frac{e}{\sqrt{2}\, s\vartheta} \left[W^+_\mu \, \bar{u}^i V_{ij} \gamma^\mu \left(\frac{1 - \gamma_5}{2} \right) d^j + W^-_\mu \bar{d}^j V^*_{ij} \gamma^\mu \left(\frac{1 - \gamma_5}{2} \right) u^i \right]$$

Sotto CP $\quad W^+ \to W^-$

$\Rightarrow$ ultimo termine:

$$W^+_\mu \, \bar{u}^i V^*_{ij} \gamma \left(\frac{1 - \gamma_5}{2} \right) d^j$$

Quindi

$$\mathcal{L}_{mix} \xrightarrow{CP} \frac{e}{\sqrt{2}\, s\vartheta} \left[W^+_\mu \bar{u}^i V^*_{ij} \gamma^\mu \left(\frac{1 - \gamma_5}{2} \right) d^j + W^-_\mu \bar{d}^j V_{ij} \gamma^\mu \left(\frac{1 - \gamma_5}{2} \right) u^i \right]$$

Quindi, la lagr. di MS è invariante sotto CP $\underline{\underline{se}}$ $\boxed{V_{ij} = V^*_{ij}}$, ovvero se V è reale!