

Form Factors for LFV Higgs Decays in the DLRSM Model

0.0.1 Diagram ni_GL

$$A_L(\text{ni_GL}) = \frac{\sqrt{2}im_{l_a}m_{l_b}^2m_{n_i}(Q_{Lai}T_{RLib} + \overline{Q_{Lbi}T_{RLia}})B_0^{(1)}(m_{l_a}, m_{n_i}, m_{W_1})}{8\pi^2k_1^3(m_{l_a}^2 - m_{l_b}^2)} + \frac{\sqrt{2}im_{l_a}m_{l_b}^2(-Q_{Lai}\overline{Q_{Lbi}m_{l_b}^2})}{8\pi^2k_1^3(m_{l_a}^2 - m_{l_b}^2)} \quad (1)$$

$$A_R(\text{ni_GL}) = \frac{\sqrt{2}im_{l_a}^2m_{l_b}(-Q_{Lai}\overline{Q_{Lbi}m_{l_b}^2} - T_{RLib}\overline{T_{RLia}})B_1^{(1)}(m_{l_a}, m_{n_i}, m_{W_1})}{8\pi^2k_1^3(m_{l_a}^2 - m_{l_b}^2)} + \frac{\sqrt{2}im_{l_b}m_{n_i}(Q_{Lai}T_{RLib}m_{l_b}^2)}{8\pi^2k_1^3(m_{l_a}^2 - m_{l_b}^2)} \quad (2)$$

(3)

0.0.2 Diagram GL_ni

$$A_L(\text{GL_ni}) = \frac{\sqrt{2}im_{l_a}^2m_{l_b}m_{n_i}(-Q_{Lbi}T_{RLia} - \overline{Q_{Lai}T_{RLib}})B_0^{(2)}(m_{l_b}, m_{n_i}, m_{W_1})}{8\pi^2k_1^3(m_{l_a}^2 - m_{l_b}^2)} + \frac{\sqrt{2}im_{l_a}m_{l_b}^2(-Q_{Lbi}\overline{Q_{Lai}m_{l_b}^2})}{8\pi^2k_1^3(m_{l_a}^2 - m_{l_b}^2)} \quad (4)$$

$$A_R(\text{GL_ni}) = \frac{\sqrt{2}im_{l_a}^2m_{l_b}(-Q_{Lbi}\overline{Q_{Lai}m_{l_b}^2} - T_{RLia}\overline{T_{RLib}})B_1^{(2)}(m_{l_b}, m_{n_i}, m_{W_1})}{8\pi^2k_1^3(m_{l_a}^2 - m_{l_b}^2)} + \frac{\sqrt{2}im_{l_a}m_{n_i}(-Q_{Lbi}T_{RLia}m_{l_b}^2)}{8\pi^2k_1^3(m_{l_a}^2 - m_{l_b}^2)} \quad (5)$$

(6)

0.0.3 Diagram ni_GR

$$A_L(\text{ni_GR}) = \frac{\sqrt{2}im_{l_a}^2m_{l_b}(-J_{ai}\overline{J_{bi}} - Q_{Rai}\overline{Q_{Rbi}m_{l_b}^2})B_1^{(1)}(m_{l_a}, m_{n_i}, m_{W_2})}{8\pi^2k_1v_R^2(m_{l_a}^2 - m_{l_b}^2)} + \frac{\sqrt{2}im_{l_b}m_{n_i}(J_{ai}\overline{Q_{Rbi}m_{l_b}^2} + Q_{Rai}\overline{J_{bi}})}{8\pi^2k_1v_R^2(m_{l_a}^2 - m_{l_b}^2)} \quad (7)$$

$$A_R(\text{ni_GR}) = \frac{\sqrt{2}im_{l_a}m_{l_b}^2m_{n_i}(J_{ai}\overline{Q_{Rbi}} + Q_{Rai}\overline{J_{bi}})B_0^{(1)}(m_{l_a}, m_{n_i}, m_{W_2})}{8\pi^2k_1v_R^2(m_{l_a}^2 - m_{l_b}^2)} + \frac{\sqrt{2}im_{l_a}m_{l_b}^2(-J_{ai}\overline{J_{bi}} - Q_{Rai}\overline{Q_{Rbi}m_{l_b}^2})}{8\pi^2k_1v_R^2(m_{l_a}^2 - m_{l_b}^2)} \quad (8)$$

(9)

0.0.4 Diagram GR_ni

$$A_L(\text{GR_ni}) = \frac{\sqrt{2}im_{l_a}^2 m_{l_b} (-J_{bi}\overline{J_{ai}} - Q_{Rbi}\overline{Q_{Rai}}m_{l_b}^2) B_1^{(2)}(m_{l_b}, m_{n_i}, m_{W_2})}{8\pi^2 k_1 v_R^2 (m_{l_a}^2 - m_{l_b}^2)} + \frac{\sqrt{2}im_{l_a} m_{n_i} (-J_{bi}\overline{Q_{Rai}}m_{l_a}^2 - Q_{Rbi}\overline{J_{ai}}m_{l_b}^2) B_1^{(2)}(m_{l_b}, m_{n_i}, m_{W_2})}{8\pi^2 k_1 v_R^2 (m_{l_a}^2 - m_{l_b}^2)} \quad (10)$$

$$A_R(\text{GR_ni}) = \frac{\sqrt{2}im_{l_a}^2 m_{l_b} m_{n_i} (-J_{bi}\overline{Q_{Rai}} - Q_{Rbi}\overline{J_{ai}}) B_0^{(2)}(m_{l_b}, m_{n_i}, m_{W_2})}{8\pi^2 k_1 v_R^2 (m_{l_a}^2 - m_{l_b}^2)} + \frac{\sqrt{2}im_{l_a} m_{l_b}^2 (-J_{bi}\overline{J_{ai}} - Q_{Rbi}\overline{Q_{Rai}}m_{l_b}^2) B_0^{(2)}(m_{l_b}, m_{n_i}, m_{W_2})}{8\pi^2 k_1 v_R^2 (m_{l_a}^2 - m_{l_b}^2)} \quad (11)$$

$$(12)$$

0.0.5 Diagram ni_HR

$$A_L(\text{ni_HR}) = \frac{\sqrt{2}im_{l_a}^2 m_{l_b} (-K_{ai}\overline{K_{bi}} - Q_{Rai}\overline{Q_{Rbi}}m_{l_b}^2) B_1^{(1)}(m_{l_a}, m_{n_i}, m_{H_R^+})}{8\pi^2 k_1^3 (m_{l_a}^2 - m_{l_b}^2)} + \frac{\sqrt{2}im_{l_b} m_{n_i} (K_{ai}\overline{Q_{Rbi}}m_{l_b}^2 + Q_{Rai}\overline{K_{bi}}m_{l_a}^2) B_1^{(1)}(m_{l_a}, m_{n_i}, m_{H_R^+})}{8\pi^2 k_1^3 (m_{l_a}^2 - m_{l_b}^2)} \quad (13)$$

$$A_R(\text{ni_HR}) = \frac{\sqrt{2}im_{l_a} m_{l_b}^2 m_{n_i} (K_{ai}\overline{Q_{Rbi}} + Q_{Rai}\overline{K_{bi}}) B_0^{(1)}(m_{l_a}, m_{n_i}, m_{H_R^+})}{8\pi^2 k_1^3 (m_{l_a}^2 - m_{l_b}^2)} + \frac{\sqrt{2}im_{l_a} m_{l_b}^2 (-K_{ai}\overline{K_{bi}} - Q_{Rai}\overline{Q_{Rbi}}m_{l_b}^2) B_0^{(1)}(m_{l_a}, m_{n_i}, m_{H_R^+})}{8\pi^2 k_1^3 (m_{l_a}^2 - m_{l_b}^2)} \quad (14)$$

$$(15)$$

0.0.6 Diagram HR_ni

$$A_L(\text{HR_ni}) = \frac{\sqrt{2}im_{l_a}^2 m_{l_b} (-K_{bi}\overline{K_{ai}} - Q_{Rbi}\overline{Q_{Rai}}m_{l_b}^2) B_1^{(2)}(m_{l_b}, m_{n_i}, m_{H_R^+})}{8\pi^2 k_1^3 (m_{l_a}^2 - m_{l_b}^2)} + \frac{\sqrt{2}im_{l_a} m_{n_i} (-K_{bi}\overline{Q_{Rai}}m_{l_a}^2 - Q_{Rbi}\overline{K_{ai}}m_{l_b}^2) B_1^{(2)}(m_{l_b}, m_{n_i}, m_{H_R^+})}{8\pi^2 k_1^3 (m_{l_a}^2 - m_{l_b}^2)} \quad (16)$$

$$A_R(\text{HR_ni}) = \frac{\sqrt{2}im_{l_a}^2 m_{l_b} m_{n_i} (-K_{bi}\overline{Q_{Rai}} - Q_{Rbi}\overline{K_{ai}}) B_0^{(2)}(m_{l_b}, m_{n_i}, m_{H_R^+})}{8\pi^2 k_1^3 (m_{l_a}^2 - m_{l_b}^2)} + \frac{\sqrt{2}im_{l_a} m_{l_b}^2 (-K_{bi}\overline{K_{ai}} - Q_{Rai}\overline{Q_{Rbi}}m_{l_b}^2) B_0^{(2)}(m_{l_b}, m_{n_i}, m_{H_R^+})}{8\pi^2 k_1^3 (m_{l_a}^2 - m_{l_b}^2)} \quad (17)$$

$$(18)$$

0.0.7 Diagram ni_W1

$$A_L(\text{ni_W1}) = -\frac{\sqrt{2}iQ_{Lai}\overline{Q_{Lbi}}g^2 m_{l_a} m_{l_b}^2 B_1^{(1)}(m_{l_a}, m_{n_i}, m_{W_1})}{32\pi^2 k_1 (m_{l_a}^2 - m_{l_b}^2)} \quad (19)$$

$$A_R(\text{ni_W1}) = -\frac{\sqrt{2}iQ_{Lai}\overline{Q_{Lbi}}g^2 m_{l_a}^2 m_{l_b} B_1^{(1)}(m_{l_a}, m_{n_i}, m_{W_1})}{32\pi^2 k_1 (m_{l_a}^2 - m_{l_b}^2)} \quad (20)$$

$$(21)$$

0.0.8 Diagram W1_ni

$$A_L(\text{W1_ni}) = -\frac{\sqrt{2}iQ_{Lbi}\overline{Q_{Lai}}g^2m_{l_a}m_{l_b}^2B_1^{(2)}(m_{l_b},m_{n_i},m_{W_1})}{32\pi^2k_1(m_{l_a}^2-m_{l_b}^2)} \quad (22)$$

$$A_R(\text{W1_ni}) = -\frac{\sqrt{2}iQ_{Lbi}\overline{Q_{Lai}}g^2m_{l_a}^2m_{l_b}B_1^{(2)}(m_{l_b},m_{n_i},m_{W_1})}{32\pi^2k_1(m_{l_a}^2-m_{l_b}^2)} \quad (23)$$

$$(24)$$

0.0.9 Diagram ni_W2

$$A_L(\text{ni_W2}) = -\frac{\sqrt{2}iQ_{Rai}\overline{Q_{Rbi}}g^2m_{l_a}^2m_{l_b}B_1^{(1)}(m_{l_a},m_{n_i},m_{W_2})}{32\pi^2k_1(m_{l_a}^2-m_{l_b}^2)} \quad (25)$$

$$A_R(\text{ni_W2}) = -\frac{\sqrt{2}iQ_{Rai}\overline{Q_{Rbi}}g^2m_{l_a}m_{l_b}^2B_1^{(1)}(m_{l_a},m_{n_i},m_{W_2})}{32\pi^2k_1(m_{l_a}^2-m_{l_b}^2)} \quad (26)$$

$$(27)$$

0.0.10 Diagram W2_ni

$$A_L(\text{W2_ni}) = -\frac{\sqrt{2}iQ_{Rbi}\overline{Q_{Rai}}g^2m_{l_a}^2m_{l_b}B_1^{(2)}(m_{l_b},m_{n_i},m_{W_2})}{32\pi^2k_1(m_{l_a}^2-m_{l_b}^2)} \quad (28)$$

$$A_R(\text{W2_ni}) = -\frac{\sqrt{2}iQ_{Rbi}\overline{Q_{Rai}}g^2m_{l_a}m_{l_b}^2B_1^{(2)}(m_{l_b},m_{n_i},m_{W_2})}{32\pi^2k_1(m_{l_a}^2-m_{l_b}^2)} \quad (29)$$

$$(30)$$

0.0.11 Diagram ni_GLp_GLm

$$A_L(\text{ni_GLp_GLm}) = \frac{iQ_{Lai}T_{RLib}m_{l_a}m_{n_i}(-\alpha_{13}^2+4\lambda_{12}\rho_1)C_0(m_{H_1^0},m_{l_a},m_{l_b},m_{n_i},m_{W_1},m_{W_1})}{8\pi^2\rho_1k_1} + \frac{iQ_{Lai}\overline{Q_{Lbi}}}{8\pi^2\rho_1k_1} \quad (31)$$

$$A_R(\text{ni_GLp_GLm}) = \frac{iQ_{Lai}\overline{Q_{Lbi}}m_{l_a}^2m_{l_b}(\alpha_{13}^2-4\lambda_{12}\rho_1)C_1(m_{H_1^0},m_{l_a},m_{l_b},m_{n_i},m_{W_1},m_{W_1})}{8\pi^2\rho_1k_1} + \frac{iT_{RLib}\overline{T_{RLia}}}{8\pi^2\rho_1k_1} \quad (32)$$

$$(33)$$

0.0.12 Diagram ni_GRp_GRm

$$A_L(\text{ni_GRp_GRm}) = \frac{iJ_{ai}\overline{J_{bi}}k_1^3m_{l_b}(-\alpha_{13}^2 + 4\lambda_{12}\rho_1)C_2(m_{H_1^0}, m_{l_a}, m_{l_b}, m_{n_i}, m_{W_2}, m_{W_2})}{8\pi^2\rho_1v_R^4} + \frac{iJ_{ai}\overline{Q_{Rbi}}k_1^3m_{l_b}m_{n_i}}{8\pi^2\rho_1v_R^4} \quad (34)$$

$$A_R(\text{ni_GRp_GRm}) = \frac{iJ_{ai}\overline{J_{bi}}k_1^3m_{l_a}(\alpha_{13}^2 - 4\lambda_{12}\rho_1)C_1(m_{H_1^0}, m_{l_a}, m_{l_b}, m_{n_i}, m_{W_2}, m_{W_2})}{8\pi^2\rho_1v_R^4} + \frac{iQ_{Rai}\overline{J_{bi}}k_1^3m_{l_a}m_{n_i}}{8\pi^2\rho_1v_R^4} \quad (35)$$

$$(36)$$

0.0.13 Diagram ni_HRp_HRm

$$A_L(\text{ni_HRp_HRm}) = \frac{iK_{ai}\overline{K_{bi}}m_{l_b}(-\alpha_{12}\alpha_{13}v_R^2 - \alpha_{13}\alpha_{23}k_1^2 + 2\alpha_{23}\rho_1k_1^2 + 2\rho_1v_R^2(\alpha_{23} + 2\lambda_{12}))C_2(m_{H_1^0}, m_{l_a}, m_{l_b}, m_{n_i}, m_{W_2}, m_{W_2})}{8\pi^2\rho_1k_1v_R^2} \quad (37)$$

$$A_R(\text{ni_HRp_HRm}) = \frac{iK_{ai}\overline{K_{bi}}m_{l_a}(\alpha_{12}\alpha_{13}v_R^2 + \alpha_{13}\alpha_{23}k_1^2 - 2\alpha_{23}\rho_1k_1^2 - 2\rho_1v_R^2(\alpha_{23} + 2\lambda_{12}))C_1(m_{H_1^0}, m_{l_a}, m_{l_b}, m_{n_i}, m_{W_2}, m_{W_2})}{8\pi^2\rho_1k_1v_R^2} \quad (38)$$

$$(39)$$

0.0.14 Diagram ni_W1p_W1m

$$A_L(\text{ni_W1p_W1m}) = \frac{iQ_{Lai}\overline{Q_{Lbi}}g^4k_1m_{l_a}C_1(m_{H_1^0}, m_{l_a}, m_{l_b}, m_{n_i}, m_{W_1}, m_{W_1})}{64\pi^2} \quad (40)$$

$$A_R(\text{ni_W1p_W1m}) = -\frac{iQ_{Lai}\overline{Q_{Lbi}}g^4k_1m_{l_b}C_2(m_{H_1^0}, m_{l_a}, m_{l_b}, m_{n_i}, m_{W_1}, m_{W_1})}{64\pi^2} \quad (41)$$

$$(42)$$

0.0.15 Diagram ni_W2p_W2m

$$A_L(\text{ni_W2p_W2m}) = \frac{iQ_{Rai}\overline{Q_{Rbi}}g^4k_1m_{l_b}(\alpha_{13} - 2\rho_1)C_2(m_{H_1^0}, m_{l_a}, m_{l_b}, m_{n_i}, m_{W_2}, m_{W_2})}{128\pi^2\rho_1} \quad (43)$$

$$A_R(\text{ni_W2p_W2m}) = \frac{iQ_{Rai}\overline{Q_{Rbi}}g^4k_1m_{l_a}(-\alpha_{13} + 2\rho_1)C_1(m_{H_1^0}, m_{l_a}, m_{l_b}, m_{n_i}, m_{W_2}, m_{W_2})}{128\pi^2\rho_1} \quad (44)$$

$$(45)$$

0.0.16 Diagram ni_GRp_HRm

$$A_L(\text{ni_GRp_HRm}) = \frac{iK_{ai}\overline{J_{bi}}m_{l_b}(-\alpha_{13}\alpha_{23}k_1^4 - \alpha_{13}k_1^2v_R^2(\alpha_{12} + \alpha_{13}) - 2\alpha_{23}\rho_1v_R^4 + 2\rho_1k_1^2v_R^2(-\alpha_{23} + 4\lambda_{12}))}{16\pi^2\rho_1k_1v_R^4} \quad (46)$$

$$A_R(\text{ni_GRp_HRm}) = \frac{iK_{ai}\overline{J_{bi}}m_{l_a}(\alpha_{13}\alpha_{23}k_1^4 + \alpha_{13}k_1^2v_R^2(\alpha_{12} + \alpha_{13}) + 2\alpha_{23}\rho_1v_R^4 + 2\rho_1k_1^2v_R^2(\alpha_{23} - 4\lambda_{12}))}{16\pi^2\rho_1k_1v_R^4} C_1 \quad (47)$$

$$(48)$$

0.0.17 Diagram ni_HRp_GRm

$$A_L(\text{ni_HRp_GRm}) = \frac{iJ_{ai}\overline{K_{bi}}m_{l_b}(-\alpha_{13}\alpha_{23}k_1^4 - \alpha_{13}k_1^2v_R^2(\alpha_{12} + \alpha_{13}) - 2\alpha_{23}\rho_1v_R^4 + 2\rho_1k_1^2v_R^2(-\alpha_{23} + 4\lambda_{12}))}{16\pi^2\rho_1k_1v_R^4} \quad (49)$$

$$A_R(\text{ni_HRp_GRm}) = \frac{iJ_{ai}\overline{K_{bi}}m_{l_a}(\alpha_{13}\alpha_{23}k_1^4 + \alpha_{13}k_1^2v_R^2(\alpha_{12} + \alpha_{13}) + 2\alpha_{23}\rho_1v_R^4 + 2\rho_1k_1^2v_R^2(\alpha_{23} - 4\lambda_{12}))}{16\pi^2\rho_1k_1v_R^4} C_1 \quad (50)$$

$$(51)$$

0.0.18 Diagram ni_W1p_GLm

$$A_L(\text{ni_W1p_GLm}) = \frac{\sqrt{2}iQ_{Lai}\overline{Q_{Lbi}}g^2m_{l_a}\left(2\left(m_{H_1^0}\right)^2 - 2m_{l_a}^2 - m_{l_b}^2\right)C_2(m_{H_1^0}, m_{l_a}, m_{l_b}, m_{n_i}, m_{W_1}, m_{W_1})}{64\pi^2k_1} \quad (52)$$

$$A_R(\text{ni_W1p_GLm}) = -\frac{\sqrt{2}iQ_{Lai}\overline{Q_{Lbi}}g^2m_{l_a}^2m_{l_b}C_1(m_{H_1^0}, m_{l_a}, m_{l_b}, m_{n_i}, m_{W_1}, m_{W_1})}{64\pi^2k_1} + \frac{\sqrt{2}i\overline{Q_{Lbi}}T_{RLia}g^2m_{l_b}m_{l_a}}{64\pi^2k_1} \quad (53)$$

$$(54)$$

0.0.19 Diagram ni_W2p_GRm

$$A_L(\text{ni.W2p.GRm}) = \frac{\sqrt{2i}J_{ai}Q_{Rbi}g^2k_1m_{l_b}m_{n_i}(-\alpha_{13}+2\rho_1)C_0(m_{H_1^0},m_{l_a},m_{l_b},m_{n_i},m_{W_2},m_{W_2})}{128\pi^2\rho_1v_R^2} + \frac{\sqrt{2i}Q_{Rai}}{128\pi^2\rho_1v_R^2} \quad (55)$$

$$A_R(\text{ni-W2p-GRm}) = \frac{\sqrt{2}iQ_{Rai}\overline{Q_{Rbi}}g^2k_1m_{l_a}(\alpha_{13}-2\rho_1)B_0^{(12)}(m_{H_1^0},m_{W_2},m_{W_2})}{128\pi^2\rho_1v_R^2} + \frac{\sqrt{2}iQ_{Rai}\overline{Q_{Rbi}}g^2k_1m_{l_a}}{(56)}$$

(57)

0.0.20 Diagram ni_W2p_HRm

$$A_L(\text{ni_W2p_HRm}) = \frac{\sqrt{2}iK_{ai}\overline{Q_{Rbi}}g^2m_{l_b}m_{n_i}(\alpha_{13}k_1^2 + 2\rho_1v_R^2)C_0(m_{H_1^0}, m_{l_a}, m_{l_b}, m_{n_i}, m_{W_2}, m_{H_R^+})}{128\pi^2\rho_1k_1v_R^2} + \frac{\sqrt{2}iQ_{Rbi}g^2m_{l_b}m_{n_i}(\alpha_{13}k_1^2 + 2\rho_1v_R^2)C_0(m_{H_1^0}, m_{l_a}, m_{l_b}, m_{n_i}, m_{W_2}, m_{H_R^+})}{128\pi^2\rho_1k_1v_R^2} \quad (58)$$

$$A_R(\text{ni-W2p-HRm}) = \frac{\sqrt{2i}Q_{Rai}\overline{Q_{Rbi}}g^2m_{l_a}(-\alpha_{13}k_1^2 - 2\rho_1v_R^2)B_0^{(12)}(m_{H_1^0}, m_{W_2}, m_{H_R^+})}{128\pi^2\rho_1k_1v_R^2} + \frac{\sqrt{2i}Q_{Rai}Q_{Rbi}g^2m_{l_a}}{128\pi^2\rho_1k_1v_R^2} \quad (59)$$

(60)

0.0.21 Diagram ni_GLp_W1m

$$A_L(\text{ni_GLp_W1m}) = -\frac{\sqrt{2}iQ_{Lai}T_{RLib}g^2m_{l_a}m_{n_i}C_0(m_{H_1^0}, m_{l_a}, m_{l_b}, m_{n_i}, m_{W_1}, m_{W_1})}{64\pi^2k_1} - \frac{\sqrt{2}iQ_{Lai}\overline{Q_{Lbi}}g^2m_{l_a}m_{n_i}}{64\pi^2k_1} \quad (61)$$

$$A_R(\text{ni_GLp_W1m}) = \frac{\sqrt{2}iQ_{Lai}\overline{Q_{Lbi}}g^2m_{l_b}\left(2\left(m_{H_1^0}\right)^2-m_{l_a}^2-2m_{l_b}^2\right)C_1(m_{H_1^0},m_{l_a},m_{l_b},m_{n_i},m_{W_1},m_{W_1})}{64\pi^2k_1} + \quad (62)$$

(63)

0.0.22 Diagram ni_GRp-W2m

$$A_L(\text{ni_GRp_W2m}) = \frac{\sqrt{2}iQ_{Rai}\overline{Q_{Rbi}}g^2k_1m_{l_b}(-\alpha_{13}+2\rho_1)B_0^{(12)}(m_{H_1^0},m_{W_2},m_{W_2})}{128\pi^2\rho_1v_R^2} + \frac{\sqrt{2}iQ_{Rai}\overline{Q_{Rbi}}g^2k_1m_{l_b}}{128\pi^2\rho_1v_R^2} \quad (64)$$

$$A_R(\text{ni_GRp_W2m}) = \frac{\sqrt{2}iQ_{Rai}\overline{J_{bi}}g^2k_1m_{l_a}m_{n_i}(\alpha_{13}-2\rho_1)C_0(m_{H_1^0},m_{l_a},m_{l_b},m_{n_i},m_{W_2},m_{W_2})}{128\pi^2\rho_1v_R^2} + \frac{\sqrt{2}iQ_{Rai}\overline{Q_{Rbi}}g^2k_1m_{l_b}}{128\pi^2\rho_1v_R^2} \quad (65)$$

$$(66)$$

0.0.23 Diagram ni_HRp-W2m

$$A_L(\text{ni_HRp_W2m}) = \frac{\sqrt{2}iQ_{Rai}\overline{Q_{Rbi}}g^2m_{l_b}(\alpha_{13}k_1^2+2\rho_1v_R^2)\left(2\left(m_{H_1^0}\right)^2-m_{l_a}^2-2m_{l_b}^2\right)C_1(m_{H_1^0},m_{l_a},m_{l_b},m_{n_i},m_{W_2},m_{W_2})}{128\pi^2\rho_1k_1v_R^2} \quad (67)$$

$$A_R(\text{ni_HRp_W2m}) = \frac{\sqrt{2}iQ_{Rai}\overline{K_{bi}}g^2m_{l_a}m_{n_i}(-\alpha_{13}k_1^2-2\rho_1v_R^2)C_0(m_{H_1^0},m_{l_a},m_{l_b},m_{n_i},m_{H_R^+},m_{W_2})}{128\pi^2\rho_1k_1v_R^2} + \frac{\sqrt{2}iQ_{Rai}\overline{Q_{Rbi}}g^2k_1m_{l_b}}{128\pi^2\rho_1v_R^2} \quad (68)$$

$$(69)$$

0.0.24 Diagram GL_ninj

$$A_L(\text{GL_ninj}) = \frac{\sqrt{2}iQ_{Lai}T_{RLjb}m_{l_a}(-\Omega_{SRij}\alpha_{13}\epsilon^2+2\overline{\Omega_{RLij}}\rho_1)B_0^{(12)}(m_{H_1^0},m_{n_i},m_{n_j})}{32\pi^2\rho_1k_1^3} + \frac{\sqrt{2}im_{l_a}m_{l_b}^2(\alpha_{13}\epsilon^2)}{32\pi^2\rho_1k_1^3} \quad (70)$$

$$A_R(\text{GL_ninj}) = \frac{\sqrt{2}i\overline{Q_{Lbj}}T_{RLia}m_{l_b}(2\Omega_{RLij}\rho_1-\alpha_{13}\overline{\Omega_{SRij}}\epsilon^2)B_0^{(12)}(m_{H_1^0},m_{n_i},m_{n_j})}{32\pi^2\rho_1k_1^3} + \frac{\sqrt{2}im_{l_a}^2m_{l_b}(\alpha_{13}\epsilon^2)}{32\pi^2\rho_1k_1^3} \quad (71)$$

$$(72)$$

0.0.25 Diagram GR_ninj

$$A_L(\text{GR_ninj}) = \frac{\sqrt{2}iJ_{ai}\overline{Q_{Rbj}}m_{l_b}(-\Omega_{SRij}\alpha_{13}\epsilon^2 + 2\overline{\Omega_{RLij}}\rho_1)B_0^{(12)}(m_{H_1^0}, m_{n_i}, m_{n_j})}{32\pi^2\rho_1 k_1 v_R^2} + \frac{\sqrt{2}im_{l_a}^2 m_{l_b}(\alpha_{13}\epsilon^2 (J_{ai}\overline{Q_{Rbj}}))}{32\pi^2\rho_1 k_1 v_R^2} \quad (73)$$

$$A_R(\text{GR_ninj}) = \frac{\sqrt{2}iQ_{Rai}\overline{J_{bj}}m_{l_a}(2\Omega_{RLij}\rho_1 - \alpha_{13}\overline{\Omega_{SRij}}\epsilon^2)B_0^{(12)}(m_{H_1^0}, m_{n_i}, m_{n_j})}{32\pi^2\rho_1 k_1 v_R^2} + \frac{\sqrt{2}im_{l_a}m_{l_b}^2(\alpha_{13}\epsilon^2(-J_{ai}\overline{Q_{Rbj}}))}{32\pi^2\rho_1 k_1 v_R^2} \quad (74)$$

$$(75)$$

0.0.26 Diagram HR_ninj

$$A_L(\text{HR_ninj}) = \frac{\sqrt{2}iK_{ai}\overline{Q_{Rbj}}m_{l_b}(-\Omega_{SRij}\alpha_{13}\epsilon^2 + 2\overline{\Omega_{RLij}}\rho_1)B_0^{(12)}(m_{H_1^0}, m_{n_i}, m_{n_j})}{32\pi^2\rho_1 k_1^3} + \frac{\sqrt{2}im_{l_a}^2 m_{l_b}(\alpha_{13}\epsilon^2 (K_{ai}\overline{Q_{Rbj}}))}{32\pi^2\rho_1 k_1^3} \quad (76)$$

$$A_R(\text{HR_ninj}) = \frac{\sqrt{2}iQ_{Rai}\overline{K_{bj}}m_{l_a}(2\Omega_{RLij}\rho_1 - \alpha_{13}\overline{\Omega_{SRij}}\epsilon^2)B_0^{(12)}(m_{H_1^0}, m_{n_i}, m_{n_j})}{32\pi^2\rho_1 k_1^3} + \frac{\sqrt{2}im_{l_a}m_{l_b}^2(\alpha_{13}\epsilon^2(-K_{ai}\overline{Q_{Rbj}}))}{32\pi^2\rho_1 k_1^3} \quad (77)$$

$$(78)$$

0.0.27 Diagram W1_ninj

$$A_L(\text{W1_ninj}) = \frac{\sqrt{2}iQ_{Lai}\overline{Q_{Lbj}}g^2m_{l_a}m_{n_j}(-\Omega_{SRij}\alpha_{13}\epsilon^2 + 2\overline{\Omega_{RLij}}\rho_1)C_0(m_{H_1^0}, m_{l_a}, m_{l_b}, m_{W_1}, m_{n_i}, m_{n_j})}{128\pi^2\rho_1 k_1} + \frac{\sqrt{2}im_{l_a}^2 m_{n_j}(\alpha_{13}\epsilon^2 (Q_{Lai}\overline{Q_{Lbj}}))}{128\pi^2\rho_1 k_1} \quad (79)$$

$$A_R(\text{W1_ninj}) = \frac{\sqrt{2}iQ_{Lai}\overline{Q_{Lbj}}g^2m_{l_b}m_{n_i}(2\Omega_{RLij}\rho_1 - \alpha_{13}\overline{\Omega_{SRij}}\epsilon^2)C_0(m_{H_1^0}, m_{l_a}, m_{l_b}, m_{W_1}, m_{n_i}, m_{n_j})}{128\pi^2\rho_1 k_1} + \frac{\sqrt{2}im_{l_a}m_{n_j}^2(\alpha_{13}\epsilon^2(-Q_{Lai}\overline{Q_{Lbj}}))}{128\pi^2\rho_1 k_1} \quad (80)$$

$$(81)$$

0.0.28 Diagram W2_ninj

$$A_L(\text{W2_ninj}) = \frac{\sqrt{2}iQ_{Rai}\overline{Q_{Rbj}}g^2m_{l_b}m_{n_i}(-\Omega_{SRij}\alpha_{13}\epsilon^2 + 2\overline{\Omega_{RLij}}\rho_1)C_0(m_{H_1^0}, m_{l_a}, m_{l_b}, m_{W_2}, m_{n_i}, m_{n_j})}{128\pi^2\rho_1 k_1} + \frac{\sqrt{2}im_{l_a}^2 m_{n_i}(\alpha_{13}\epsilon^2 (Q_{Rai}\overline{Q_{Rbj}}))}{128\pi^2\rho_1 k_1} \quad (82)$$

$$A_R(\text{W2_ninj}) = \frac{\sqrt{2}iQ_{Rai}\overline{Q_{Rbj}}g^2m_{l_a}m_{n_j}(2\Omega_{RLij}\rho_1 - \alpha_{13}\overline{\Omega_{SRij}}\epsilon^2)C_0(m_{H_1^0}, m_{l_a}, m_{l_b}, m_{W_2}, m_{n_i}, m_{n_j})}{128\pi^2\rho_1 k_1} + \frac{\sqrt{2}im_{l_a}m_{n_j}^2(\alpha_{13}\epsilon^2(-Q_{Rai}\overline{Q_{Rbj}}))}{128\pi^2\rho_1 k_1} \quad (83)$$

$$(84)$$