Part I
LeptoQuark Mediated Neutrino Mass:

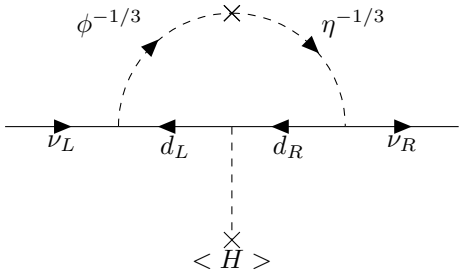
1 2×LQ

2 options:

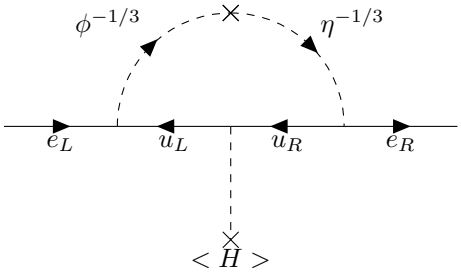
1. $e_R = +(S) \implies$ tree level
2. $e_R = -(S) \implies$ 1 loop level

$$m_\nu \propto x\,(M_d)\,x\prime \quad m_e \propto x\,(M_u)\,x\prime\prime \quad h \implies e^- e^+\,(1{+}?) \text{ where } \mathcal{A} \sim m_e$$

- Phenomenology of the LQ→? and h→? decays?!
- Rare processes!

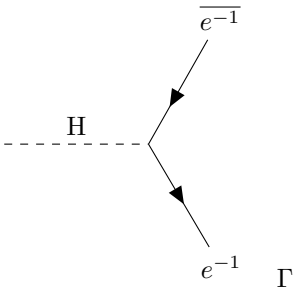


(a) Diagram contributing to Direac Neutrino Mass.

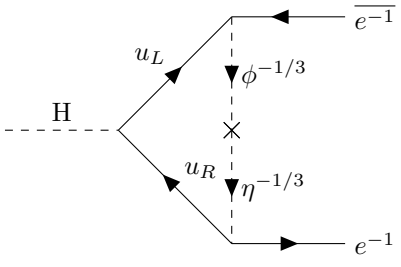


(b) Diagram contributing to Dirac Charged Lepton Mass.

Figure 1: LeptoQuark mediated 1 loop Lepton Mass Diagrams.

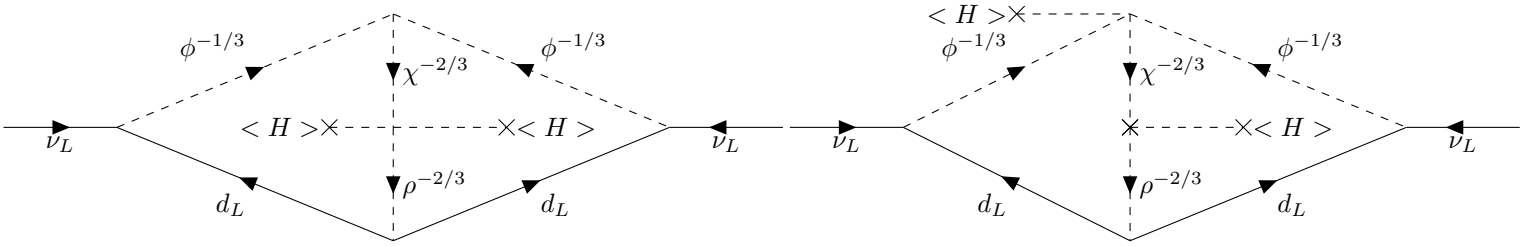


$\Gamma \sim m_e$?



$\Gamma \sim m_e f\,(1{+}?)$?

2 Other tries



3 1 loop, 1 LQ, d_R mixing model

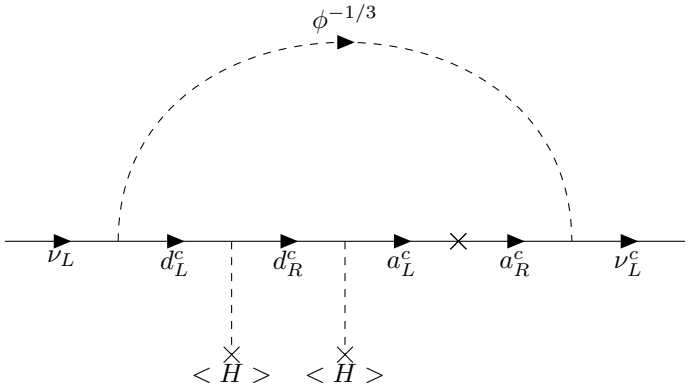


Figure 2: Neutrino Mass Diagram through d quark mixing.

Particle	$SU(3)_c$	$SU(2)_L$	$U(1)_Y$	S	Flavour
Q	3	2	1/6		3
d_R^c	3^*	1	+1/3		3
u_R^c	3^*	1	-2/3		3
L	1	2	-1/2		3
e_R^c	1	1	+1		3
$A_{R,L}$	3	2	-5/6		3
H	1	2	1/2		1
ϕ	3	1	-1/3		1

$$\mathcal{L}^Y_{new,4D} \subset y_1 \underbrace{\overline{Q^c_L} L}_{\left(\overline{d^c_L}\nu_L - \overline{u^c_L} e_L\right)} \phi^* + y_2 \overline{u^c_R} e_R \phi^* + y_3 \overline{A_R} L \phi + y_\epsilon \overline{d_R} A_L H + h.c.$$

$$\mathcal{L}_{3D} \subset \mathcal{M}_A \overline{A} A$$

$$V(H,\phi) = -m_1^2 |H|^2 + \frac{\lambda_1}{4} |H|^4 + m_2^2 |\phi|^2 + \frac{\lambda_2}{4} |\phi|^4 + \lambda_3 \left(H^\dagger H\right) |\phi|^2$$